April 13, 2021

Sabrina Cook
Water Use Efficiency Implementation Section Chief
California Department of Water Resources
Water Use Efficiency Branch
901 P St., Room 313A
Sacramento, CA 95814

Subject: 2020 Agricultural Water Management Plan for Participating Sacramento River Settlement Contractors: GCID, RD 108, SMWC

Dear Ms. Cook,

The Sacramento River Settlement Contractors (SRSC) districts and water company participating in this Agricultural Water Management Plan submittal have complied with the requirements of the Water Conservation Act by completing and submitting electronic copies of the following via the WUE data Portal:

- 2016 Sacramento Valley Regional Water Management Plan (Approved Federal Water Management Plan)
- Proof of U.S. Bureau of Reclamation Acceptance of the 2016 SVRWMP (screen shot of Reclamation website with approved plans), accepted 2019
- Proof of Public Hearing Noticing for all three participating members (GCID, RD 108, and SMWC)
- Resolution of Adoption by all three participating member Boards (GCID, RD 108, and SMWC)

The SRSC are also complying with requirements under Water Code Sections 10840-10844 by notifying and providing copies of this submittal to the appropriate entities.

The contact information for each SRSC participating member is provided in Table. 1.

Table 1
SRSC Contacts

District/ Company	Conservation Coordinator	Phone	Email
GCID	Holly Dawley	530.934.8881	hdawley@gcid.net
RD108	Bill Vanderwaal	530.437.2221	wvanderwaal@rd108.org
SMWC	Brad Mattson	530.738.4423x5	brad@sutterbasinwater.com

We would appreciate receiving your letter of acceptance for compliance with the Agricultural Water Management Plan at your earliest convenience.

Sincerely,

Thaddeus L. Bettner
Regional Water Management Plan Coordinator
General Manager
Glenn-Colusa Irrigation District

cc:

David White/USBR
Holly Dawley/GCID
Zac Dickens/GCID
Bill Vanderwaal/RD108
Brad Mattson/SMWC

2020 Sacramento Settlement Contractor Regional Agricultural Water Management Plan—Adopted

Adopted on

March 18, 2021 (Glenn-Colusa Irrigation District)

March 18, 2021 (Reclamation District No. 108)

March 26, 2021 (Sutter Mutual Water Company)

As Federal Water Contractors, the Regional AWMP Includes the following Components:

- Proof of Public Noticing
- Resolutions of Adoption (GCID, RD 108, SMWC)
- Proof of Reclamation Approval of the 2016 Sacramento Valley Regional Water Management Plan
- Approved CVPIA Water Management Plan: Sacramento Valley Regional Water Management Plan, 2016 Annual Update (Posted to the Federal Register in 2016 and USBR approved in 2019)

An Adopted Plan is submitted on behalf of

- Glenn-Colusa Irrigation District
- Reclamation District No. 108
- Sutter Mutual Water Company

2020 SRSC AWMP

Proof of Public Noticing

Public Noticing, GCID:	March 4, 2021 and March 11, 2021, Pioneer Review (Williams/Colusa)
	March 3, 2021 and March 10, 2021 Valley Mirror (Willows)
Public Noticing, RD 108:	March 4, 2021 and March 11, 2021, Pioneer Review (Colusa)
	March 5, 2021 and March 12, 2021, Daily Democrat (Woodland)
Public Noticing, SMWC:	March 9, 2021 and March 16, 2021, Appeal-Democrat (Yuba and Sutter)

Pioneer Review
3/4/21

legal & classifieds

EMPLOYMENT

ASSISTANT SWIM TEAM COACHES NEEDED

The COLUSA SWIM TEAM seeking 2 Assistant Coaches. Late May – Mid August. Text 530-713-6359 or visit Colusa Swim Team on Facebook for more info.

02/18, 02/25, 03/04/2021 - WPR #2021-0197

EMPLOYMENT

RICHTER AVIATION

LOADER/HELPERS NEEDED

Loader/Helpers to load airplanes for rice season.
Seasonal, no experience necessary.
Must be reliable and have current CDL.
Call (530) 438-2141. Apply in person.

02/25, 03/04, 03/11, 03/18, 03/25, 04/07/2021 - WPR #2021-0220

EMPLOYMENT

COLUSA COUNTY OFFICE OF EDUCATION

SUBSTITUTE CUSTODIAN

$14.00/hr. Hours/Days as needed. High school diploma or GED & practical experience. Apply online at www.edjoin.org
Colusa County Office of Education
345 5th St, Colusa, CA 95932.
Continuous. EOE/AA

03/04, 03/11/2021 - WPR #2021-0363

EMPLOYMENT

COLUSA COUNTY OFFICE OF EDUCATION

SUBSTITUTE FOOD SERVICE ASSISTANT

$14.00/hr., Hours/Days as needed. Relevant training and experience. Provide Food Handler Certification.
Apply online at www.edjoin.org
Colusa County Office of Education
345 5th St, Colusa, CA 95932.
Continuous. EOE/AA

03/04, 03/11/2021 - WPR #2021-0364

FICTITIOUS BUSINESS NAME

FILE NO. 2021-00000016
Date filed: Feb. 1, 2021
The following persons are doing business as:
PRIMAL PECANS
Business Address:

FICTITIOUS BUSINESS NAME

FILE NO. 2021-00000003
Date filed: January 8, 2021
The following persons are doing business as:
MCNARY-MOORE FUNERAL SERVICE
Business Address:
107 5TH ST., COLUSA, CA 95932
Mailing Address:
30 CONSTITUTION DR., SUITE 100
CHICO, CA 95973
Name of Registrant(s):
1. **JANUS ADVISER, INC.**
AI #ON: 2177109 - STATE: CALIFORNIA
30 CONSTITUTION DR., SUITE 100
CHICO, CA 95973

This business is conducted by a **Corporation**. The registrant commenced to transact business under the fictitious business name or names listed above on: **Mar. 1, 2021.**
/s/ Kevin Stiles, Vice President of Janus Advisor, Inc.
This statement was filed with the County Clerk of Colusa County on date stamped above. I hereby certify that the foregoing is a correct copy of the original on file in my office.
/s/ Rose Gallo-Vasquez, Clerk-Recorder

01/20, 01/27, 02/04, 02/11, 02/25/2021 - WPR #2021-0138

LEGAL NOTICE

GLENN COLUSA IRRIGATION DISTRICT

NOTICE OF AVAILABILITY: AGRICULTURAL WATER MANAGEMENT PLAN

Notice is hereby given that Glenn Colusa Irrigation District's (GCID) proposed Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code § 10820 et. seq., the Water Conservation Act of 2009, is now available for public inspection at the GCID office, 344 E. Laurel Street, Willows, CA 95988. Public comments on the proposed plan will be received for consideration by the GCID Board of Directors until March 17, 2021 at the GCID Office, 344 E. Laurel Street, Willows, CA 95988. GCID will receive comments regarding the AWMP, and then the Board of Directors will adopt the AWMP as drafted or modified during its regular Board of Directors meeting schedule for Thursday, March 18, 2021 at 9:00 a.m. at the GCID office address and location noted above.

03/04, 03/11/2021 - WPR #2021-0359

LEGAL NOTICE

NOTICE OF AVAILABILITY:

AGRICULTURAL WATER MANAGEMENT PLAN

Notice is hereby given that Glenn Colusa Irrigation District's (GCID) proposed

Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code § 10820 et. seq., the Water Conservation Act of 2009, is now available for public inspection at the GCID office, 344 E. Laurel Street, Willows, CA 95988. Public comments on the proposed plan will be received for consideration by the GCID Board of Directors until March 17, 2021 at the GCID Office, 344 E. Laurel Street, Willows, CA 95988. GCID will receive comments regarding the AWMP, and then the Board of Directors will adopt the AWMP as drafted or modified during its regular Board of Directors meeting schedule for Thursday, March 18, 2021 at 9:00 a.m. at the GCID office address and location noted above.

March 4 & March 11, 2021

LEGAL NOTICE

NOTICE OF AVAILABILITY:

AGRICULTURAL WATER MANAGEMENT PLAN

Notice is hereby given that Glenn Colusa Irrigation District's (GCID) proposed Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code § 10820 et. seq., the Water Conservation Act of 2009, is now available for public inspection at the GCID office, 344 E. Laurel Street, Willows, CA 95988. Public comments on the proposed plan will be received for consideration by the GCID Board of Directors until March 17, 2021 at the GCID Office, 344 E. Laurel Street, Willows, CA 95988. GCID will receive comments regarding the AWMP, and then the Board of Directors will adopt the AWMP as drafted or modified during its regular Board of Directors meeting schedule for Thursday, March 18, 2021 at 9:00 a.m. at the GCID office address and location noted above. 3/3, 3/10

3/3/21 - Valley Mirror

dependent on experience, new employees should anticipate being hired at the beginning of the salary range. For details and instructions visit www.countyofglenn.net/jobs, (a resume is not accepted in lieu of an application). Application deadline Friday, 3/12/21, 5:00pm. Equal Opportunity Employer. 2/27, 3/3, 3/6, 3/10

FIREWOOD FOR SALE

Ron's Firewood. Dry and covered almond, oak, euc., olive, & English walnut. Competitively priced, with 32 years of experience. **865-2219, 514-2019.** UFN

LEGAL NOTICE

NOTICE OF AVAILABILITY:

AGRICULTURAL WATER MANAGEMENT PLAN

Notice is hereby given that Glenn Colusa Irrigation District's (GCID) proposed Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code § 10820 et. seq., the Water Conservation Act of 2009, is now available for public inspection at the GCID office, 344 E. Laurel Street, Willows, CA 95988. Public comments on the proposed plan will be received for consideration by the GCID Board of Directors until March 17, 2021 at the GCID Office, 344 E. Laurel Street, Willows, CA 95988. GCID will receive comments regarding the AWMP, and then the Board of Directors will adopt the AWMP as drafted or modified during its regular Board of Directors meeting schedule for Thursday, March 18, 2021 at 9:00 a.m. at the GCID office address and location noted above. 3/3, 3/10

Valley Mirror 3/10/21

PROGRAM MANAGER II (MSS)

$6,027- $7,721/mo.

Continuous recruitment

Please visit: www.countyofcolusa.org to obtain the link to apply.

03/11/2021 - WPR #2021-0375

FICTITIOUS BUSINESS NAME

FILE NO. 2021-00000022

Date filed: February 10, 2021

The following persons are doing business as:

ELITE HOME INSPECTIONS

Business Address:
1108 TESS DR., ARBUCKLE, CA 95912

Mailing Address:
PO BOX 1259, ARBUCKLE, CA 95912

Name of Registrant(s):

1. **CORONA, DAVID AMBRIZ**
   1108 TESS DR., ARBUCKLE, CA 95912

This business is conducted by **an Individual**. The registrant commenced to transact business under the fictitious business name or names listed above on: **N/A**.

/s/ David Ambriz

This statement was filed with the County Clerk of Colusa County on date stamped above. I hereby certify that the foregoing is a correct copy of the original on file in my office.

/s/ Rose Gallo-Vasquez, Clerk-Recorder

02/18, 02/25, 03/04, 03/11/2021 - WPR #2021-0221

FICTITIOUS BUSINESS NAME

FILE NO. 2021-00000024

Date filed: February 22, 2021

The following persons are doing business as:

LA CABANA MEXICAN FOOD

Business Address:
1028 BRIDGE ST., STE. B, COLUSA, CA 95932

Mailing Address:
1028 BRIDGE ST., STE. B, COLUSA, CA 95932

Name of Registrant(s):

1. **CEJA, CRISTOBAL**
   2291 LINDSEY DRIVE, COLUSA, CA 95932
2. **CEJA, SILVIA**
   2291 LINDSEY DRIVE, COLUSA, CA 95932

This business is conducted by **a Married Couple**. The registrant commenced to transact business under the fictitious business name or names listed above on:

LEGAL NOTICE

RECLAMATION DISTRICT NO. 108

NOTICE OF AVAILABILITY:

AGRICULTURAL WATER MANAGEMENT PLAN

Notice is hereby given that Reclamation District 108's (RD-108) proposed Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code section 10820 et seq., the Water Conservation Act of 2009, is now available for public inspection at the RD-108 Office, 975 Wilson Bend Road, Grimes, CA 95950. Public comments on the proposed plan will be received for consideration by the RD-108 Board of Trustees until March 18, 2021 at the RD-108 Office, 975 Wilson Bend Road, Grimes, CA 95950. RD-108 will receive comments regarding the AWMP, and then the Board of Trustees will adopt the AWMP as drafted or modified during its regular Board of Trustees meeting scheduled for Thursday, March 18th, 2021 at 8:30 a.m. at the RD-108 Office address and location noted above.

03/04, 03/11/2021 - WPR #2021-0360

LEGAL NOTICE

COMMUNITY ACTION PARTNERSHIP COLUSA, GLENN & TRINITY COUNTIES

NOTICE OF BOARD VACANCY

ONE (1) REPRESENTATIVE OF PRIVATE ENTERPRISE

IN COLUSA COUNTY ON THE COLUSA-GLENN-TRINITY COMMUNITY ACTION PARTNERSHIP BOARD OF DIRECTORS

A candidate, Category III, Representing Private Enterprise,

A) Shall be an official or member of business, industry, labor, religious, welfare, education or other major groups and interest in the community;

B) Must reside in Colusa County

Directors provide insight into community problem solving based on their knowledge and understanding of both the community and the sector they represent. They are responsive to community designated needs and participate in planning programmatic strategies as a part of a community action plan.

protect the health, safety, and welfare of the community:

SECTION 4

Section 11-8.4(c) is hereby added to read as follows:

(c) The community development director may in their discretion not issue an industrial hemp license for a property or applicant when said property owner or applicant failed to reasonably correct a written notice of code violation involving an industrial hemp license or County code provisions in the preceding twelve months. The decision to withhold an industrial hemp license may be appealed pursuant to Section 44-1.80.080 of the County Code.

SECTION 5

Section 11-8.1(a) is hereby amended to read as follows and Sections 11-8.1(a)(1), (2), (3) and (4) shall remain unchanged:

(a) Industrial hemp cultivation, including seed production, may only occur on properties zoned foothill agriculture (F-A), exclusive agriculture (E-A), and upland conservation (U-C) that are a minimum of one and one-half miles away from the following boundaries:

SECTION 6

This ordinance is exempt from the California Environmental Quality Act (CEQA) because it is not a project under CEQA. Additionally, if it were deemed a project it would be categorically exempt under California Code of Regulations Title 14, Division 6, Chapter 3 Section 15060(c)(2) because the activity will not result in a direct or reasonably foreseeable indirect physical change in the environment, and Section 15061(b)(3) because there is no possibility that the project may have a significant effect on the environment.

SECTION 7

The provisions of Chapter 11 are severable and if any provision of Chapter 11 or its application in a particular circumstance is held invalid, the remainder of the Chapter, including the application of such part or provision in another circumstance, will not be affected and will continue in full force. The Board of Supervisors declares that it would have passed each section, subsection, subdivision, paragraph, sentence, clause, or phrase in Chapter 11 irrespective of the fact that any one, or more sections, subsections, subdivisions, paragraphs, sentences, clauses or phrases be held unconstitutional, invalid or unenforceable.

SECTION 8

This ordinance shall become effective thirty (30) days after its passage. It shall be published once with the names of the members of the Board of Supervisors voting for and against the ordinance in a newspaper of general circulation published in the County of Colusa, State of California, within fifteen (15) days after its passage.

Introduced at a regular meeting of the Board of Supervisors

Pioneer 3/11/21

LEGAL NOTICE

RECLAMATION DISTRICT NO. 108

NOTICE OF AVAILABILITY: AGRICULTURAL WATER MANAGEMENT PLAN

Notice is hereby given that Reclamation District 108's (RD-108) proposed Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code section 10820 et seq., the Water Conservation Act of 2009, is now available for public inspection at the RD-108 Office, 975 Wilson Bend Road, Grimes, CA 95950. Public comments on the proposed plan will be received for consideration by the RD-108 Board of Trustees until March 18, 2021 at the RD-108 Office, 975 Wilson Bend Road, Grimes, CA 95950. RD-108 will receive comments regarding the AWMP, and then the Board of Trustees will adopt the AWMP as drafted or modified during its regular Board of Trustees meeting scheduled for Thursday, March 18th, 2021 at 8:30 a.m. at the RD-108 Office address and location noted above.

03/04, 03/11/2021 - WPR #2021-0360

Daily Democrat
DailyDemocrat.com · Woodland, CA
711 Main Street
Woodland, CA 95695
530-406-6223
legals@dailydemocrat.com

3597500

RECLAMATION DISTRICT NO. 108
PO BOX 50
GRIMES, CA 95950

Account Number: 3597500

Ad Order Number: 0006557924

Customer's Reference / PO Number: Newspaper Notification_3.01.2021 / Newspaper Notification_3.01.2021

Publication: Woodland Daily Democrat

Publication Dates: 03/05/2021, 03/12/2021

Amount: $100.12

Payment Amount: $100.12 *Payment Method:* Credit Card

Invoice Text: NOTICE OF
AVAILABILITY:
AGRICULTURAL
WATER
MANAGEMENT PLAN

Notice is hereby given that Reclamation District 108's (RD-108) proposed Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code section 10820 et seq., the Water Conservation Act of 2009, is now available for public inspection at the RD-108 Office, 975 Wilson Bend Road, Grimes, CA 95950. Public comments on the proposed plan will be received for consideration by the RD-108 Board of Trustees until March 18, 2021 at the RD-108 Office, 975 Wilson Bend Road, Grimes, CA 95950. RD-108 will receive comments regarding the AWMP, and then the Board of Trustees will adopt the AWMP as drafted or modified during its regular Board of Trustees meeting scheduled for Thursday, March 18th, 2021 at 8:30 a.m. at the RD-108 Office address and location noted above.

Woodland Daily Democrat
711 Main Street
Woodland, CA 95695
530-406-6223
legals@dailydemocrat.com

3597500

RECLAMATION DISTRICT NO. 108
PO BOX 50
GRIMES, CA 95950

Legal No. **0006557924**

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

STATE OF CALIFORNIA
COUNTY OF YOLO

FILE NO. Newspaper Notification_3.01.2021

I am a citizen of the United States. I am over the age of eighteen years and not a party to or interested in the above-entitled matter. I am the Legal Advertising Clerk of the printer and publisher of The Daily Democrat, a newspaper published in the English language in the City of Woodland, County of Yolo, State of California.

I declare that the Daily Democrat is a newspaper of general circulation as defined by the laws of the State of California as determined by this court's order dated June 30, 1952 in the action entitled In the Matter of the Ascertainment and Establishment of the Standing of The Daily Democrat as a Newspaper of General Circulation, Case Number 12659. Said order states "The Daily Democrat" has been established, printed and published in the City of Woodland, County of Yolo, State of California; That it is a newspaper published daily for the dissemination of local and telegraphic news and intelligence of general character and has a bona fide subscription list of paying subscribers; and...THEREFORE, IT IS ORDERED, ADJUDGED AND DECREED:...That "The Daily Democrat" is a newspaper of general circulation for the City of Woodland, County of Yolo, California. Said order has not been revoked.

I declare that this notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

03/05/2021, 03/12/2021

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

Dated at Woodland, California, this
12th day of March 2021

(Signature) Jill Teer

NOTICE OF AVAILABILITY: AGRICULTURAL WATER MANAGEMENT PLAN

Notice is hereby given that Reclamation District 108's (RD-108) proposed Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code section 10820 et seq., the Water Conservation Act of 2009, is now available for public inspection at the RD-108 Office, 975 Wilson Bend Road, Grimes, CA 95950. Public comments on the proposed plan will be received for consideration by the RD-108 Board of Trustees until March 18, 2021 at the RD-108 Office, 975 Wilson Bend Road, Grimes, CA 95950. RD-108 will receive comments regarding the AWMP, and then the Board of Trustees will adopt the AWMP as drafted or modified during its regular Board of Trustees meeting scheduled for Thursday, March 18th, 2021 at 8:30 a.m. at the RD-108 Office address and location noted above.

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

APPEAL-DEMOCRAT
1530 Ellis Lake Drive, Marysville, CA 95901 * (530) 749-4700

STATE OF CALIFORNIA * Counties of Yuba and Sutter

I am not a party to, nor interested in the above entitled matter. I am the principal clerk of the printer and publisher of THE APPEAL-DEMOCRAT, a newspaper of general circulation, printed & published in the City of Marysville, County of Yuba, to which Newspaper has been adjudged a newspaper of general circulation by The Superior Court of the County of Yuba, State of California under the date of November 9, 1951, No. 11481, and County of Sutter to which Newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Sutter, State of California under the date of May 17, 1999, Case No.CV PT99-0819. The Notice, of which the annexed is a copy, appeared in said newspaper on the following dates:.

March 9 & 16, 2021

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

March 16, 2021 Nancy Brown

Date Signature

Reclamation District 1500 Notice of Availability

COPY:

NOTICE OF AVAILABILITY:
AGRICULTURAL WATER MANAGEMENT PLAN

Notice is hereby given that Sutter Mutual Water Company's (SMWC) proposed Agricultural Water Management Plan (AWMP), prepared pursuant to Water Code §10820 et seq., the water Conservation Act of 2009, is now available for public inspection at the SMWC office 15094 Cranmore Rd., Robbins CA 95676. Public comments on the proposed plan will be received for consideration by the SMWC Board of Directors until March 25, 2021 at the SMWC Office 15094 Cranmore Rd., Robbins CA 95676. SMWC will receive comments regarding the AWMP, and then the Board of Directors will adopt the AWMP as drafted or modified during a special Board of Directors meeting scheduled for March 26, 2021 at 9:00 am at the SMWC Office address and location noted above.

March 9 & 16, 2021 Ad #00265956

2020 SRSC AWMP

Signed Resolutions

Glenn-Colusa Irrigation District:	March 18, 2021
Reclamation District No. 108:	March 18, 2021
Sutter Mutual Water Company:	March 26, 2021

GLENN-COLUSA IRRIGATION DISTRICT
RESOLUTION NO. 2021-05

RESOLUTION OF THE GLENN-COLUSA IRRIGATION DISTRICT BOARD OF DIRECTORS TO ADOPT THE AGRICULTURAL WATER MANAGEMENT PLAN

The Board of Directors of Glenn-Colusa Irrigation District (GCID) hereby finds and declares as follows:

WHEREAS, the Legislature has codified the Agricultural Water Management Planning Act (AWMPA), at Water Code sections 10800-10853, thereby requiring certain agricultural water suppliers to prepare and adopt an Agricultural Water Management Plan (AWMP) to achieve the conservation of water;

WHEREAS, the AWMPA defines an "agricultural water supplier" as a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water, and requires an agricultural water supplier serving water to at least 25,000 acres to prepare an AWMP;

WHEREAS, an AWMP must contain information regarding an agricultural water supplier's service area, quantity and quality of water supplies, and specific water use efficiency information;

WHEREAS, an agricultural water supplier that is required to submit a water conservation plan to the U.S. Bureau of Reclamation (USBR) pursuant to the Central Valley Project Improvement Act (CVPIA) or Reclamation Reform Act of 1982 (RRA), or both, may submit those plans in satisfaction of the substantive AWMP Requirements contained in the AWMPA;

WHEREAS, in 2007 Glenn-Colusa Irrigation District (GCID) and other Sacramento River Settlement Contractors (SRSC) developed the SRSCs Regional Water Management Plan (RWMP) for submittal to the USBR pursuant to the applicable CVPIA and RRA requirements for water conservation plans;

WHEREAS, in Glenn-Colusa Irrigation District and the SRSCs prepared updates to the RWMP in 2009 (2009 Update), 2012 (2010/2011 Update), and 2016 (2016 Update), and in cooperation with the USBR, collectively referred to herein as RWMP Updates;

WHEREAS, the RWMP and the RWMP Updates, collectively, contain the requisite information for Glenn-Colusa Irrigation District's water conservation plan submittals to the USBR, Glenn-Colusa Irrigation District has submitted them to the USBR in satisfaction of its water conservation plan obligations, and the USBR has accepted these submittals as adequate;

WHEREAS, Glenn-Colusa Irrigation District has prepared its Water Measurement Compliance Program pursuant to Water Code section 10608.48, including a report regarding efficient water management practices; and

WHEREAS, the RWMP, the RWMP Updates, and the Water Measurement Compliance Program, collectively, contain the requisite information to satisfy the substantive AWMP requirement required under the AWMPA.

NOW, THEREFORE, BE IT RESOLVED that the Board of Glenn-Colusa Irrigation District does hereby adopt the RWMP, the RWMP Updates, and the Water Measurement Compliance Program, collectively as Glenn-Colusa Irrigation District's Agricultural Water Management Plan required under the AWMPA.

PASSED AND ADOPTED by unanimous vote of the Board of Directors on March 18, 2021.

Ayes: Directors Bransford, Knight, Amaro, Dennis and Vann
Absent:
Noes:
Abstain:

* * *

I hereby certify that I am the Secretary of the Glenn-Colusa Irrigation District and that the foregoing resolution was duly adopted by the Board of Directors of said District at a regular meeting thereof duly held on March 18, 2021, at which meeting a quorum of said Board of Directors was at all times present and acting.

IN WITNESS WHEREOF, I have set my hand and the seal of the District this 18th day of March 2021.

Thaddeus L. Bettner, Secretary
Board of Directors
Glenn-Colusa Irrigation District

RECLAMATION DISTRICT NO. 108
RESOLUTION NO. 21-02

RESOLUTION TO ADOPT THE AGRICULTURAL WATER MANAGEMENT PLAN

WHEREAS, the Legislature has codified the Agricultural Water Management Planning Act (AWMPA), at Water Code sections 10800-10853, thereby requiring certain agricultural water suppliers to prepare and adopt an Agricultural Water Management Plan (AWMP) to achieve the conservation of water;

WHEREAS, the AWMPA defines an "agricultural water supplier" as a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water, and requires an agricultural water supplier serving water to at least 25,000 acres to prepare an AWMP;

WHEREAS, an AWMP must contain information regarding an agricultural water supplier's service area, quantity and quality of water supplies, and specific water use efficiency information;

WHEREAS, an agricultural water supplier that is required to submit a water conservation plan to the U.S. Bureau of Reclamation (USBR) pursuant to the Central Valley Project Improvement Act (CVPIA) or Reclamation Reform Act of 1982 (RRA), or both, may submit those plans in satisfaction of the substantive AWMP requirements contained in the AWMPA;

WHEREAS, in 2007, **Reclamation District 108** and other Sacramento River Settlement Contractors (SRSCs) developed the SRSCs Regional Water Management Plan (RWMP) for submittal to the USBR pursuant to the applicable CVPIA and RRA requirements for water conservation plans;

WHEREAS, Reclamation District 108 and the SRSCs prepared an updates to the RWMP in 2009 (2009 Update), 2012 (2010/2011 Update), and 2016 (2016 Update), and in cooperation with the USBR, they most recently prepared the 2016 update to the RWMP (2016 Update), collectively referred to herein as RWMP Updates;

WHEREAS, the RWMP, the RWMP Updates, collectively, contain the requisite information for **Reclamation District 108** water conservation plan submittals to the USBR, **Reclamation District 108** has submitted them to the USBR in satisfaction of its water conservation plan obligations. and the USBR has accepted these submittals as adequate;

WHEREAS, Reclamation District 108 has prepared its Water Measurement Compliance Program pursuant to Water Code section 10608.48, including a report regarding efficient water management practices; and

WHERE AS, the RWMP, the RWMP Updates, and the Water Measurement Compliance Program, collectively, contain the requisite information to satisfy the substantive AWMP requirements required under the AWMPA.

NOW, THEREFORE, BE IT RESOLVED by Reclamation District 108 Board of Trustees as follows:

1. The foregoing recitals and findings, and each of them, are true and correct.

2. The Board hereby adopts the RWMP, the RWMP Updates, and the Water Measurement Compliance Program, collectively, as **Reclamation District 108** Agricultural Water Management Plan required under the AWMPA.

PASSED AND ADOPTED by unanimous vote of the Board of Trustees on **March 18th, 2021.**

I HEREBY CERTIFY that the forgoing is a true and correct copy of the resolution of the Board of Trustees of **Reclamation District 108** as duly passed and adopted by said Board on the **18th day of March, 2021.**

President of the Board of Trustees

Secretary of the Board of Trustees

SUTTER MUTUAL WATER COMPANY
RESOLUTION NO. 2021-01

RESOLUTION OF THE SUTTER MUTUAL WATER COMPANY BOARD OF DIRECTORS TO ADOPT THE AGRICULTURAL WATER MANAGEMENT PLAN

The Board of Directors Sutter Mutual Water Company (SMWC) hereby finds and declares as follows:

WHEREAS, the Legislature has codified the Agricultural Water Management Planning Act (AWMPA), at Water Code sections 10800-10853, thereby requiring certain agricultural water suppliers to prepare and adopt an Agricultural Water Management Plan (AWMP) to achieve the conservation of water;

WHEREAS, the AWMPA defines an "agricultural water supplier" as a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water, and requires an agricultural water supplier serving water to at least 25,000 acres to prepare an AWMP;

WHEREAS, an AWMP must contain information regarding an agricultural water supplier's service area, quantity and quality of water supplies, and specific water use efficiency information;

WHEREAS, an agricultural water supplier that is required to submit a water conservation plan to the U.S. Bureau of Reclamation (USBR) pursuant to the Central Valley Project Improvement Act (CVPIA) or Reclamation Reform Act of 1982 (RRA), or both, may submit those plans in satisfaction of the substantive AWMP Requirements contained in the AWMPA;

WHEREAS, in 2007 SMWC and other Sacramento River Settlement Contractors (SRSC) developed the SRSCs Regional Water Management Plan (RWMP) for submittal to the USBR pursuant to the applicable CVPIA and RRA requirements for water conservation plans;

WHEREAS, SMWC and the SRSCs prepared updates to the RWMP in 2009 (2009 Update), 2012 (2010/2011 Update), and 2016 (2016 Update) in cooperation with the USBR, collectively referred to herein as RWMP Updates;

WHEREAS, the RWMP and the RWMP Updates, collectively, contain the requisite information for SMWC's water conservation plan submittals to the USBR, SMWC has submitted them to the USBR in satisfaction of its water conservation plan obligations, and the USBR has accepted these submittals as adequate;

WHEREAS, SMWC has prepared its Water Measurement Compliance Program pursuant to Water Code section 10608.48, including a report regarding efficient water management practices; and

WHEREAS, the RWMP, the RWMP Updates, and the Water Measurement Compliance Program, collectively, contain the requisite information to satisfy the substantive AWMP requirement required under the AWMPA.

NOW, THEREFORE, BE IT RESOLVED that the SMWC Board of Directors does hereby adopt the RWMP, the RWMP Updates, and the Water Measurement Compliance Program, collectively as Sutter Mutual Water Company's Agricultural Water Management Plan required under the AWMPA.

PASSED AND ADOPTED by unanimous vote of the Board of Directors on March 26, 2021.

Ayes: 7
Absent: 0
Noes: 0
Abstain: 0

* * *

I hereby certify that I am the Secretary of the Sutter Mutual Water Company and that the foregoing resolution was duly adopted by the Board of Directors of said Company at a regular meeting thereof duly held on March 26, 2021, at which meeting a quorum of said Board of Directors was at all times present and acting.

IN WITNESS WHEREOF, I have set my hand and the seal of the Company this 26th day of March 2021.

Brad Mattson, Secretary
Board of Directors
Sutter Mutual Water Company

2020 SRSC AWMP

Proof of Reclamation Approval: 2016 Sacramento River Regional Water Management Plan

MENU

California-Great Basin

Welcome to the Bureau of Reclamation California-Great Basin

Reclamation / California-Great Basin / WaterShare / Water Management Plans

REGION 10

Water Management Plans

The Central Valley Improvement Act of 1992 (CVPIA) and Section 210(b) of the Reclamation Reform Act of 1982 require certain entities that enter into a water service or repayment contract with the Bureau of Reclamation to prepare and submit to Reclamation a Water Management Plan (WMP).

Please send inquiries or comments about WMPs to David T. White or (916) 978-5208 (TTY 800-877-8339).

Reclamation has deemed adequate the following Water Management Plans.

2021

- Stockton East Water District

2020

- City of Tracy

- Tulelake Irrigation District

2017

- Banta Carbona Irrigation District
- Chowchilla Water District
- City of Avenal
- City of Fernley
- City of Shasta Lake
- Delano Earlimart Irrigation District
- Goleta Water District
- Tranquility Irrigation District

2016

- City of Coalinga
- Colusa County Water District
- James Irrigation District
- Lindmore Irrigation District
- Sycamore Mutual Water Company
- Kern Tulare Water District
- San Benito County Water Agency
- Sacramento River Settlement Contractors:
  - Anderson-Cottonwood Irrigation District
  - Glen-Colusa Irrigation District
  - Meridian Farms Water Company
  - Natomas Central Mutual Water Company
  - Princeton-Cordova-Glen Irrigation District
  - Provident Irrigation District
  - Reclamation District No. 108
  - Reclamation District No. 1004
  - Sutter Mutual Water Company

2015

- Bella Vista Water District

2020 SRSC AWMP

2016 Sacramento River Regional Water Management Plan (CVPIA)

Approved by U.S. Bureau of Reclamation in 2019, see supporting documentation

2016 Sacramento Valley Regional Water Management Plan Annual Update

Preface

This *2016 Sacramento Valley Regional Water Management Plan Annual Update* (2016 RWMP Annual Update) was prepared by the Sacramento River Settlement Contractors (SRSC) in cooperation with the U.S. Bureau of Reclamation, in accordance with the *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors* (Regional Criteria). This 2016 RWMP Annual Update is the fourth update to the *Sacramento Valley Regional Water Management Plan* (RWMP) that was completed in 2007. The Regional Criteria specify that beginning one year after acceptance of the RWMP, the participating SRSCs will jointly file an annual update every subsequent year to report on implementation actions taken, along with any additions and revisions to the RWMP. Accordingly, this 2016 RWMP Annual Update includes updated information and status on numerous topics included as part of the RWMP.

Following are the participants in the RWMP and this 2016 RWMP Annual Update:

- Anderson-Cottonwood Irrigation District (ACID)
- Glenn-Colusa Irrigation District (GCID)
- Provident Irrigation District (PID)
- Princeton-Codora-Glenn Irrigation District (PCGID)
- Reclamation District No. 108 (RD 108)
- Reclamation District No. 1004 (RD 1004)
- Meridian Farms Water Company (MFWC)
- Sutter Mutual Water Company (SMWC)
- Natomas Central Mutual Water Company (NCMWC)

This 2016 RWMP Annual Update summarizes activities and updates to projects and practices identified in the RWMP and focuses on the following:

- Development of individual SRSC water budgets
- Inclusion of new projects and update of proposed project status
- Review of all Quantifiable Objectives (QO) and Targeted Benefits (TB) and recommendation that all projects be designated and tracked by sub-basin
- Update of all water management practices

This document is intended to be used in conjunction with the existing RWMP (an electronic copy is provided in Appendix A to this 2016 RWMP Annual Update), the 2009 RWMP Annual Update (an electronic copy is provided in Appendix B to this 2016 RWMP Annual Update), the 2010/2011 RWMP Annual Update (an electronic copy is provided in Appendix C to this 2016 RWMP Annual Update), and the 2012 RWMP Annual Update (an electronic copy is provided in Appendix D to this 2016 RWMP Annual Update). Preface Table 1 identifies all section headings included in the RWMP and indicates which subsections have been revised as part of this 2016 RWMP Annual Update. A brief description of the changes made for each section is also provided. Where a revision is made to the RWMP, the revised paragraph is shaded. Relevant surrounding text is also provided, excluding tables and figures that did not require revision.

PREFACE TABLE 1
Document Organization and Description of Changes
2016 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section	Information Needing to Be Updated in this 2016 RWMP Annual Update?
1.0 Regional Description and Resources	Yes, see subsections below
1.1 History and Sub-basin Description	No
1.1.1 Redding Sub-basin	No
1.1.2 Colusa Sub-basin	No
1.1.3 Butte Sub-basin	No
1.1.4 Sutter Sub-basin	No
1.1.5 American Sub-basin	No
1.1.6 Colusa Drain Mutual Water Company	No
1.2 Surface Water and Groundwater Resources	No
1.2.1 Surface Water Resources	No
1.2.2 Groundwater Resources	No
1.3 Typical District Facilities	No
1.4 Topography and Soils	No
1.4.1 Topography	No
1.4.2 Soils	No
1.5 Climate	No
1.6 Natural and Cultural Resources	No
1.6.1 Natural Resources	No
1.6.2 Cultural Resources	No
1.7 Operating Rules, Regulations and Agreements that Affect Water Availability	No
1.7.1 Surface Water Resources	No
1.7.2 Groundwater Resources	No
1.8 Water Measurement, Pricing, and Billing	Yes, see subsections below
1.8.1 Measurement Practices	No

PREFACE TABLE 1
Document Organization and Description of Changes
2016 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section	Information Needing to Be Updated in this 2016 RWMP Annual Update?
1.8.2 Pricing Structures and Billing	Updated each SRSC's pricing rates in Table 1-6
1.9 Water Shortage Allocation Policies	No
1.9.1 CVP Sacramento River Contract Supply Requirements	No
1.9.2 Criteria for Defining Water Availability	No
1.10 Water Quality	No
1.10.1 Surface Water Quality	No
1.10.2 Groundwater Quality	No
2.0 Sub-basin Water Use, Supply, and District Descriptions	Yes, see subsections below
2.1 Redding Sub-basin	No
2.1.1 Water Supply within the Redding Sub-basin	No
2.1.2 Water Use within the Redding Sub-basin	No
2.1.3 Anderson-Cottonwood Irrigation District	No
2.2 Colusa Sub-basin	No
2.2.1 Water Supply within the Colusa Sub-basin	No
2.2.2 Water Use within the Colusa Sub-basin	No
2.2.3 Glenn-Colusa Irrigation District	No
2.2.4 Provident Irrigation District	No
2.2.5 Princeton-Codora-Glenn Irrigation District	No
2.2.6 Reclamation District No. 108	No
2.3 Butte Sub-basin	No
2.3.1 Water Supply within the Butte Sub-basin	No
2.3.2 Water Use within the Butte Sub-basin	No
2.3.3 Reclamation District No. 1004	No
2.4 Sutter Sub-basin	No
2.4.1 Water Supply within the Sutter Sub-basin	No
2.4.2 Water Use within the Sutter Sub-basin	No
2.4.3 Meridian Farms Water Company	No
2.4.4 Sutter Mutual Water Company	No
2.4.5 Pelger Mutual Water Company	No

PREFACE TABLE 1
Document Organization and Description of Changes
2016 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section	Information Needing to Be Updated in this 2016 RWMP Annual Update?
2.5 American Sub-basin	No
2.5.1 Water Supply within the American Sub-basin	No
2.5.2 Water Use within the American Sub-basin	No
2.5.3 Natomas Central Mutual Water Company	No
2.6 Water Balance Summary	Updated water balance summary information for participating SRSCs
3.0 Regional Water Measurement Program	Yes, see subsections below
3.1 Plan Identification	Updated appendix cross reference
3.2 Proposed Cooperative Water Measurement Study Measurement Plan Evaluation	No
3.3 Plan Selection	No
3.3.1 Year 1 (2006-2007) Progress Report	No
3.3.2 Year 2 (2007-2008) Progress Report	No
3.3.3 Final Report	No
4.0 Analysis of Sub-region Water Management Quantifiable Objectives	Yes, see subsections below
4.1 Development of CALFED Targeted Benefits	No
4.1.1 Purpose	No
4.1.2 Targeted Benefits and Quantifiable Objectives	No
4.1.3 Sacramento Valley Water Quality Coalition	No
4.2 Participating Sacramento River Settlement Contractor Identification of Applicable Targeted Benefits and Associated Quantifiable Objectives	Yes, see subsections below
4.2.1 Sacramento River Basinwide Water Management Plan	No
4.2.2 Sacramento Valley Water Management Agreement and Program	No
4.2.3 Development of Quantifiable Objectives	Table 4-6 updated targeted benefits and proposed actions; Table 4-7 updated targeted benefits and implemented actions
4.2.4 Redding Sub-basin	No
4.2.5 Colusa Sub-basin	No
4.2.6 Butte Sub-basin	No
4.2.7 Sutter Sub-basin	No

PREFACE TABLE 1
Document Organization and Description of Changes
2016 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section	Information Needing to Be Updated in this 2016 RWMP Annual Update?
4.2.8 American Sub-basin	No
5.0 Identification of Actions to Implement and Achieve Proposed Quantifiable Objectives	Yes, see subsections below
5.1 Redding Sub-basin	No
5.2 ACID Churn Creek Lateral Improvements Project	No
5.3 ACID Main Canal Modernization Project	No
5.4 ACID Conjunctive Water Management Program	No
5.4.4 ACID Olney Creek Watershed Restoration Project	No
5.4.5 Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project	No
5.4.6 System Improvement Program	Updated project description, project completion list, and budget
5.4.7 Clear Creek Siphon Rehabilitation Project	No
5.5 Colusa Sub-basin	Updated potential QOs in Table 5-5
5.6 GCID Water Conservation and Management Project	Updated project schedule
5.7 GCID Conjunctive Water Management Program	No
5.8 (Project removed)	No
5.8.4 GCID Drain Water Outflow Measurement Program	No
5.8.5 GCID Main Canal Milepost 35.6 Regulating Reservoir Project	No
5.8.6 RD 108 Strategic Plan for Groundwater Resources Characterization	No
5.9 RD 108 Conjunctive Water Management Program	Updated project description, schedules, and budget
5.10 RD 108 Flow Control and Measurement Project	Updated project description
5.10.4 RD 108 Northern Area Groundwater Study	No
5.10.5 RD 108 Recycled Water Improvement Project	No
5.10.6 RD 108 Recycled Water Management Project	No
5.10.7 RD 108 Irrigation Scheduling	No
5.10.8 RD 108 Rice Water Conservation Program	No
5.10.9 RD 108 Alternative Water Supply Study	New project description, schedule, and budget
5.10.10 RD 108 Water Use Efficiency Program	New project description, schedule, and budget

PREFACE TABLE 1
Document Organization and Description of Changes
2016 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section		Information Needing to Be Updated in this 2016 RWMP Annual Update?
5.11	PCGID Conjunctive Water Management Program	No
5.12	PID Conjunctive Water Management Program	No
5.13	Butte Sub-basin	No
5.14	RD 1004 Canal Lining Project	No
5.15	RD 1004 Conjunctive Water Management Program	No
5.15.4	RD 1004 White Mallard Dam and Fish Ladder Replacement Project and Five-Points Project	No
5.15.5	RD 1004 Flowmeter Replacement Program	No
5.15.6	RD 1004 Recirculation Pump 8 Rebuild Project	No
5.15.7	RD 1004 ITRC Water Gate Project	No
5.15.8	RD 1004 10-Foot by 8-Foot Weirs Installation Project	No
5.16	Sutter Sub-basin	Provided new project information in Table 5-16
5.17	MFWC Conjunctive Water Management Program	No
5.17.4	MFWC Phase 2 Fish Screen Project	No
5.17.5	MFWC Flow Measurement Project	New project description, schedule, and budget
5.18	SMWC, PMWC, and RD 1500 Joint Sutter Basin Drainwater Reuse Project	No
5.19	SMWC Canal Lining Project	No
5.20	SMWC, PMWC, and RD 1500 Joint Sutter Basin Groundwater Management Program	No
5.21	SMWC Internal Water Supply Program	No
5.22	PMWC Conjunctive Water Management Program	No
5.22.4	PMWC Canal Lining Project	No
5.23	American Sub-basin	No
5.24	NCMWC Conjunctive Water Management Program	No
5.24.4	NCMWC American Basin Fish Screen and Habitat Improvement Project – Sankey Diversion	Updated project schedules and budget
5.24.5	NCMWC SCADA Project for the Natomas Basin	No
6.0	Establishment of Monitoring Program	No
6.1	Cooperative Study Update	No

PREFACE TABLE 1
Document Organization and Description of Changes
2016 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section	Information Needing to Be Updated in this 2016 RWMP Annual Update?
6.2 Water Quality and the Sacramento Valley Water Quality Coalition	No
6.2.1 Sacramento Valley Management Plan	No
6.2.2 Diazinon Management Plan	No
6.2.3 Groundwater	No
7.0 Proposed Budget and Allocation of Regional Costs	Updated the conservation budget based on estimates of staff, time, and materials used for conservation; included estimated amount spent last year (Table 7-1) and projected budget and staff time summary for next 2 years (Table 7-2)
8.0 RWMP Coordination	Updated contact information
9.0 References	Updated references

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Tables

Figures

Acronyms and Abbreviations

1995 WQCP	1995 Water Quality Control Plan for the San Francisco Bay/ Sacramento-San Joaquin River Delta Estuary
AB 3030 Plan	Assembly Bill 3030 Groundwater Management Plan
AB	Assembly Bill
ac-ft	acre-feet
ac-ft/yr	acre-feet per year
ACID	Anderson-Cottonwood Irrigation District
AFSP	Anadromous Fish Screen Program
Ag WUE	Agricultural Water Use Efficiency Element
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin River Delta
bgs	below ground surface
BWMP	Sacramento River Basinwide Water Management Plan
CALFED	CALFED Bay-Delta Authority
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
Coalition	Sacramento Valley Water Quality Coalition
Cooperative Study	Cooperative Water Measurement Study
CVP	Central Valley Project
Delta	Sacramento-San Joaquin River Delta
Department	California Department of Water Resources
ESA	Endangered Species Act
ET	evapotranspiration
ETo	reference evapotranspiration
GCID	Glenn-Colusa Irrigation District
ITRC	Irrigation Training and Research Center
M&I	municipal and industrial
maf	million acre-feet

MFWC	Meridian Farms Water Company
mg/L	milligrams per liter
MID	Maxwell Irrigation District
M.P.	milepost
MRPP	Monitoring and Reporting Program Plan
msl	mean sea level
N/A	not applicable
NCMWC	Natomas Central Mutual Water Company
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
O&M	operation and maintenance
PCGID	Princeton-Codora-Glenn Irrigation District
Phase 8 Settlement	California Bay-Delta Phase 8 Settlement
PID	Provident Irrigation District
PMWC	Pelger Mutual Water Company
QO	quantifiable objective
RD	Reclamation District
Reclamation	U.S. Bureau of Reclamation
Regional Criteria	Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors
Regional Plan	Sacramento Valley Regional Water Management Plan
SCADA	supervisory control and data acquisition
SMWC	Sutter Mutual Water Company
SRSC	Sacramento River Settlement Contractor
SVWMP	Sacramento Valley Water Management Program
SWP	State Water Project
SWRCB	State Water Resources Control Board
taf/yr	thousand acre-feet per year
TB	targeted benefit
TCCA	Tehama-Colusa Canal Authority
TIDC	Tisdale Irrigation and Drainage Company

TM	technical memorandum
TMDL	Total Maximum Daily Load
True ISM	True Irrigation Scheduling Management
USFWS	U.S. Fish and Wildlife Service
Water Board	Central Valley Regional Water Quality Control Board
WUE	Agricultural Water Use Efficiency Program

SECTION 1.0

Regional Description and Resources

Section 1.0 revisions to the RWMP are highlighted below in shaded text. An update of water pricing was completed for each SRSC.

1.1 History and Sub-basin Description

1.2 Surface Water and Groundwater Resources

1.3 Typical District Facilities

1.4 Topography and Soils

1.5 Climate

1.6 Natural and Cultural Resources

1.7 Operating Rules, Regulations, and Agreements that Affect Water Availability

1.8 Water Measurement, Pricing, and Billing

1.8.1 Measurement Practices

1.8.2 Pricing Structures and Billing

1.8.2.1 Existing Pricing Structures

1.8.2.2 Indirect Price Signals Related to Water Use

Water pricing is only one of several direct and indirect cost signals to which a grower might be subject. For a farmer who pays a flat rate, the sum of the base charge and annual irrigation charge as referenced in Table 1-6, for water use as an SRSC customer, may still have a monetary impact through such things as quantity and cost of fertilizers, pesticides, and herbicides. Increased water use may increase costs for these inputs. Poor water management by over irrigating may reduce yields and resulting gross revenue. If the farmer operates a private well or drain pump, the electrical power costs are a direct cost related to water use. Districts must cover operating and capital expenses with revenue from customers. Excessive irrigation results in increased pumping costs from the Sacramento River, the drain system, and wells. These costs are ultimately passed directly back to the growers, albeit at an average rate for all district customers. Many SRSC operating staff have authority to shut off delivery to a customer whose field is observed to be poorly irrigated and allowed to have excessive tailwater runoff.

TABLE 1-6
Existing SRSC Pricing Structures
2016 Sacramento Valley Regional Water Management Plan Annual Update

SRSC	Pricing Structure
ACID	Base charge of $78.42 per acre per year. Annual application fee of $115.00 per parcel. Irrigation delivery is on rotation basis.
GCID	Base charge of $7.63 per acre per year. Annual irrigation charge of $82.00 per acre (rice).
PID	Base charge of $10.00 per acre per year. Annual irrigation charge of $80.00 per acre (rice).
PCGID	Base charge of $10.00 per acre per year. Annual irrigation charge of $160.00 per acre (rice). $10.00 to $15.00 per acre per irrigation for other crops.
RD 108	Three-part rate structure: part 1 – Acreage Rate Component ($22.66 per acre except Decomp -$0), part 2 – Applied Water ($4.80 per acre multiplied by a crop-type factor) is the estimated quantity needed based on crop type, part 3 – Lift (varies based on amount of Lift from $4.80 to (-$0.60) per ac-ft) is the actual volume of water used multiplied by a Net Volumetric Rate component based on Lift.
RD 1004	Per-ac-ft charge of $17.00, measured at customer turnout.
MFWC	Base charge of $27.00 per acre per year. Irrigation charge of $30.65 per ac-ft.
SMWC	Base charge of $40.00 per landowner stock acre. Water charges were based on a volumetric rate of $20.50 per ac-ft per ac measured at the crop/field delivery point.
NCMWC	Base charge and administration fee on all acres of $54.52 and $33.58 to cover fixed cost of the Company; plus a water toll on irrigated acres based on type of crop. Irrigation charge of $8.83 per ac-ft based on ETAW and applied water demand. Rice decomposition flooding charge is an additional $17.66 per ac-ft.

Information specific to each participating SRSC's pricing structure, including the basis of the water charges and copies of current billing forms used by each, can be found in Section 2.0.

1.9 Water Shortage Allocation Policies

1.10 Water Quality

SECTION 2.0

Sub-basin Water Use, Supply, and District Descriptions

Section 2.0 revisions to the RWMP are highlighted below in shaded text.

2.1 Redding Sub-basin

2.1.1 Water Supply within the Redding Sub-basin

2.1.2 Water Use within the Redding Sub-basin

2.1.3 Anderson-Cottonwood Irrigation District

2.1.3.1 History

2.1.3.2 Service Area and Distribution System

2.1.3.3 Water Supply

Surface Water.

Settlement Contract Historical Diversions.

Non-contract Period (November – March).

Other Surface Water Sources.

Groundwater.

Other Water Supplies.

2.1.3.4 Water Use

District Water Requirements.

Urban.

Environmental.

Groundwater Recharge.

Topography and Soils.

Transfers and Exchanges.

Other Uses.

2.1.3.5 District Facilities

2.1.3.6 ACID Operating Rules and Regulations

2.1.3.7 Water Measurement, Pricing, and Billing

2.2 Colusa Sub-basin

2.2.1 Water Supply within the Colusa Sub-basin

2.2.2 Water Use within the Colusa Sub-basin

2.2.3 Glenn-Colusa Irrigation District

2.2.3.1 History

2.2.3.2 Service Area and Distribution System

2.2.3.3 Water Supply

Surface Water.

Settlement Contract Historical Diversions.

Non-contract Period (November – March).

Groundwater.

Other Water Supplies.

2.2.3.4 Water Use

2.2.3.5 District Facilities

Diversion Facilities.

Conveyance System.

Storage Facilities.

Spill Recovery.

2.2.3.6 District Operating Rules and Regulations

2.2.3.7 Water Measurement, Pricing, and Billing

2.2.4 Provident Irrigation District

2.2.4.1 History

2.2.4.2 Service Area and Distribution System

2.2.4.3 Water Supply

2.2.4.4 Water Use

2.2.4.5 District Facilities

2.2.4.6 District Operating Rules and Regulations

2.2.4.7 Water Measurement, Pricing, and Billing

2.2.5 Princeton-Codora-Glenn Irrigation District

2.2.5.1 History

2.2.5.2 Service Area and Distribution System

2.2.5.3 Water Supply

2.2.5.4 Water Use

2.2.5.5 District Facilities

2.2.5.6 District Operating Rules and Regulations

2.2.5.7 Water Measurement, Pricing, and Billing

2.2.6 Reclamation District No. 108

2.2.6.1 History

2.2.6.2 Service Area and Distribution System

2.2.6.3 Water Supply

Surface Water.

Settlement Contract Historical Diversions.

Non-contract Period (November – March).

Other Surface Water Sources.

Groundwater.

Other Water Supplies.

2.2.6.4 Water Use

District Water Requirements.

Urban.

Environmental.

Groundwater Recharge.

Topography and Soils.

Transfers and Exchanges.

Other Uses.

2.2.6.5 District Facilities

Diversion Facilities.

Conveyance System.

Storage Facilities.

Spill Recovery.

2.2.6.6 District Operating Rules and Regulations

2.2.6.7 Water Measurement, Pricing, and Billing

2.3 Butte Sub-basin

2.3.1 Water Supply within the Butte Sub-basin

2.3.2 Water Use within the Butte Sub-basin

2.3.3 Reclamation District No. 1004

2.3.3.1 History

2.3.3.2 Service Area and Distribution System

2.3.3.3 Water Supply

2.3.3.4 Water Use

2.3.3.5 District Facilities

2.3.3.6 District Operating Rules and Regulations

2.3.3.7 Water Measurement, Pricing, and Billing

2.4 Sutter Sub-basin

2.4.1 Water Supply within the Sutter Sub-basin

2.4.2 Water Use within the Sutter Sub-basin

2.4.3 Meridian Farms Water Company

2.4.3.1 History

2.4.3.2 Service Area and Distribution System

2.4.3.3 Water Supply

2.4.3.4 Water Use

2.4.3.5 District Facilities

2.4.3.6 District Operating Rules and Regulations

2.4.3.7 Water Measurement, Pricing, and Billing

2.4.4 Sutter Mutual Water Company

2.4.4.1 History

2.4.4.2 Service Area and Distribution System

2.4.4.3 Water Supply

Surface Water.

Settlement Contract Historical Diversions.

Non-contract Period (November – March).

Other Surface Water Sources.

Groundwater.

Other Water Supplies.

2.4.4.4 Water Use

Company Water Requirements.

Urban.

Environmental.

Groundwater Recharge.

Topography and Soils.

Transfers and Exchanges.

Other Uses.

2.4.4.5 District Facilities

Diversion Facilities.

Conveyance System.

Storage Facilities.

Spill Recovery.

2.4.4.6 Company Operating Rules and Regulations

2.4.4.7 Water Measurement, Pricing, and Billing

2.4.5 Pelger Mutual Water Company

2.4.5.1 History

2.4.5.2 Service Area and Distribution System

2.4.5.3 Water Supply

2.4.5.4 Water Use.

2.4.5.5 District Facilities.

2.4.5.6 District Operating Rules and Regulations

2.4.5.7 Water Measurement, Pricing, and Billing

2.5 American Sub-basin

2.5.1 Water Supply within the American Sub-basin

2.5.2 Water Use within the American Sub-basin

2.5.3 Natomas Central Mutual Water Company

2.5.3.1 History

2.5.3.2 Service Area and Distribution System

2.5.3.3 Water Supply

Surface Water.

Settlement Contract Historical Diversions.

Non-contract Period (November – March).

Other Surface Water Sources.

Groundwater.

Other Water Supplies.

2.5.3.4 Water Use

District Water Requirements.

Urban.

Environmental.

Groundwater Recharge.

Topography and Soils.

Transfers and Exchanges.

Other Uses.

2.5.3.5 District Facilities

Diversion Facilities.

Conveyance System.

Storage Facilities.

Spill Recovery.

2.5.3.6 District Operating Rules and Regulations

2.5.3.7 Water Measurement, Pricing, and Billing

2.6 Water Balance Summary

Water balance summaries were developed for each participating SRSC and are included in Appendix E for the 2013 through 2015 irrigation year and Appendix F for the 2016 irrigation year. These summaries are based on the Agricultural Water Inventory Tables (Standard Tables) in the *Water Management Planner* (Reclamation, 2014) to meet the 2011 Standard Criteria for Agricultural and Urban Water Management Plans. The tables were modified to display and identify information unique to the SRSCs, including rice production. The summaries are limited to the April through October period covered by the SRSC contracts.

Surface water supplies are based on records of the SRSC diversions from Reclamation's monthly water accounting and the SRSC's records. Irrigation district groundwater pumping is based on SRSC records. Private groundwater pumping is estimated by the SRSCs.

Precipitation data are based on the average monthly precipitation reported by California Irrigation Management Information System (CIMIS) for the Colusa/Williams, Davis, and Verona stations; for the Redding Sub-basin, precipitation data are based on information from the Gerber South CIMIS station.

Crop ET tables were prepared using (1) crop coefficients (Kc values) developed by the Irrigation Training and Research Center (ITRC) at California Polytechnic State University for district water balances for typical year (2016) and wet year (2017) surface irrigation (ITRC, 2003a) and (2) monthly 2016 reference ET (ETo) from CIMIS. For the SRSCs in the Sacramento Valley, Kc values were developed using the Zone 12 data from the Irrigation Training and Research Center Report (2003b) and the average ETo data reported by CIMIS at Colusa/Williams, Davis, and Verona stations for 2016. The crop ET for the Redding Sub-basin is based on the Zone 14 data from the ITRC Report and 2016 ETo data for the Gerber South CIMIS station. Evaporation for use in estimating distribution system evaporation and seepage is estimated at 1.1 times the monthly ETo. Effective precipitation is estimated at 60 percent of the irrigation season precipitation.

Leaching requirements were developed using the methods and equations described by R.S. Ayers and D.W. Westcot in *Water Quality for Agriculture* (Food and Agricultural Association of the United Nations, 1985) (also known as FAO Irrigation and Drain Paper 29, Rev. 1). As identified in the footnotes to Table 5 of the water balances, the crop consumptive use values do not include water required for initial flooding, re-flooding, or flow-through on rice fields.

It should be recognized that these source data were considered the most accurate and current information available at the district level for the 2016 irrigation year. Information provided in the original BWMP was developed by and obtained from the Department for a normalized 1995 cropping pattern for a projected normal and drought condition. The unit ET of applied water assumed for each district in the BWMP compares favorably with the ITRC and CIMIS assumptions and data used to develop the balance summaries for the 2016 irrigation year.

Table 6 of the water balances summarizes the inflows and outflows from the individual SRSCs, including an estimate of available soil moisture, inflow from precipitation, and evapotranspiration precipitation by crops. Figure 2-57 summarizes the SRSC water balances. The various sources of the district outflows have been estimated by the SRSCs. The sub-total without recirculation was utilized as a closure term. As such, in addition to percolation to the groundwater basin, the volume shown includes unaccounted-for drain water outflow; errors in assumptions used in calculations or estimated uses such as crop water use (ET); and other factors such as effective precipitation, evaporation, and groundwater recharge. A positive value indicates that the assumed percolation to groundwater is greater than groundwater pumping. A negative value may indicate uncounted-for groundwater pumping from privately owned wells. Table 6 of the water balances also shows the quantities of water recaptured and recirculated for reuse within the SRSC service areas.

In addition to the individual water balance tables, a regional-level summary of SRSC diversion and return flows for the 2016 irrigation year was prepared. Figure 2-58 is a schematic that illustrates the relationships between participating SRSCs, and shows diversions from and return flows attributable to the participating SRSCs to and from the Sacramento River. Return flows to the river are available for a variety of uses including re-diversion or environmental benefits. The regional-level summary of SRSC diversion and return flows also identifies the average diversion and average consumptive use per cropped acre for the 2016 irrigation year within the participating SRSC service areas.

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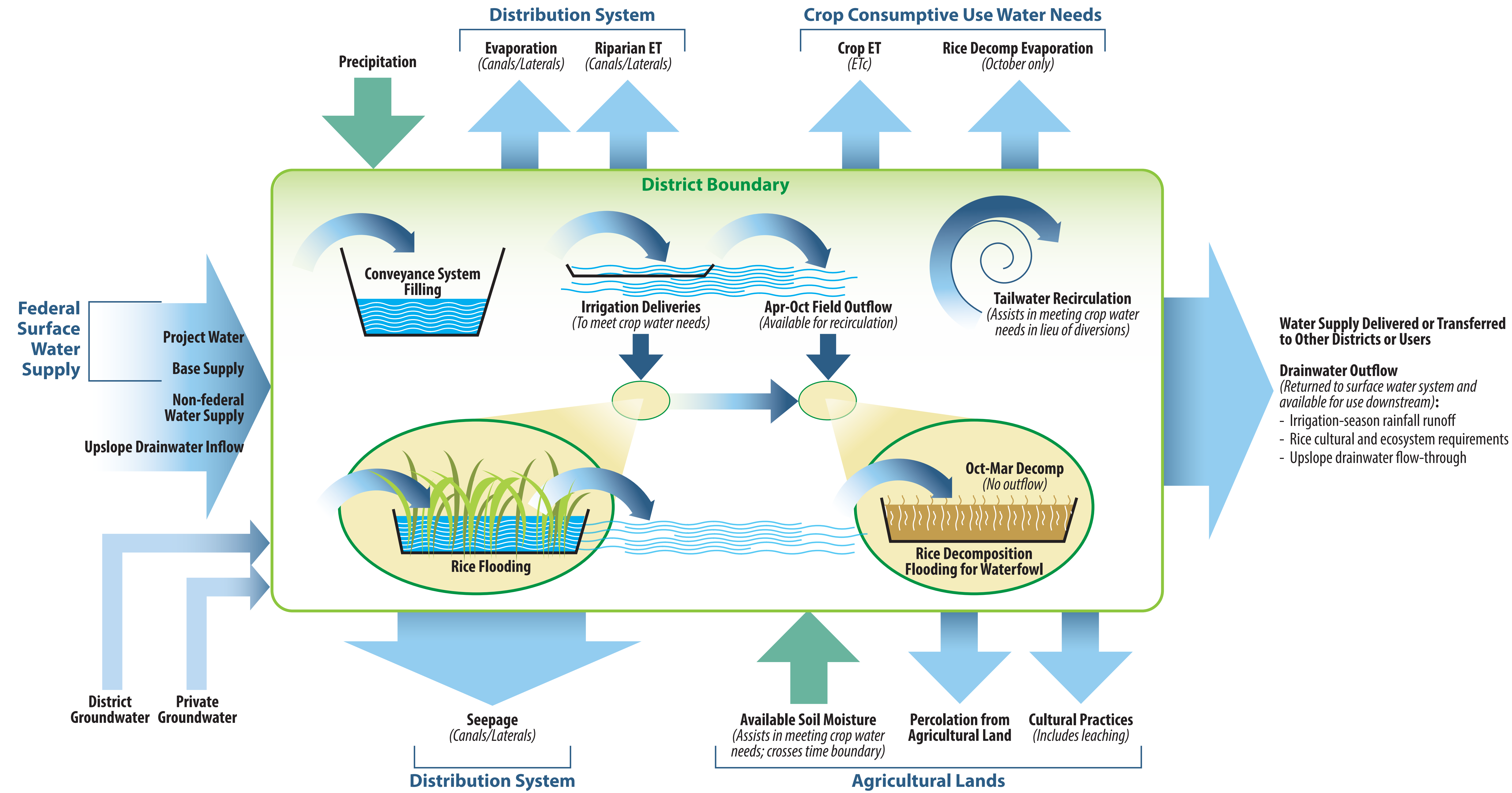


Note: All district inflows and outflows except for rice decomp evaporation are April through October. Rice decomp evaporation is October only.

FIGURE 2-57
SCHEMATICS OF DISTRICT WATER BALANCE

SUMMARY

SRSC 2016 Diversions* =	1,342,151 AF
SRSC 2016 Return Flows (available for use downstream)* =	278,278 AF
Total 2016 Recirculation/Reuse by SRSCs =	386,219 AF

SUMMARY (Cont.)

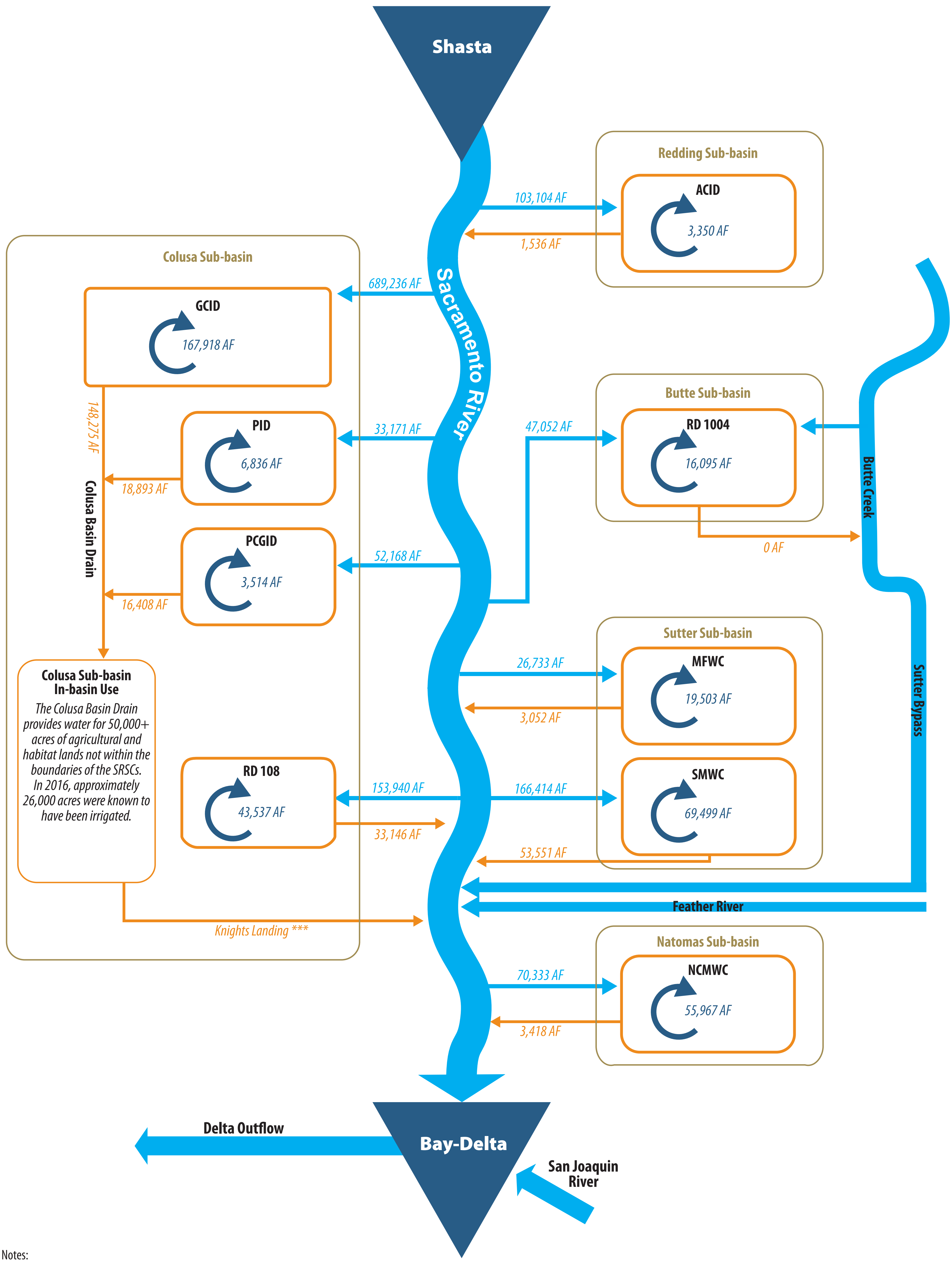
Total Cropped Acres for 2016** =	355,939 AC
Average Diversion for 2016 = (SRSC Diversion ÷ Total Cropped Acres)	3.51 AF/AC
Average Consumptive Use for 2016 = ((SRSC Diversion-SRSC Return Flow) ÷ Total Cropped Acres)	2.79 AF/AC

LEGEND

DIVERSIONS

RETURN FLOW

Total Recirculated for Reuse



Notes:

* Diversions and return flows are from 2016 SRSC water balance tables.

** Total cropped acres for 2016 includes 26,000 acres within the Colusa Sub-basin that rely on return flows from the SRSCs for surface water supplies.

***Flow data associated with the return flow at Knights Landing is not available after September 2012 as a result of modifications made to outfall gates and funding constraints.

AC = acre

AF = acre-feet

FIGURE 2-58
SCHEMATICS AND SUMMARY OF 2016 SRSC DIVERSIONS AND RETURN FLOWS

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SECTION 3.0

Regional Water Measurement Program

Section 3.0 revisions to the RWMP are highlighted below in shaded text.

3.1 Plan Identification

As stated in Reclamation's Regional Criteria (Reclamation, 2004):

Each Participating contractor shall implement one of the following measurement options:

1. *Fully measure with a reasonable degree of accuracy the volume of water delivered by each Participating contractor to each of its respective customers, and implement procedures that provide incentives for improved management of water within 5 years of contract renewal; or*
2. *Implement a mutually acceptable water measurement program (including timeframes and budget needs) within 3 years of the renewal of the Participating contractors' contract with Reclamation, with full Implementation within 5 years thereof. This option should be at least as effective as option 1 and will be substantiated based on field documentation derived from the measurement study(s) conducted in relevant Sub-regions. Please attach a description of the study(s) including the study objectives, along with an estimated timeline and budget.*

The participating SRSCs will implement the second option. The first phase of this program is titled the Cooperative Water Measurement Study Work Plan, which was funded by Reclamation, completed in 2003, and is included as Appendix B of the 2007 Final Sacramento Valley RWMP.

The next phase of the Cooperative Study is funded partially through Chapter 7 Proposition 50 funds for the CALFED Water Use Efficiency Program (Section B Agricultural Research and Development Projects), and partially by a Reclamation Water Conservation Field Service Program Grant. Coordination of participants and preparation of Cooperative Study components have been ongoing since January 2006. Field study began at the start of the 2006 irrigation season. All Cooperative Study elements are described below (refer to the 2009 RWMP Annual Update).

District-specific water measurement plans and programs are included in Appendix G to this 2016 RWMP Annual Update.

3.2 Cooperative Water Measurement Study Measurement Plan Evaluation

3.3 Plan Selection

3.3.1 Year 1 (2006) Progress Report

3.3.2 Final Report

3.3.3 Cooperative Study Conclusions Overview

SECTION 4.0

Analysis of Sub-region Water Management Quantifiable Objectives

Section 4.0 revisions to the RWMP are highlighted below in shaded text. A re-evaluation of TBs applicable to each SRSC and identification/summary of all actions to meet QOs for each applicable TB were completed.

The method used to number and identify proposed projects has been revised to better reference the sub-basin within which a particular project is proposed. The SRSCs have determined that this system is more appropriate given the reuse of water at the sub-basin level to identify and describe TBs rather than the CALFED numbers used in previous updates.

Tables 4-1, 4-2, 4-3, 4-4, and 4-5 (located at the end of this section) list the new RWMP sub-basin number for each sub-basin with the original CALFED number and the corresponding targeted benefit.

The list of TBs, proposed actions, and quantifiable objectives presented in Table 4-6 (located at the end of this section) includes all projects currently identified to date within each sub-basin by individual SRSCs. A list of implemented actions, formerly listed as proposed actions in Table 4-6, and associated TBs and quantifiable objectives are presented in Table 4-7 (located at the end of this section). In some instances, a proposed action listed in Table 4-6 is undergoing a phased implementation approach and the entire action is yet to be completed. Hence, only the implemented action is listed in Table 4-7. A comparison of the target QO amount with actions proposed and implemented by the SRSCs is shown in Table 4-8 (located at the end of this section).

4.1 Development of CALFED Targeted Benefits

4.2 Participating Sacramento River Settlement Contractor Identification of Applicable Targeted Benefits and Associated Quantifiable Objectives

4.2.1 Sacramento River Basinwide Water Management Plan

4.2.2 Sacramento Valley Water Management Agreement and Program

4.2.3 Development of Quantifiable Objectives

4.2.4 Redding Sub-basin

4.2.4.1 Identification of Applicable Targeted Benefits

4.2.4.2 Determination of Non-applicability

Anderson-Cottonwood Irrigation District.

4.2.5 Colusa Sub-basin

4.2.5.1 Identification of Applicable Targeted Benefits

4.2.5.2 Determination of Non-applicability

Glenn-Colusa Irrigation District.

Princeton-Codora-Glenn Irrigation District.

Provident Irrigation District.

Reclamation District No. 108.

4.2.6 Butte Sub-basin

4.2.6.1 Identification of Applicable Targeted Benefits

4.2.6.2 Determination of Non-applicability

Reclamation District No. 1004.

4.2.7 Sutter Sub-basin

4.2.7.1 Identification of Applicable Targeted Benefits

4.2.7.2 Determination of Non-applicability

Sutter Mutual Water Company.

Pelger Mutual Water Company.

Meridian Farms Water Company.

4.2.8 American Sub-basin

4.2.8.1 Identification of Applicable Targeted Benefits

4.2.8.2 Determination of Non-applicability

Natomas Central Mutual Water Company.

TABLE 4-1
Targeted Benefits in Redding Sub-basin
2016 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
4	R-1	Provide flow to improve aquatic ecosystem conditions in Cottonwood Creek
6	R-2	Provide flow to improve aquatic ecosystem conditions in the Sacramento River below Keswick
7	R-3	Decrease nonproductive ET to increase water supply for beneficial uses
8	R-4	Provide long-term diversion flexibility to increase water supply for beneficial uses on suitable lands

TABLE 4-2
Targeted Benefits in Colusa Sub-basin
2016 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
20	C-1	Provide flow to improve ecosystem conditions in the Sacramento River below Keswick
21	C-2	Reduce Group A pesticides to enhance and maintain beneficial uses of water in the Colusa Drain
22	C-3	Reduce pesticides to enhance and maintain beneficial uses of water in the Colusa Basin Drain
23	C-4	Reduce pesticides to enhance and maintain beneficial uses of water in the Sacramento River
26	C-5	Provide long-term diversion flexibility to increase the water supply for beneficial use for suitable lands
27	C-6	Provide long-term diversion flexibility to increase the water supply for beneficial use for wetlands
28	C-7	Provide long-term diversion flexibility to increase water supply for Sacramento and Delevan National Wildlife Refuges
29	C-8	Provide long-term diversion flexibility to increase the water supply for beneficial uses for salt affected soils

TABLE 4-3
Targeted Benefits in Butte and Sutter Sub-basins
2016 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
30	BS-1	Provide flow to improve aquatic ecosystem conditions in the Sacramento River below Keswick
31	BS-2	Reduce pesticides to enhance and maintain beneficial uses of water in the Sacramento River
83	BS-3	Reduce pesticides to enhance and maintain beneficial uses of water in the Sacramento Slough
33	BS-4	Decrease nonproductive ET to increase water supply for beneficial uses for suitable lands
34	BS-5	Provide long-term diversion flexibility to increase water supply for beneficial uses for suitable lands
35	BS-6	Provide long-term diversion flexibility to increase water supply for beneficial uses for wetlands

TABLE 4-4
Targeted Benefits in Lower Feather River and Yuba River
2016 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
37	FY-1	Provide flow to improve aquatic ecosystem conditions in Butte Creek
42	FY-2	Reduce salinity to enhance and maintain beneficial uses of water in the Sacramento Slough near Verona
43	FY-3	Reduce temperatures to enhance and maintain aquatic species populations in Butte Creek
46	FY-4	Decrease nonproductive ET to increase water supply for beneficial uses for affected lands
47	FY-5	Provide long-term diversion flexibility to increase water supply for beneficial uses for suitable lands
48	FY-6	Provide long-term diversion flexibility to increase water supply for beneficial uses for wetlands

TABLE 4-5
Targeted Benefits in American Sub-basin
2016 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
57	A-1	Provide flow to improve ecosystem conditions in the Sacramento River below Keswick
58	A-2	Reduce pesticides to enhance and maintain beneficial uses of water in the Natomas East Main Drain
59	A-3	Reduce pesticides to enhance and maintain beneficial uses of water in the Sacramento River
63	A-4	Decrease nonproductive ET to increase water supply for beneficial uses.
64	A-5	Provide long-term diversion flexibility to increase the water supply for beneficial uses for suitable lands
65	A-6	Provide long-term diversion flexibility to increase the water supply for beneficial use for wetlands

TABLE 4-6
Summary of Applicable Targeted Benefits and Proposed Actions
2016 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Analyze	Priority	Anticipated Year of Implementation	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Proposed Action	Maximum Contribution to QO from Proposed Action (ac-ft)	Locally Beneficial Portion of Action[a]	Action-specific Monitoring Plan	Funding Sources
R-2 In-stream flow benefit in Sacramento River **R-3** Decrease nonproductive ET	2005	2005	TBD[d]	Redding (1)	ACID	Lining of leaky canal lateral	8,700	$150,000	Action-specific monitoring plan will be included in construction contract	Proposition 50 award of $144,000 June 2005, for feasibility study
R-2 In-stream flow benefit in Sacramento River **R-4** Provide long-term diversion flexibility	2005	2005	2012	Redding (1)	ACID	Reduce spill through system automation	20,000	$40,000	Action-specific monitoring plan will be included in construction contract	Proposition 50 award of $1.775 million June 2005, for Phase 1 of construction
R-2 In-stream flow benefit in Sacramento River	TBD[d]	TBD[d]	TBD[d]	Redding (1)	ACID	Replace existing canal creek crossing with new siphon beneath Olney Creek	2,100	$62,500	Action-specific monitoring plan will be included in construction contract	TBD
R-2 In-stream flow benefit in Sacramento River	2011	2011	2014-15	Redding (1)	ACID	Repair and stabilize siphon segment crossing beneath Clear Creek	5,400	$1,750,000	Action-specific monitoring plan will be included in construction contract	ACID; TBD
R-2 In-stream flow benefit in Sacramento River	2013	2013	2013	Redding (1)	ACID	Repair leaky siphon joints; excavate and re-compact siphon cover on upslope segment of Clear Creek siphon	1,800	$202,000	Action-specific monitoring plan will be included in construction contract	ACID
R-2 In-stream flow benefit in Sacramento River **R-3** Decrease nonproductive ET	2011	2011	2013-15	Redding (1)	ACID	Replace degraded pipelines; construct pipelines to replace laterals and canals subject to leakage	3,000	$1,366,000[c]	Action-specific monitoring plan will be included in construction contract	ACID
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2007	2008	2025	Colusa (3)	GCID	GCID Water Conservation and Management Project implementation. The project includes a water distribution system (SCADA) expansion and Ethernet upgrade, and Main Canal and Main Pump Station automation; and replacement of three older check structures on the Main Canal with new automated check structures. Additionally, GCID Drain Water Outflow Measurement Program entails SCADA integration with drain outflow measurement and recapture stations, as well as a pneumatically actuated weir in the Colusa Basin Drain.	40,000	$1,772,200	Monitor diversions, spills, and system outflows	Proposition 50 WUE Grant award of $2.7 million in January 2008
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2005	2005	TBD[d]	Colusa (3)	GCID	Construct up to 16 groundwater extraction wells	30,000	$17,200,000	Well output will be monitored	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management

TABLE 4-6
Summary of Applicable Targeted Benefits and Proposed Actions
2016 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Analyze	Priority	Anticipated Year of Implementation	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Proposed Action	Maximum Contribution to QO from Proposed Action (ac-ft)	Locally Beneficial Portion of Action[a]	Action-specific Monitoring Plan	Funding Sources
C--1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2017	2018	2019	Colusa (3)	RD 108	Install 26 new control gates	TBD	$750,000	Action-specific monitoring plan will be developed	Department grant provided $1.5 million. Reclamation grant provided $750,000. RD 108 provided $750,000.
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2018	2018	2020	Colusa (3)	RD 108	Install up to three production wells for groundwater management program	16,000	$750,000	Well output will be monitored	Seeking Reclamation Drought Relief or Water Use Efficiency Funds
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2005	2005	TBD[d]	Colusa (3)	PCGID	Develop a conjunctive water management program	5,000	TBD[c]	Well output will be monitored	PCGID will fund the program with District monies
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2005	2005	TBD[d]	Colusa (3)	PID	Develop a conjunctive water management program	5,000	TBD[c]	Well output will be monitored	PID will fund the program with District monies
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **BS-6** Provide long-term diversion flexibility	2005	2005	TBD[d]	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Line canal	7,000	$120,000[b]	Action-specific monitoring plan will be included in construction contract	Funding will be pursued through future rounds of Water Use Efficiency Grant Funding
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **BS-5, BS-6, FY-5, and FY-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2005	2005	2015[d]	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Construct one groundwater production well	2,400	$200,000	Well output will be monitored	RD 1004
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **FY-1** In-stream flow benefit in Butte Creek	2003	2004	2015	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	White Mallard Dam SCADA telemetry and measurement instrumentation	17,000	$5,000	Creek diversion will be monitored	RD 1004 and other funding sources are being pursued

TABLE 4-6
Summary of Applicable Targeted Benefits and Proposed Actions
2016 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Analyze	Priority	Implement	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Proposed Action	Maximum Contribution to QO from Proposed Action (ac-ft)	Locally Beneficial Portion of Action[a]	Action-specific Monitoring Plan	Funding Sources
BS-1 In-stream flow benefit in Sacramento River	2001	2006	2020	Butte and Sutter (4)	MFWC	Install fish screen on main Meridian diversion. Enlarge Main Canal and remove one river diversion	TBD	TBD[b]	Output will be monitored	Federal and state
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2017	2018	2019	Butte and Sutter (4)	MFWC	Flow measurement program	500	$90,000	Output will be monitored	MFWC
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2005	2005	TBD[d]	Butte and Sutter (4)	SMWC, PMWC and RD 1500	Recycle irrigation	25,000	$12,000[b]	Lift pumps that recycle drainage water will be monitored	Funding for feasibility study will be pursued through future rounds of WUE Grant funding
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2009	TBD	TBD[d]	Butte and Sutter (4)	SMWC, PMWC, and RD 1500	Expansion of the existing drainwater reuse system	5,000	TBD[b]	TBD	Funding will be pursued through future rounds of federal and state grant funding opportunities
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET	2012	2012	2015	Butte and Sutter (4)	SMWC	Line canal	1,000	$14,000[b]	Action-specific monitoring plan will be included in construction contract	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2011	2011	2015	Butte and Sutter (4)	SMWC, PMWC, and RD 1500	Install six production wells for groundwater management program	5,000	$200,000[b]	Well output will be monitored	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management
A-1 In-stream flow benefit in Sacramento River **A-4** Decrease nonproductive ET **A-5 and A-6** Provide long-term diversion flexibility	2005	2005	Ongoing	American (7)	NCMWC	Construct 13 groundwater extraction wells	15,000	$100,000[b]	Well output will be monitored	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management
Total SRSC Contribution							213,800	$27,270,500		

[a]Cost-benefit analysis will be performed if funding is not received to determine what portion of project, if any, is economically feasible for a local agency to undertake. The presentation of these local and external benefits and the associated costs will be included in the annual updates at the time the QOs are analyzed.

[b]Local funding amount varies depending on type and application of project. Historical average of local contribution varies from 5 to 20 percent of project cost provided through in-kind services by the Company/District. Five percent of estimated project cost was used for projects yet to apply for funding. The local contribution for these projects will be updated as funding is sought and acquired.

[c]Project is 100 percent District funded. Exact amount will be determined at project completion.

[d]Subject to appropriation of funding.

Note:

WUE = Agricultural Water Use Efficiency Program

TABLE 4-7
Summary of Applicable Targeted Benefits and Implemented Actions
2016 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Implemented	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Implemented Action	Estimated Contribution to QO from Action (ac-ft)	Locally Beneficial Portion of Action	Action-specific Monitoring Plan	Funding Sources
R-1 Remove flow impediment in Cottonwood Creek	2010	Redding (1)	ACID	Remove and replace siphon segment crossing beneath Cottonwood Creek	8,900	$288,000	Action-specific monitoring plan will be included in construction contract	ACID and the USFWS Anadromous Fish Restoration Program provided $130,000
R-2 In-stream flow benefit in Sacramento River **R-3** Decrease nonproductive ET	2012 (additional phases remain)	Redding (1)	ACID	Replace degraded pipelines; construct pipelines to replace laterals and canals subject to leakage	4,000	See Table 4-6	Action-specific monitoring plan will be included in construction contract	ACID
R-2 In-stream flow benefit in Sacramento River **R-4** Provide long-term diversion flexibility	2012	Redding (1)	ACID	Crowley Gulch Siphon Project	1,785	$40,000	See Section 5.0	ACID and Proposition 50 WUE Grant ($1.775 million)
R-2 In-stream flow benefit in Sacramento River **R-4** Provide long-term diversion flexibility	2013	Redding (1)	ACID	Two groundwater production wells	5,600	$185,000	Well output will be monitored	Proposition 50, Chapter 8 award of $1.4 million for Integrated Regional Water Management; Omnibus Public Land Management Act of 2009, Title IX Bureau of Reclamation, Authorizations, Subtitle F – Secure Water, Public Law 111-11 award of $185,000
C-1 In-stream flow benefit in Sacramento River	2010	Colusa (3)	GCID	Measure GCID drainwater outflow to reduce tailwater spills; GCID completed construction of 12 drainwater outflow measuring sites in 2010; Construct an automated inflatable Obermeyer steel gated weir on the Colusa Basin Drain to maximize year-round diversions to crops and wildlife habitat	10,745	$650,000	Flows will be monitored to reduce spills	GCID and a Reclamation Water Conservation Grant provided $200,000
C-5, C-6, and C-8 Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2012	Colusa (3)	RD 108	Characterize the groundwater system underlying the northern portion of the District	0	$31,000	Collect and organize groundwater data to develop information	Proposition 84 Grant to provide $245,000
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2009	Colusa (3)	RD 108	Replace flashboard checks with long-crested weirs, an ITRC flap gate, and Rubicon flume gates	2,000	$300,000	Action-specific monitoring plan will be included in construction contract	RD 108 and a Reclamation Water Conservation Grant provided $300,000
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2011	Colusa (3)	RD 108	Increase capacity of recycled water	13,000	$50,000	Flows will be monitored to recapture spills and reduce outflows	RD 108 and a Reclamation CALFED Grant provided $560,000

TABLE 4-7
Summary of Applicable Targeted Benefits and Implemented Actions
2016 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Implemented	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Implemented Action	Estimated Contribution to QO from Action (ac-ft)	Locally Beneficial Portion of Action	Action-specific Monitoring Plan	Funding Sources
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2011	Colusa (3)	RD 108	Improve operations of recycled water pump stations	3,700	$235,000	Flows will be monitored to recapture spills and reduce outflows	RD 108 and a Reclamation CALFED Grant provided $560,000
C-5, C-6, and C-8 Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2009	Colusa (3)	RD 108	Groundwater resources characterization	0	$0	Well output, groundwater monitoring wells, and subsidence will be monitored	RD 108
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2012	Colusa (3)	RD 108	Irrigation scheduling	5,500	$31,000	Applied water to the field will be monitored	RD 108 and a Reclamation Water Conservation Grant provided $25,000
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2007	Colusa (3)	RD 108	Rice water conservation program	5,000	$0	Diversions and outflows will be monitored	RD 108
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2012	Colusa (3)	RD 108	Installed three production wells for groundwater management program	8,000	$128,800	Well output will be monitored	Received Proposition 50, Chapter 8 funding for Integrated Regional Water Management
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **FY-1** In-stream flow benefit in Butte Creek	2007 (additional phases remain)	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Remove and replace White Mallard Dam and fish ladder on Butte Creek; install weir and fish screen	17,000	$25,000	Creek diversion will be monitored	Ducks Unlimited provided $5 million
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **BS-5, BS-6, FY-5, and FY-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2011 and 2013	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Construct two groundwater production wells	4,200	$370,000	Well output will be monitored	RD 1004

TABLE 4-7
Summary of Applicable Targeted Benefits and Implemented Actions
2016 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Implemented	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Implemented Action	Estimated Contribution to QO from Action (ac-ft)	Locally Beneficial Portion of Action	Action-specific Monitoring Plan	Funding Sources
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **BS-5, BS-6, FY-5, and FY-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands **FY-1** In-stream flow benefit in Butte Creek	Ongoing	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Upgrade field-level flowmeters	1,600	$67,500	Field-level turnouts will be monitored, allowing RD 1004 to charge water users by the ac-ft	Individual farmers paid for initial flowmeters at approximately $1,000 each in 1992; upgrades cost an estimated $67,500; and meter maintenance, estimated at $7,000/year, is paid for by the District
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands **FY-1** In-stream flow benefit in Butte Creek	2009 (additional phases remain)	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Rebuild recirculation pump	3,800	$43,200	Lift pump that recycles drainage water will be monitored	RD 1004
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **FY-1** In-stream flow benefit in Butte Creek	2009	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Install new check structure and ITRC water gate	70	$2,500	None, gate is designed to automatically provide constant water elevation	RD 1004 and Reclamation Grant
BS-1 In-stream flow benefit in Sacramento River **FY-1** In-stream flow benefit in Butte Creek		Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Install a pair of weirs	1,200	$15,000	Increased system control will be provided with new weirs	Reclamation Grant
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2012	Butte and Sutter (4)	MFWC	Construct two groundwater production wells	1,500	$135,000	Well output will be monitored	MFWC and Proposition 50, Chapter 8 funding for Integrated Regional Water Management
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2012 (additional phases remain)	Butte and Sutter (4)	SMWC, PMWC, and RD 1500	Installed one groundwater monitoring well and one groundwater production well	1,600	$200,000	Well output will be monitored	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management

TABLE 4-7
Summary of Applicable Targeted Benefits and Implemented Actions
2016 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Implemented	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Implemented Action	Estimated Contribution to QO from Action (ac-ft)	Locally Beneficial Portion of Action	Action-specific Monitoring Plan	Funding Sources
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2007-2012	Butte and Sutter (4)	SMWC	Internal Water Supply Program	20,000	$473,000	No plans to monitor	SMWC
A-1 In-stream flow benefit in Sacramento River **A-4** Decrease nonproductive ET **A-5 and A-6** Provide long-term diversion flexibility	2010 (additional phases remain)	American (7)	NCMWC	Improve flow monitoring in Natomas Basin (phased approach)	4,500	$187,000	Flows within NCMWC and between districts will be monitored	NCMWC and Proposition 50 WUE Grant
A-1 In-stream flow benefit in Sacramento River **A-4** Decrease nonproductive ET **A-5 and A-6** Provide long-term diversion flexibility	2013	American (7)	NCMWC	Installed new pump station and fish screen on Sacramento River	1,400	$0	River diversion will be monitored	CALFED and Reclamation awarded $1.5 million for design and permitting
A-1 In-stream flow benefit in Sacramento River **A-4** Decrease nonproductive ET **A-5 and A-6** Provide long-term diversion flexibility	2011	American (7)	NCMWC	Improved flow monitoring in Natomas Basin	4,500	$187,000	Flows within NCMWC and between districts will be monitored	Proposition 50 WUE grant awarded $163,000; NCMWC paid the remaining $187,000
Total SRSC Contribution					**140,830**	**$3,395,000**		

SECTION 5.0

Identification of Actions to Implement and Achieve Proposed Quantifiable Objectives

Section 5.0 revisions to the RWMP are highlighted below in shaded text. An update of all previously identified projects was completed, and any new projects identified by the SRSCs since the completion of the initial RWMP were added, including description, schedule, budget, and funding sources.

The SRSCs are in the process of implementing water measurement compliance programs to comply with state and/or federal requirements. Implementation of these programs is anticipated to consume resources that may have otherwise been available to implement proposed actions.

5.1 Redding Sub-basin

5.2 ACID Churn Creek Lateral Improvements Project

5.2.1 Project Description

5.2.2 Schedule

5.2.3 Cost and Funding Sources

5.3 ACID Main Canal Modernization Project

5.3.1 Project Description

5.3.2 Schedule

5.3.3 Cost and Funding Sources

5.3.3.1 Monitoring

5.4 ACID Conjunctive Water Management Program

5.4.1 Project Description

5.4.2 Schedule

5.4.3 Cost and Funding Sources

5.4.3.1 Monitoring

5.4.4 ACID Olney Creek Watershed Restoration Project

5.4.4.1 Project Description

5.4.4.2 Schedule

5.4.4.3 Cost and Funding Sources

5.4.5 Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project

5.4.5.1 Project Description

5.4.5.2 Schedule

5.4.5.3 Cost and Funding Sources

5.4.5.4 Monitoring

5.4.6 System Improvement Program

5.4.6.1 Project Description

In 2008, ACID began a System Improvement Program to replace degraded or inefficient pipelines and to pipe and/or line earthen laterals and canals that were subject to leakage. Through October 2017, implementation of this Program resulted in the installation of approximately 7,400 linear feet of pipe, varying in size from 15- to 27-inch-inside diameter. A summary of the completed projects is provided in Table 5-4C.

TABLE 5-4C
System Improvement Program – Completed Projects
2016 Sacramento Valley Regional Water Management Plan Annual Update

Project Description	Diameter (inch) by Length (ft)
Lateral 29 – Rodgers	24 by 100
Lateral 29 – Rices Duce	18 by 220
Lone Tree	18 by 30
Lateral 29 – Rodgers	24 by 176
Treefoil	15 by 35
Demsage Pump	18 by 110
Demsage Pump	24 by 370
Lateral 33 – Arbesas	18 by 198
Smith Bottom	18 by 30
Lateral 27, east of Hawes Road	18 by 300
Lateral 49	18 by 154
Lateral 27	18 by 530
Lateral 41	18 by 440
Lateral 56 – Sheriff	24 by 352
Lateral 51 – Regina Lane	18 by 60
Pick-up Ditch – Davis	24 by 130
Lateral 29	18 by 40
Hillside Ditch	24 by 168
Lateral 21.1 – Moore	24 by 56
Lateral 33 – Mathews	18 by 220

TABLE 5-4C
System Improvement Program – Completed Projects
2016 Sacramento Valley Regional Water Management Plan Annual Update

Project Description	Diameter (inch) by Length (ft)
Lateral 3 – Golf Course	18 by 22
Lateral 35 – Goodman	24 by 220
Lateral 2 – Cascade Rigging	18 by 44
Lateral 2 – Cascade Rigging	15 by 100
Lateral 27	24 by 252
Lateral 33	24 by 42
Hillside Ditch	24 by 42
Lateral 29	24 by 21
Lateral 27	24 by 300
Center Ditch	24 by 294
Lateral 21.1	24 by 147
Churn Creek Pumps	27 by 260
Lateral 46	18 by 126
Lateral 35 – Pipe Lining	15 by 240
Lateral 37 – Pipe Lining	24 by 300
Lateral 23 – Pipe Lining	24 by 225
Lateral 33 – Pipe Lining	18 by 300
High School Flume – Pipe Lining	48 by 180
Hill Street (Main Canal) – Concrete Lining	450 feet
Curn Creek Pumps (Canal) – Concrete Lining	450 feet

5.4.6.2 Cost and Funding Sources

The cost of the program to date is approximately $1.03 million. Of this total, approximately $891,088 was paid directly from ACID reserve funds; $138,912 was provided by District labor and equipment; and the remainder was provided by non-District funds.

Funding sources are listed in Table 4-6.

5.4.6.3 Monitoring

There are no specific monitoring plans associated with the System Improvement Program.

5.4.7 Clear Creek Siphon Rehabilitation Project

5.4.7.1 Project Description

5.4.7.2 Schedule

5.4.7.3 Cost and Funding Sources

5.5 Colusa Sub-basin

Table 5-5 lists and describes potential projects in the Colusa Sub-basin.

TABLE 5-5
Potential Projects in the Colusa Sub-basin
2016 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
GCID Water Conservation and Management Project	GCID	Colusa	GCID Water Conservation and Management Project implementation. The project includes a water distribution system SCADA system expansion and Ethernet upgrade, and Main Canal and Main Pump Station automation. Replacement and modernization of three older checks with new automated main canal checks. SCADA integration with drain outflow measurement and recapture stations.	40,000	C-1, C-5, C-6, C-8
GCID Conjunctive Water Management Program	GCID	Colusa	Development of a ground-water program consistent with GCID and regional objectives, inclusive of both groundwater monitoring and extraction. Extraction could result from pumping of privately owned and/or up to 16 District wells.	30,000	C-1, C-5, C-6, C-8
GCID Drain Water Outflow Measurement Program[a]	GCID	Colusa	Construct 12 flow measurement sites with telemetry dedicated to the measurement of GCID system outflows. Construct an automated inflatable steel gated weir on the Colusa Basin Drain to measure flows made available by upslope irrigation districts for supply to water users downstream of the weir. The weir can aid in maximizing year-round diversions to crops and wildlife habitat.	10,745	C-1
RD 108 Strategic Plan for Groundwater Resources Characterization	RD 108	Colusa	A comprehensive review of past studies and data covering the area in and around the District to identify the approach the District should take to gain a better understanding of the groundwater basin.	0	C-5, C-6, C-8
RD 108 Conjunctive Water Management Program[a]	RD 108	Colusa	Installation of up to three production wells for groundwater management program.	16,000	C-1, C-5, C-6, C-8

TABLE 5-5
Potential Projects in the Colusa Sub-basin
2016 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
RD 108 Flow Control and Measurement Project[a]	RD 108	Colusa	Replace flashboard checks with long-crested weirs, an ITRC flap gate, and Rubicon flume gates.	2,000	C-1, C-5, C-6, C-8
RD 108 Northern Area Groundwater Study[a]	RD 108	Colusa	Characterize the groundwater system underlying the northern portion of the District.	0	C-5, C-6, C-8
RD 108 Recycled Water Improvement Project[a]	RD 108	Colusa	Increase capacity of existing recycled water pump stations.	15,000	C-1, C-5, C-6, C-8
RD 108 Recycled Water Management Project[a]	RD 108	Colusa	Improve the operations and management of three existing recycled water pump stations.	4,000	C-1, C-5, C-6, C-8
RD 108 Irrigation Scheduling Program[a]	RD 108	Colusa	Develop software to help growers improve their irrigation efficiency by using weather and soil moisture information to predict crop water needs.	5,500	C-1, C-5, C-6, C-8
RD 108 Rice Water Conservation Program[a]	RD 108	Colusa	Implement a program that offers rice growers rebates to reduce or eliminate tailwater during the maintenance period of rice cultivation.	5,000	C-1, C-5, C-6, C-8
PCGID Conjunctive Water Management Program	PCGID	Colusa	Development of a conjunctive water management program.	5,000	C-1, C-5, C-6, C-8
PID Conjunctive Water Management Program	PID	Colusa	Development of a conjunctive water management program.	5,000	C-1, C-5, C-6, C-8

[a]Project has been fully or partially implemented as described in the following sections.

Note:
M.P. = milepost

5.6 GCID Water Conservation and Management Project

5.6.1 Project Description

5.6.2 Schedule

The project schedule shown in Table 5-6 will commence upon appropriation of funding. The construction of this project will be executed in phases and is not expected to be completed in its entirety within the duration of this RWMP.

TABLE 5-6
GCID Water Conservation and Management Project Schedule
2016 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Feasibility and Pre-design	Completed as part of the wildlife refuge water supply
Environmental Document	Programmatic document is completed; supplemental documentation and permitting is expected to be required during design
Implementation	Implementation is expected to be completed by 2025

5.6.3 Cost and Funding Sources

5.7 GCID Conjunctive Water Management Program

5.7.1 Project Description

5.7.2 Schedule

5.7.3 Cost and Funding Sources

5.8 (Project removed)

5.8.4 GCID Drain Water Outflow Measurement Program

5.8.4.1 Project Description

5.8.4.2 Schedule

5.8.4.3 Cost and Funding Sources

5.8.4.4 Monitoring

5.8.5 GCID Main Canal Milepost 35.6 Regulating Reservoir Project

5.8.5.1 Project Description

5.8.5.2 Schedule

5.8.5.3 Cost and Funding Sources

5.8.6 RD 108 Strategic Plan for Groundwater Resources Characterization

5.8.6.1 Project Description

5.8.6.2 Schedule

5.8.6.3 Cost and Funding

5.9 RD 108 Conjunctive Water Management Program

5.9.1 Project Description

RD 108 proposes to expand upon its conjunctive water management program, which provide the flexibility to pump and convey groundwater in lieu of some of its surface water supply. RD 108's initial groundwater project, including three new groundwater production wells, yielded a project capacity of up to 8,000 ac-ft per year. The next phase will include the addition of three new groundwater production wells. Three groundwater production wells would be located within the service area near RD 108's existing canals. The production wells would likely have capacities of approximately 3,500 gallons per minute. This project would help RD 108 meet the following objectives:

- Increase RD 108 water supply reliability and flexibility
- Increase in-stream flows during dry years
- Increase in-basin water supply reliability and flexibility
- Help satisfy the requirements of the Phase 8 Settlement Agreement

Targeted Benefits for this project are listed in Table 4-6.

5.9.2 Schedule

The project schedule shown in Table 5-9 will commence upon appropriation of funding.

TABLE 5-9
RD 108 Conjunctive Water Management Program Schedule
2016 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Pre-design	Complete in 2018.
Groundwater Management Plan	Completed in 2006; update adopted November 2008; updated in 2013.
Environmental Document	Complete in 2019.
Construction	Construction of three production wells in 2019 and 2020.

5.9.3 Cost and Funding Sources

The cost for the next phase of the RD 108 Conjunctive Water Management Program is estimated to be $1.5 million. RD 108 is applying for public assistance to implement this program through Reclamation Drought Resiliency Grants. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.10 RD 108 Flow Control and Measurement Project

5.10.1 Project Description

RD 108 replaced flashboard checks with 23 long-crested weirs, one ITRC flap gate, and three Rubicon flume gates. Five acoustic velocity flowmeters were installed at strategic locations in the distribution canals, and approximately 80 farm turnouts were calibrated for improved flow measurement. The project improved water-level control and measurement, and provided simplified canal operation that resulted in approximately 2,000 ac-ft of water savings and $20,000 in pumping cost savings annually.

RD 108 is complying with SBX-7 and other applicable laws regarding flow control and measurement.

Targeted Benefits for this project are listed in Table 4-7.

5.10.2 Schedule

The project was completed December 2009.

5.10.3 Cost and Funding Sources

The total project cost for the RD 108 Flow Control and Measurement Project was $600,000. A Reclamation Water Use Efficiency Grant provided half of the cost.

Funding sources are listed in Table 4-7.

5.10.4 RD 108 Northern Area Groundwater Study

5.10.4.1 Project Description

5.10.4.2 Schedule

5.10.4.3 Cost and Funding Sources

5.10.5 RD 108 Recycled Water Improvement Project

5.10.5.1 Project Description

5.10.5.2 Schedule

5.10.5.3 Cost and Funding Sources

5.10.6 RD 108 Recycled Water Management Project

5.10.6.1 Project Description

5.10.6.2 Schedule

5.10.6.3 Cost and Funding Sources

5.10.7 RD 108 Irrigation Scheduling Program

5.10.7.1 Project Description

5.10.7.2 Schedule

5.10.7.3 Cost and Funding

5.10.8 RD 108 Rice Water Conservation Program

5.10.8.1 Project Description

5.10.8.2 Schedule

5.10.8.3 Cost and Funding

5.10.9 RD 108 Alternative Water Supply Study

5.10.9.1 Project Description

RD 108 contracted with David's Engineering to conduct an Alternative Water Supply Study that investigated alternative sources of water supply. These sources included additional groundwater wells, added recycling, investing in Sites Reservoir, and fallowing land. This study is informing RD 108 in its planning of future projects, including participation in the Sites Reservoir Project, additional groundwater wells, recycling projects, and fallowing lands.

5.10.9.2 Schedule

The project was completed in January 2018.

5.10.9.3 Cost and Funding

The cost for the Alternative Water Supply Study was $45,000 and was funded solely by RD 108.

5.10.10 RD 108 Water Use Efficiency Program

5.10.10.1 Project Description

RD 108 is installing 26 new control gates and associated structures to refine operations. The District is also connecting the County Line Road Groundwater Well by pipeline to Distribution Canal 15D to increase distribution efficiency. It will also increase efficiency by connecting the New Steiner Pumping Plant by pipeline to replace the North Steiner Pumping Plant. The new control gates will enable more finely tuned and automated water level control in the distribution canals. They will also reduce the travel required by watermen to adjust the flows.

5.10.10.2 Schedule

The project began in August 2017, upon award of funding by the Department. Work is scheduled through the end of 2019.

5.10.10.3 Cost and Funding

The overall cost of the project is estimated to be $3 million, with $1.5 million provided by Department grant and $750,000 by Reclamation. RD 108 will provide the remaining $750,000.

5.11 PCGID Conjunctive Water Management Program

5.11.1 Project Description

5.11.1.1 Phase I of the Conjunctive Water Management Program

5.11.2 Schedule

5.11.3 Cost and Funding Sources

5.12 PID Conjunctive Water Management Program

5.12.1 Project Description

5.12.2 Schedule

5.12.3 Cost and Funding Sources

5.13 Butte Sub-basin

5.14 RD 1004 Canal Lining Project

5.14.1 Project Description

5.14.2 Schedule

5.14.3 Cost and Funding Sources

5.15 RD 1004 Conjunctive Water Management Program

5.15.1 Project Description

5.15.2 Schedule

5.15.3 Cost and Funding Sources

5.15.3.1 Monitoring

5.15.4 RD 1004 White Mallard Dam and Fish Ladder Replacement Project and Five-Points Project

5.15.4.1 Project Description

5.15.4.2 Schedule

5.15.4.3 Cost and Funding Sources

5.15.4.4 Monitoring

5.15.5 RD 1004 Flowmeter Replacement Program

5.15.5.1 Project Description

5.15.5.2 Schedule

5.15.5.3 Cost and Funding Sources

5.15.6 RD 1004 Recirculation Pump 8 Rebuild Project

5.15.6.1 Project Description

5.15.6.2 Schedule

5.15.6.3 Cost and Funding Sources

5.15.7 RD 1004 ITRC Water Gate Project

5.15.7.1 Project Description

5.15.7.2 Schedule

5.15.7.3 Cost and Funding Sources

5.15.8 RD 1004 10-Foot by 8-Foot Weirs Installation Project

5.15.8.1 Project Description

5.15.8.2 Schedule

5.15.8.3 Cost and Funding Sources

5.16 Sutter Sub-basin

Table 5-16 lists and describes potential projects in the Sutter Sub-basin.

TABLE 5-16
Potential Projects in the Sutter Sub-basin
2016 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
MFWC Conjunctive Water Management Program[a]	MFWC	Sutter	Installation of two groundwater production wells.	1,500	BS-1
MFWC Phase 2 Fish Screen Project	MFWC	Sutter	Phase II Fish Screen.	TBD	BS-1
MFWC Flow Measurement Project	MFWC	Sutter	Flow Measurement	500	BS-1, BS-5. BS-6
SMWC Irrigation Recycling Project	SMWC, PMWC, and RD 1500	Sutter	Feasibility analysis of a tailwater recovery system.	25,000	BS-1, BS-5, BS-6
SMWC, PMWC, and RD 1500 Joint Sutter Basin Drainwater Reuse Project	SMWC, PMWC, and RD 1500	Sutter	Feasibility study identifying alternatives for expansion of the existing drainwater reuse system.	5,000	BS-1, BS-5, BS-6
SMWC Canal Lining	SMWC	Sutter	Canal lining to reduce diversions and eliminate spills.	1,000	BS-1, BS-4

TABLE 5-16
Potential Projects in the Sutter Sub-basin
2016 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
SMWC, PMWC, and RD 1500 Joint Sutter Basin Groundwater Management Program	SMWC, PMWC, and RD 1500	Sutter	Groundwater investigation; installation of 12 monitoring wells and 6 production wells.	5,000	BS-1, BS-5, BS-6
SMWC Internal Water Supply Program	SMWC	Sutter	Internal water supply program.	TBD	BS-1, BS-5, BS-6

5.17 MFWC Conjunctive Water Management Program

5.17.1 Project Description

5.17.2 Schedule

5.17.3 Cost and Funding Sources

5.17.4 MFWC Phase 2 Fish Screen Project

5.17.4.1 Project Description

5.17.4.2 Schedule

5.17.4.3 Cost and Funding Sources

5.17.5 MFWC Flow Measurement Project

5.17.5.1 Project Description

MFWC intends to install flow measurement devices on each company-owned internal drainage pump. This will require replacing and adjusting discharge pipes on five pumps. A total of eight meters will be purchased, calibrated, and installed for improved flow measurement. The project will improve water-level control and measurement, and simplify canal operations. The project is anticipated to result in approximately 500 ac-ft of water savings.

Targeted Benefits for this project are listed in Table 4-7.

5.17.5.2 Schedule

The project is expected to be completed in April 2019.

5.17.5.3 Cost and Funding Sources

The total project cost for the MFWC Flow Measurement Project is estimated at $90,000. Funding is provided by MFWC.

5.18 SMWC, PMWC, and RD 1500 Joint Sutter Basin Drainwater Reuse Project

5.18.1 Project Description

5.18.2 Schedule

5.18.3 Cost and Funding Sources

5.19 SMWC Canal Lining Project

5.19.1 Project Description

5.19.2 Schedule

5.19.3 Cost and Funding Sources

5.20 SMWC, PMWC, and RD 1500 Joint Sutter Basin Groundwater Management Program

5.20.1 Project Description

5.20.1.1 Phase I of the Groundwater Management Program

5.20.2 Schedule

5.20.3 Cost and Funding Sources

5.20.4 Monitoring

5.21 SMWC Internal Water Supply Program

5.21.1 Project Description

5.21.2 Schedule

5.21.3 Cost and Funding Sources

5.22 PMWC Conjunctive Water Management Program

This project has been removed because PMWC is no longer participating in this RWMP Annual Update.

5.22.1 Project Description

5.22.2 Schedule

5.22.3 Cost and Funding Sources

5.22.4 PMWC Canal Lining Project

This project has been removed because PMWC is no longer participating in this RWMP Annual Update.

5.22.4.1 Project Description

5.22.4.2 Schedule

5.22.4.3 Cost and Funding Sources

5.23 American Sub-basin

5.24 NCMWC Conjunctive Water Management Program

5.24.1 Project Description

5.24.2 Schedule

5.24.3 Cost and Funding Sources

5.24.4 NCMWC American Basin Fish Screen and Habitat Improvement Project – Sankey Diversion

5.24.4.1 Project Description

This project involves the construction of a new 434-cfs pump station on the Sacramento River near Sankey Road. Each of the five pumps in the station will independently draw water through a positive-barrier fish screen, pump the water over the levee, and discharge it into the proposed new Sankey Highline Canal.

NCMWC's current system raises the water surface in the Natomas Cross Canal to draw water through two existing pumping plants. This canal runs into the Sacramento River approximately 1,000 feet upstream of the proposed pumping plant. The increase in efficiency from replacing the existing diversion system with the single new facility would save 1,400 ac-ft of water annually.

Targeted Benefits associate with this project are listed in Table 4-6.

5.24.4.2 Schedule

The project was completed in 2013.

5.24.4.3 Cost and Funding Sources

Approximately $1.5 million have been received from CALFED and Reclamation for design and permitting. NCMWC entered into cooperative agreements with CDFG, CALFED, and Reclamation for the remaining $44 million to build the Sankey Diversion Facilities.

Funding sources are listed in Table 4-7.

5.24.5 NCMWC SCADA Project for the Natomas Basin

5.24.5.1 Project Description

5.24.5.2 Schedule

5.24.5.3 Cost and Funding Sources

SECTION 6.0

Establishment of Monitoring Program

No changes were made.

6.1 Cooperative Study Update

6.2 Water Quality and the Sacramento Valley Water Quality Coalition

6.2.1 Sacramento Valley Management Plan

6.2.2 Diazinon Management Plan

6.2.3 Groundwater

SECTION 7.0

Proposed Budget and Allocation of Regional Costs

Section 7.0 revisions to the RWMP are highlighted below in shaded text. SRSC's water conservation budgets were updated for 2016, 2017, and 2018.

The water conservation budget presented below (see Tables 7-1 and 7-2) for past and future years is based on estimates of staff time and materials used for conservation efforts by each of the participating SRSCs. Conservation activities were defined as actions or efforts associated with contributing to efficient water management.

TABLE 7-1
Estimated Amount Spent in 2016
2016 Sacramento Valley Regional Water Management Plan Annual Update

Budget Item	Total Budget, Including Staff Time ($)
	Year 2016
Conservation Staff	444,320
Measurement	1,666,142
CIMIS	21,764
Water Quality	124,746
Agricultural Education Program	73,704
Quantity Pricing	93,570
Policy Changes	121,626
Contractors' Pumps	6,392,522
Irrigation System Maintenance	5,905,254
Facilitate Financing of On-farm Systems	624
Line or Pipe Canals/Install Reservoirs	103,152
Delivery Flexibility	776,110
District Spill/Tailwater System	878,380
Optimize Conjunctive Use	246,588
Automate Canal Structures	403,368
Customer Pump Testing	9,916
Total	***17,261,786***

TABLE 7-2
Projected Budget and Staff Time Summary for 2017 and 2018
2016 Sacramento Valley Regional Water Management Plan Annual Update

Budget Item	Total Budget, Including Staff Time ($)	
	Year 2017	**Year 2018**
Conservation Staff	443,360	455,100
Measurement	1,600,143	1,625,702
CIMIS	23,610	23,842
Water Quality	117,221	120,264
Agricultural Education Program	85,769	76,673
Quantity Pricing	84,365	85,220
Policy Changes	166,181	216,432
Contractors' Pumps	6,227,626	8,015,038
Irrigation System Maintenance	6,044,608	6,285,545
Facilitate Financing of On-farm Systems	744	768
Line or Pipe Canals/Install Reservoirs	82,462	1,596,364
Delivery Flexibility	680,730	1,143,090
District Spill/Tailwater System	906,940	929,804
Optimize Conjunctive Use	252,485	313,779
Automate Canal Structures	226,150	1,155,665
Customer Pump Testing	11,930	17,508
Total	***16,954,324***	***22,060,794***

SECTION 8.0

RWMP Coordination

Section 8.0 revisions to the RWMP are highlighted below in shaded text. Contact information was updated for all SRSC conservation coordinators.

Quarterly conference calls or meetings will be attended by the representatives listed in Table 8-1. Any issues that may not affect an individual SRSC, but may impact the region or sub-basin will be addressed at this time. A current list of conservation coordinators for each participating SRSC will be provided with the RWMP annual update.

TABLE 8-1
RWMP Conservation Coordinators
2016 Sacramento Valley Regional Water Management Plan Annual Update

District/Company	Conservation Coordinator	Phone	Email
ACID	John Jones	530-365-7329	jjones@andersoncottonwoodirrigationdistrict.org
GCID	Thad Bettner	530-934-8881	tbettner@gcid.net
PID	Lance Boyd	530-934-4801	lboyd52@aol.com
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RWMP Coordinator	Thad Bettner	530-934-8881	tbettner@gcid.net

SECTION 9.0

References

Bureau of Reclamation (Reclamation). 2014. *Water Management Planner*. Agricultural Water Inventory Tables (Standard Tables).

California Irrigation Management Information System (CIMIS). 2016. Average monthly precipitation data. http://www.cimis.water.ca.gov/.

Food and Agricultural Association of the United Nations. 1985. *Water Quality for Agriculture*. FAO Irrigation and Drain Paper 29, Rev. 1. Prepared by R.S. Ayers and D.W. Westcot. Reprinted 1989 and 1994.

Irrigation Training and Research Center (ITRC). 2003a. *California Evapotranspiration Data for Irrigation District Water Balances* (ITRC Report). 2016 update. http://www.itrc.org/etdata/waterbal.htm.

Irrigation Training and Research Center (ITRC) 2003b. California Crop and Soil Evapotranspiration, ITRC Report 03-001. January.

Appendix A
Final Sacramento Valley Regional Water Management Plan Compact Disc

Appendix B
2009 Sacramento Valley Regional Water Management Plan Annual Update Compact Disc

Appendix C
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update Compact Disc

Appendix D
2012 Sacramento Valley Regional Water Management Plan Annual Update Compact Disc

Appendix E
2013–2015 Sacramento River Settlement Contractor Water Balance Tables

Water Balance Summary

Prepared for

Sacramento River Settlement Contractors

October 2016

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Contents

Acronyms and Abbreviations

BWMP	Sacramento River Basinwide Water Management Plan
CIMIS	California Irrigation Management Information System
district	irrigation district
ET	evapotranspiration
ETo	reference ET
ITRC	Irrigation Training and Research Center
ITRC Report	*California Evapotranspiration Data for Irrigation District Water Balances*
Reclamation	Bureau of Reclamation
SRSC	Sacramento River Settlement Contractor

Water Balance Summary

Water balance summaries were developed for each participating Sacramento River Settlement Contractor (SRSC) and are included in Appendix A for the 2013–2015 irrigation years. These summaries are based on the Agricultural Water Inventory Tables (Standard Tables) in the *Water Management Planner* (Bureau of Reclamation [Reclamation], 2014) to meet the 2011 Standard Criteria for Agricultural and Urban Water Management Plans. The tables were modified to display and identify information unique to the SRSCs, including rice production. The summaries are limited to the April through October period covered by the SRSC contracts.

Surface water supplies are based on records of the SRSC diversions from Reclamation monthly water accounting and SRSC records. Irrigation district (district) groundwater pumping is based on SRSC records. Private groundwater pumping is estimated by the SRSCs.

Precipitation data are based on the average monthly precipitation reported for the Sacramento Valley by the California Irrigation Management Information System (CIMIS) for the Colusa, Davis, and Verona stations; for the Redding Sub-basin, precipitation data are based on information from the Gerber CIMIS station for 2013, Shasta College CIMIS station for 2014, and Gerber South CIMIS station for 2015.

Crop evapotranspiration (ET) tables were prepared using (1) crop coefficients (Kc values) developed by the Irrigation Training and Research Center at California Polytechnic State University for district water balances for dry year surface irrigation and (2) monthly 2013-2015 reference ET (ETo) from CIMIS. For the SRSCs in the Sacramento Valley, Kc values were developed using the Zone 12 data from the Irrigation Training and Research Center (ITRC) Report (2003) and the average ETo data reported by CIMIS at Colusa, Davis, and Verona stations for 2013–2015. The crop ET for the Redding Sub-basin is based on the Zone 14 data from the ITRC Report and 2013 ETo data for the Gerber CIMIS station, 2014 ETo data for the Shasta College CIMIS station and 2015 ETo data for the Gerber South CIMIS station. Evaporation for use in estimating distribution system evaporation and seepage is estimated at 1.1 times the monthly ETo. Effective precipitation is estimated at 60 percent of the irrigation season precipitation.

Leaching requirements were developed using the methods and equations described by R.S. Ayers and D.W. Westcot in *Water Quality for Agriculture* (Food and Agricultural Association of the United Nations, 1985) (also known as FAO Irrigation and Drain Paper 29, Rev. 1). As identified in the footnotes to Table 5 of the water balances, the crop consumptive use values do not include water required for initial flooding, re-flooding, or flow-through on rice fields.

These source data were considered the most accurate and current information available at the district level for the 2013–2015 irrigation seasons. Information provided in the original Sacramento River Basinwide Water Management Plan (BWMP) was developed by and obtained from the California Department of Water Resources for a normalized 1995 cropping pattern for projected normal and drought conditions. The unit ET of applied water assumed for each district in the BWMP compares favorably with the ITRC and CIMIS assumptions and data used to develop the balance summaries for the 2013–2015 irrigation seasons.

Table 6 of the water balances summarizes the inflows and outflows from the individual SRSCs, including estimates of available soil moisture, inflow from precipitation, and ET precipitation by crops. Figure 1 summarizes the SRSC water balances. The various sources of the district outflows have been estimated by the SRSCs. The subtotal without recirculation was used as a closure term. As such, in addition to percolation to the groundwater basin, the volume shown includes unaccounted for drain water outflow; errors in assumptions used in calculations or estimated uses such as crop water use (ET); and other factors such as effective precipitation, evaporation, and groundwater recharge. A positive value indicates that the assumed percolation to groundwater is greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells. Table 6 of the water balances also shows the quantities of water recaptured and recirculated for reuse within the SRSC service areas.

In addition to the individual water balance tables, a regional-level summary of SRSC diversion and return flows for the 2013–2015 irrigation years was prepared. Figures 2, 3, and 4 are schematics that illustrate the relationships between participating SRSCs and show diversions from the Sacramento River and return flows to the river attributable to the participating SRSCs. Return flows to the river are available for various uses including re-diversion or environmental benefits. The regional-level summaries of SRSC diversion and return flows also identify the average diversion and average consumptive use per cropped acre within the participating SRSC service area for each irrigation year.

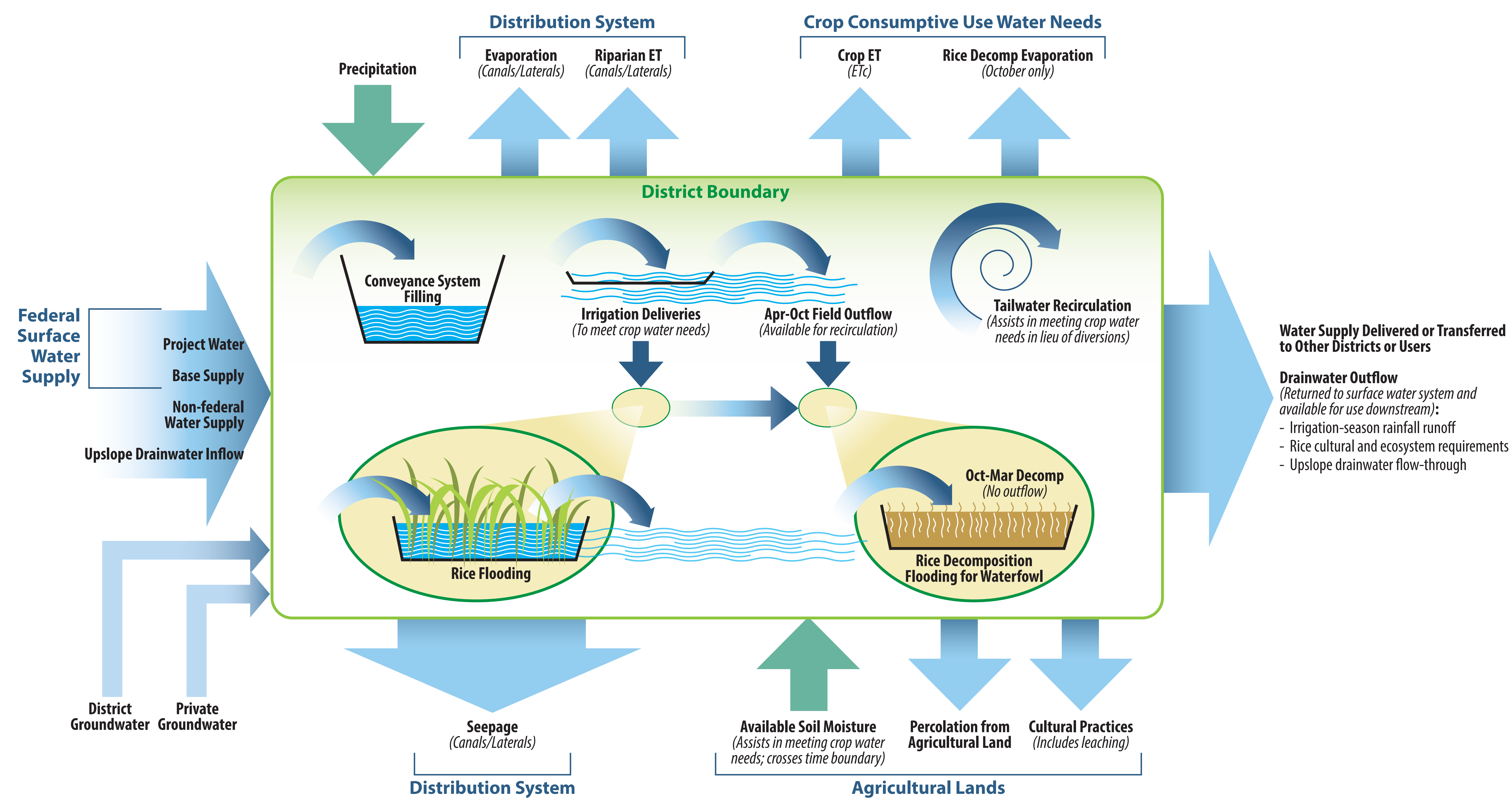
References

Bureau of Reclamation (Reclamation). 2014. *Water Management Planner.* December.

Food and Agriculture Organization of the United Nations. 1985. *Water Quality for Agriculture*. FAO Irrigation and Drain Paper 29, Rev. 1. Prepared by R.S. Ayers and D.W. Westcot. Reprinted 1989 and 1994.

Irrigation Training and Research Center (ITRC). 2003. *California Evapotranspiration Data for Irrigation District Water Balances* (ITRC Report). 2016 update available at: http://www.itrc.org/etdata/waterbal.htm.

Figures



Note: All district inflows and outflows except for rice decomp evaporation are April through October. Rice decomp evaporation is October only.

FIGURE 1
SCHEMATICS OF DISTRICT WATER BALANCE

SUMMARY

SRSC 2013 Diversions* =	1,524,436 AF
SRSC 2013 Return Flows (available for use downstream)* =	416,091 AF
Total 2013 Recirculation/Reuse by SRSCs =	382,296 AF

SUMMARY (Cont.)

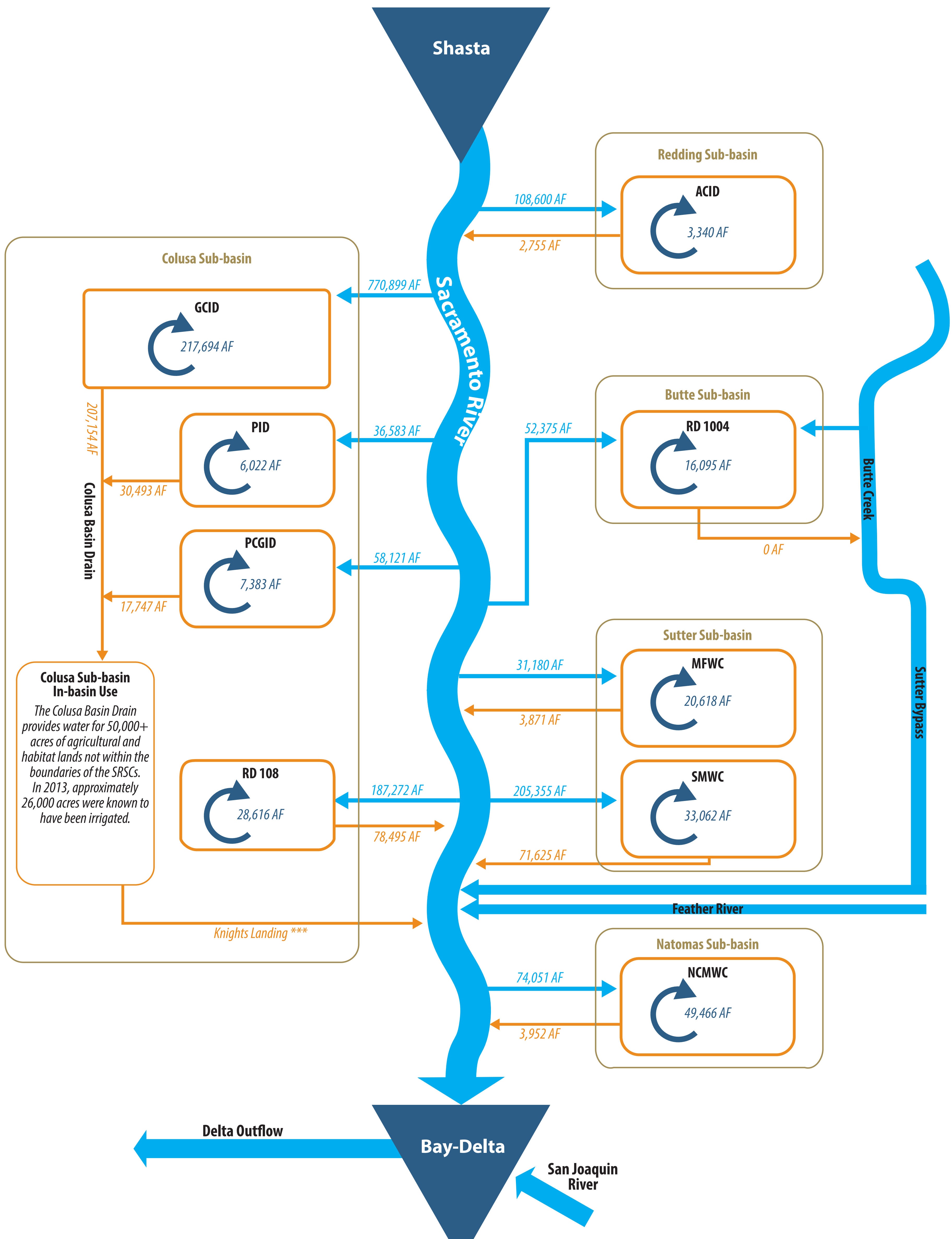
Total Cropped Acres for 2013** =	407,429 AC
Average Diversion for 2013 = (SRSC Diversion ÷ Total Cropped Acres)	3.74 AF/AC
Average Consumptive Use for 2013 = ((SRSC Diversion-SRSC Return Flow) ÷ Total Cropped Acres)	2.72 AF/AC

LEGEND

DIVERSIONS

RETURN FLOW

Total Recirculated for Reuse



Notes:

* Diversions and return flows are from 2013 SRSC water balance tables.

** Total cropped acres for 2013 includes 26,000 acres within the Colusa Sub-basin that rely on return flows from the SRSCs for surface water supplies.

***Flow data associated with the return flow at Knights Landing is not available after September 2012 as a result of modifications made to outfall gates and funding constraints.

AC = acre

AF = acre-feet

FIGURE 2
SCHEMATICS AND SUMMARY OF
2013 SRSC DIVERSIONS AND RETURN FLOWS

CH2MHILL.

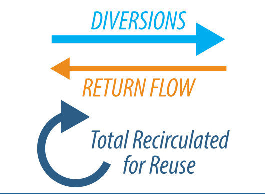
SUMMARY

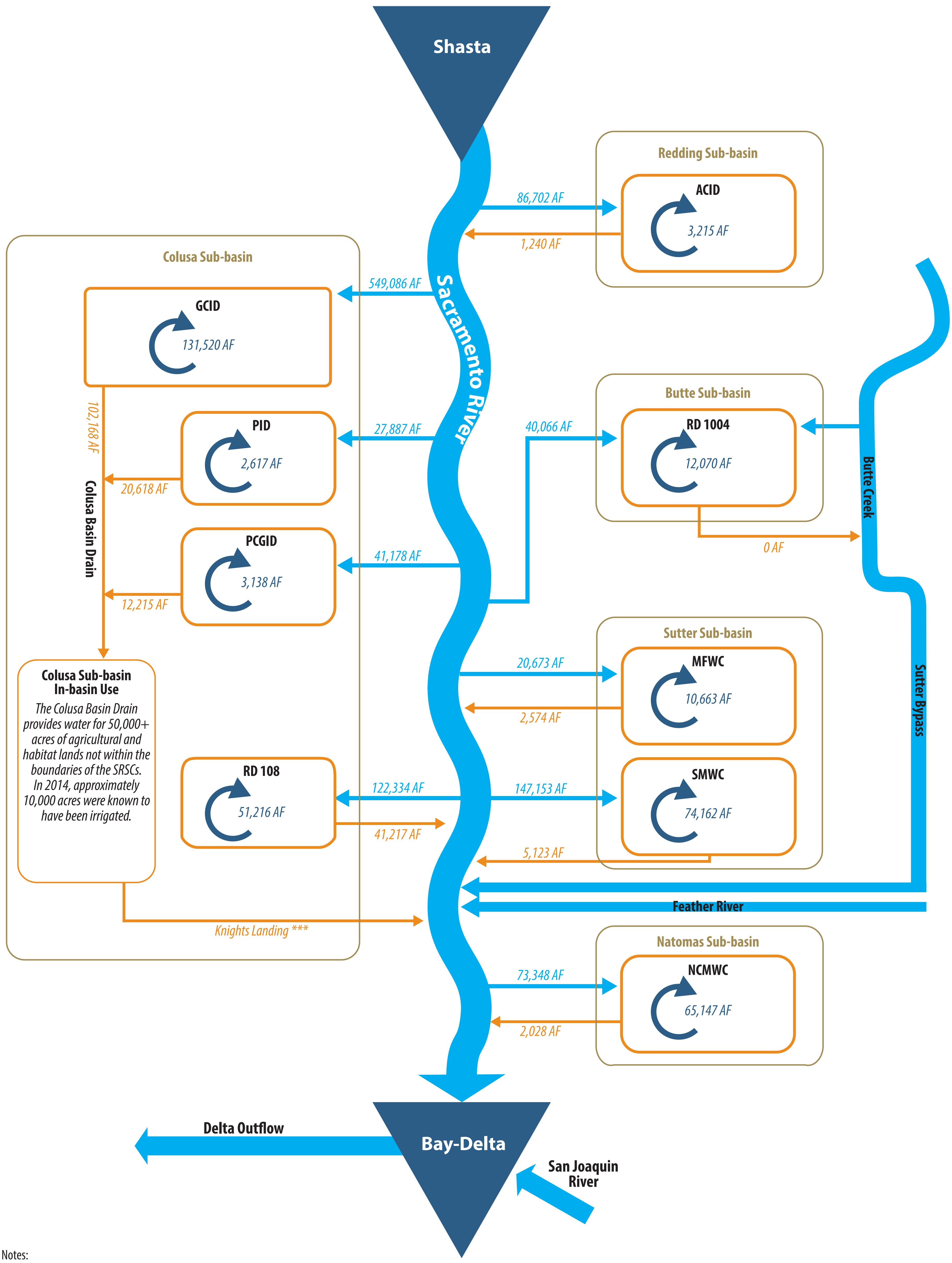
SRSC 2014 Diversions* =	1,108,427 AF
SRSC 2014 Return Flows (available for use downstream)* =	187,182 AF
Total 2014 Recirculation/Reuse by SRSCs =	353,748 AF

SUMMARY (Cont.)

Total Cropped Acres for 2014** =	306,781 AC
Average Diversion for 2014 = (SRSC Diversion ÷ Total Cropped Acres)	3.61 AF/AC
Average Consumptive Use for 2014 = ((SRSC Diversion-SRSC Return Flow) ÷ Total Cropped Acres)	3.00 AF/AC

LEGEND





Notes:
* Diversions and return flows are from 2014 SRSC water balance tables.
** Total cropped acres for 2014 includes 10,000 acres within the Colusa Sub-basin that rely on return flows from the SRSCs for surface water supplies.
***Flow data associated with the return flow at Knights Landing is not available after September 2012 as a result of modifications made to outfall gates and funding constraints.
AC = acre
AF = acre-feet

FIGURE 3
SCHEMATICS AND SUMMARY OF
2014 SRSC DIVERSIONS AND RETURN FLOWS

CH2MHILL.

SUMMARY

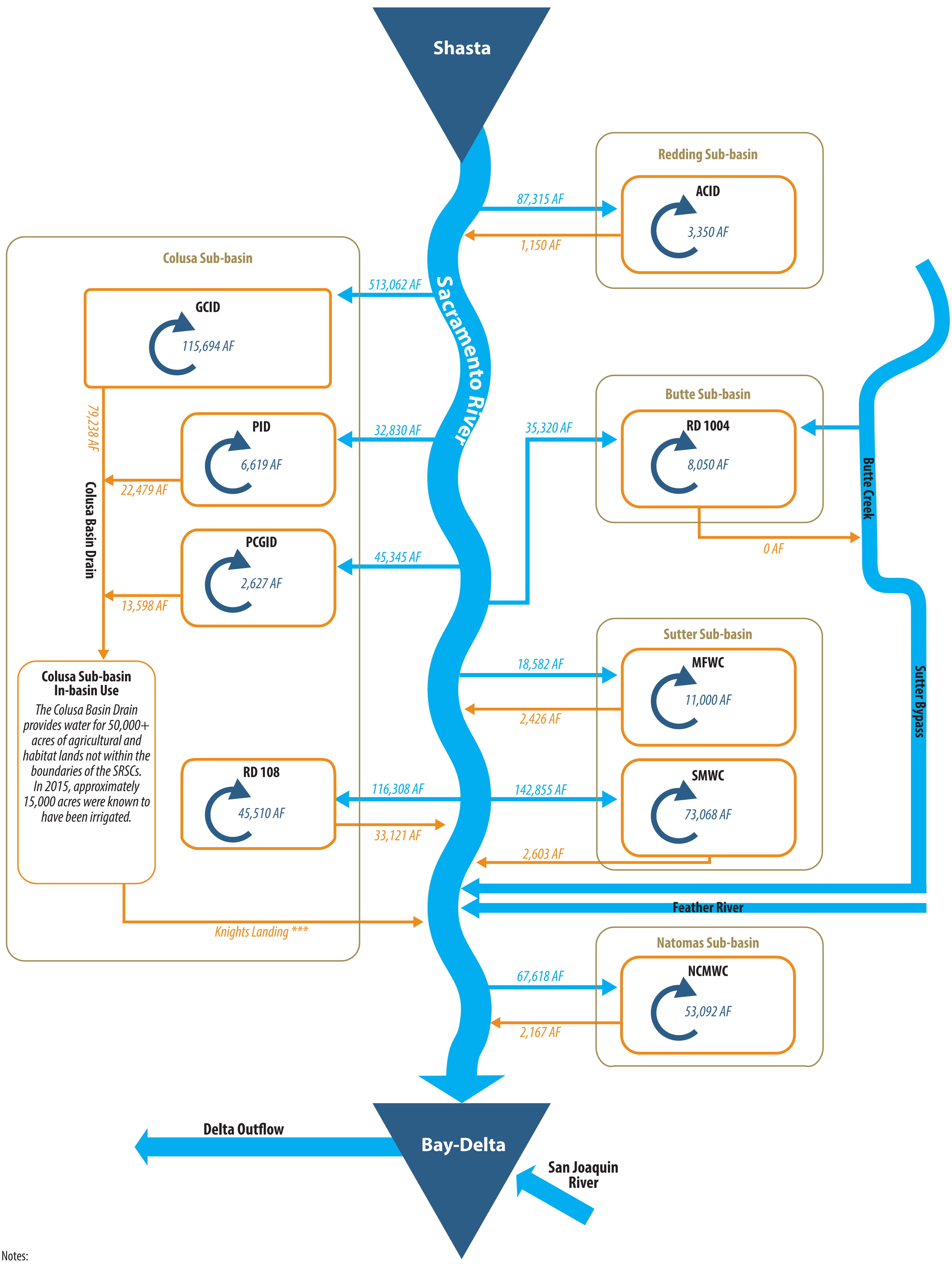
SRSC 2015 Diversions* =	1,059,235 AF
SRSC 2015 Return Flows (available for use downstream)* =	156,781 AF
Total 2015 Recirculation/Reuse by SRSCs =	319,010 AF

SUMMARY (Cont.)

Total Cropped Acres for 2015** =	325,279 AC
Average Diversion for 2015 = (SRSC Diversion ÷ Total Cropped Acres)	3.26 AF/AC
Average Consumptive Use for 2015 = ((SRSC Diversion-SRSC Return Flow) ÷ Total Cropped Acres)	2.77 AF/AC

LEGEND

DIVERSIONS
RETURN FLOW
Total Recirculated for Reuse



Notes:
* Diversions and return flows are from 2015 SRSC water balance tables.
** Total cropped acres for 2015 includes 15,000 acres within the Colusa Sub-basin that rely on return flows from the SRSCs for surface water supplies.
***Flow data associated with the return flow at Knights Landing is not available after September 2012 as a result of modifications made to outfall gates and funding constraints.
AC = acre
AF = acre-feet

FIGURE 4
SCHEMATICS AND SUMMARY OF 2015 SRSC DIVERSIONS AND RETURN FLOWS

CH2MHILL.

Appendix A
2013–2015 Sacramento River Settlement Contractor Water Balance Tables

Anderson-Cottonwood Irrigation District

District/Company **Anderson Cottonwood Irrigation District**

TABLE 1

Anderson Cottonwood Irrigation District – 2013 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	12,073	0	0	0	12,073
May	20,653	0	0	0	20,653
June	18,249	0	0	0	18,249
July	17,479	0	0	0	17,479
August	17,804	0	0	0	17,804
September	16,940	0	0	0	16,940
October	5,402	0	0	0	5,402
TOTAL	108,600	0	0	0	108,600

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Anderson Cottonwood Irrigation District – 2013 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Anderson Cottonwood Irrigation District – 2013 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	12,073	0	12,073
May	20,653	0	20,653
June	18,249	0	18,249
July	17,479	0	17,479
August	17,804	0	17,804
September	16,940	0	16,940
October	5,402	0	5,402
TOTAL	108,600	0	108,600

[a]In addition to the water supplies shown in Table 3, 3,340 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Anderson Cottonwood Irrigation District**

Anderson Cottonwood Irrigation District – 2013 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.01	3.0	0.25
Mar	0.8	0.06	4.2	0.35
Apr	0.3	0.03	6.9	0.58
May	0.7	0.06	8.4	0.70
Jun	0.5	0.04	9.4	0.78
Jul	0.0	0.00	10.0	0.84
Aug	0.0	0.00	8.1	0.68
Sept	0.5	0.04	6.2	0.52
Oct	0.0	0.00	4.7	0.39
Nov	1.0	0.08	2.9	0.24
Dec	0.2	0.02	2.4	0.20
TOTAL-YR	4.9	0.41	67.9	5.66
TOTAL-Apr-Oct	**2.0**	**0.17**	**53.8**	**4.48**

[a]Precipitation is precipitation reported for CIMIS Station at Gerber (#8).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the reference ET (ETo) reported for the Gerber CIMIS Station.

TABLE 4

Anderson Cottonwood Irrigation District – 2013 Distribution System Evaporation and Seepage (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	177,952	30	123	20	549	24,511	(25,040)
Laterals	871,324	10	200	33	896	11,202	(12,065)
TOTAL			323	54	1,445	35,713	(37,105)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **Anderson Cottonwood Irrigation District**

TABLE 5

Anderson Cottonwood Irrigation District – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

	Acres[a]	Crop Et[b]	Effective Precipitation[c]		ETAW	Leaching Requirement	
Crop Name	(crop acres)	(AF/Ac)	(AF/Ac)	(acre-feet)	(acre-feet)	(AF/Ac)	(acre-feet)
Alfalfa	215	3.26	0.01	2	700	0.11	24
Pasture	6,533	3.39	0.01	59	22,068	0.03	196
Walnuts	970	3.31	0.01	9	3,203	0.16	155
Crop Acres	7,718			69	25,971		375
Total Irrig. Acres	7,718	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Station at Gerber (#8) x Kc based on ITRC Dry Year ETc for Zone 14 surface irrigation for water balances. Water Needs do not include water required for cultural practices.

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season.

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 6

Anderson Cottonwood Irrigation District – 2013 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	108,600
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,286
Available Soil Moisture[c]	Estimated	329
	Total Water Supplies =	**110,215**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	35,713
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,392
Riparian ET[d] (Canals/Laterals)	Estimated	10,679
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,086
	Total Distribution System =	**48,870**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	25,971
Evapotranspiration of Precip - ET_{pr}	Table 5	69
Cultural Practices *(includes Leaching Requirement)*	Table 5	375
	Total Crop Water Needs =	**26,415**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Upslope Drainwater Flow Through[h]	Estimated	0
Remainder Drainwater Outflow[i]	District Records	2,755
	Total District Outflow *(from District Records)* **=**	**2,755**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**3,340**
	Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	32,175

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs. Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on crop acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for cultural practices.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 7

Anderson Cottonwood Irrigation District – 2013 Annual Water Quantities Delivered under Each Right or Contract (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2004	113,569	-	-	-	113,569	3,577	4,395
2005	102,018	-	-	-	102,018	3,214	3,948
2006	93,168	-	-	-	93,168	2,935	3,606
2007	111,903	-	-	-	111,903	3,525	4,331
2008	109,864	-	-	-	109,864	3,464	4,252
2009	106,922	-	-	-	106,922	3,368	4,138
2010	100,009	0	0	0	100,009	3,151	15,000
2011	89,814	0	0	0	89,814	3,150	15,000
2012	101,229	0	0	0	101,229	3,239	15,000
2013	108,600	0	0	0	108,600	3,340	2,755
Total	1,037,096	0	0	0	1,037,096	32,963	72,424
Average	103,710	0	0	0	103,710	3,296	7,242

[a]Federal Ag Water Supply from Reclamation Water Account Records. Data prior to 2011 are not available.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2011 are not available.

[c]Estimated by District based on observation and historical information. Data prior to 2011 are not available.

[d]Estimated by District based on observation and historical information.

District/Company **Anderson Cottonwood Irrigation District**

TABLE 1

Anderson Cottonwood Irrigation District – 2014 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	7,416	0	0	0	7,416
May	18,059	0	0	0	18,059
June	15,304	0	0	0	15,304
July	16,156	0	0	0	16,156
August	15,790	0	0	0	15,790
September	13,977	0	0	0	13,977
October	0	0	0	0	0
TOTAL	86,702	0	0	0	86,702

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Anderson Cottonwood Irrigation District – 2014 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Anderson Cottonwood Irrigation District – 2014 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	7,416	0	7,416
May	18,059	0	18,059
June	15,304	0	15,304
July	16,156	0	16,156
August	15,790	0	15,790
September	13,977	0	13,977
October	0	0	0
TOTAL	86,702	0	86,702

[a]In addition to the water supplies shown in Table 3, 3,215 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Anderson Cottonwood Irrigation District_**

Anderson Cottonwood Irrigation District – 2014 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.01	2.5	0.21
Feb	2.7	0.23	1.7	0.14
Mar	2.6	0.22	3.3	0.27
Apr	0.1	0.01	5.3	0.45
May	0.0	0.00	8.0	0.67
Jun	0.0	0.00	9.5	0.79
Jul	0.0	0.00	9.5	0.79
Aug	0.0	0.00	8.3	0.69
Sept	0.8	0.07	6.2	0.52
Oct	1.2	0.10	3.3	0.27
Nov	1.6	0.13	1.1	0.09
Dec	5.2	0.43	0.7	0.06
TOTAL-YR	14.5	1.21	59.3	4.94
TOTAL-Apr-Oct	**2.2**	**0.19**	**50.1**	**4.17**

[a]Precipitation is precipitation reported for CIMIS Station at Shasta College (#224).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the reference ET (ETo) reported for the Shasta College CIMIS Station.

TABLE 4

Anderson Cottonwood Irrigation District – 2014 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	177,952	30	123	23	512	24,511	(25,000)
Laterals	871,324	10	200	37	835	11,202	(11,999)
TOTAL			323	60	1,347	35,713	(37,000)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 5

Anderson Cottonwood Irrigation District – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop Etb (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	230	3.10	0.02	4	709	0.11	25
Pasture	6,646	3.24	0.02	110	21,401	0.03	199
Walnuts	1,570	3.21	0.02	26	5,014	0.16	251
Crop Acres	8,446			139	27,124		475
Total Irrig. Acres	8,446	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Station at Shasta College (#224) x Kc based on ITRC Dry Year ETc for Zone 14 surface irrigation for water balances. Water Needs do not include water required for cultural practices.

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season.

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 6

Anderson Cottonwood Irrigation District – 2014 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	86,702
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,570
Available Soil Moisture[c]	Estimated	1,502
	Total Water Supplies =	**89,774**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	35,713
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,287
Riparian ET[d] (Canals/Laterals)	Estimated	1,148
Conveyance System Filling[e] (Canals/Laterals)	Estimated	867
	Total Distribution System =	**39,015**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	27,124
Evapotranspiration of Precip - ET_{pr}	Table 5	139
Cultural Practices *(includes Leaching Requirement)*	Table 5	475
	Total Crop Water Needs =	**27,739**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Upslope Drainwater Flow Through[h]	Estimated	0
Remainder Drainwater Outflow[i]	District Records	1,240
	Total District Outflow *(from District Records)* **=**	**1,240**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**3,215**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**21,780**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs. Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on crop acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for cultural practices.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 7

Anderson Cottonwood Irrigation District – 2014 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2005	102,018	-	-	-	102,018	3,214	3,948
2006	93,168	-	-	-	93,168	2,935	3,606
2007	111,903	-	-	-	111,903	3,525	4,331
2008	109,864	-	-	-	109,864	3,464	4,252
2009	106,922	-	-	-	106,922	3,368	4,138
2010	100,009	0	0	0	100,009	3,151	15,000
2011	89,814	0	0	0	89,814	3,150	15,000
2012	101,229	0	0	0	101,229	3,239	15,000
2013	108,600	0	0	0	108,600	3,340	2,755
2014	86,702	0	0	0	86,702	3,215	1,240
Total	923,527	0	0	0	923,527	29,386	68,029
Average	102,614	0	0	0	102,614	3,265	7,559

[a]Federal Ag Water Supply from Reclamation Water Account Records. Data prior to 2011 are not available.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2011 are not available.

[c]Estimated by District based on observation and historical information. Data prior to 2011 are not available.

[d]Estimated by District based on observation and historical information.

District/Company **Anderson Cottonwood Irrigation District**

TABLE 1

Anderson Cottonwood Irrigation District – 2015 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	8,849	0	0	0	8,849
May	17,213	0	0	0	17,213
June	15,125	0	0	0	15,125
July	16,281	0	0	0	16,281
August	15,495	0	0	0	15,495
September	14,179	0	0	0	14,179
October	173	0	0	0	173
TOTAL	87,315	0	0	0	87,315

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Anderson Cottonwood Irrigation District – 2015 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Anderson Cottonwood Irrigation District – 2015 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	8,849	0	8,849
May	17,213	0	17,213
June	15,125	0	15,125
July	16,281	0	16,281
August	15,495	0	15,495
September	14,179	0	14,179
October	173	0	173
TOTAL	87,315	0	87,315

[a]In addition to the water supplies shown in Table 3, 3,350 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Anderson Cottonwood Irrigation District_**

Anderson Cottonwood Irrigation District – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.00	1.9	0.16
Feb	1.7	0.15	2.7	0.22
Mar	0.1	0.01	4.5	0.38
Apr	1.3	0.11	6.7	0.56
May	0.0	0.00	8.2	0.68
Jun	0.0	0.00	9.6	0.80
Jul	0.0	0.00	9.2	0.77
Aug	0.0	0.00	7.9	0.66
Sept	0.1	0.00	5.6	0.47
Oct	0.2	0.02	4.4	0.36
Nov	1.4	0.12	2.4	0.20
Dec	1.4	0.12	1.1	0.09
TOTAL-YR	6.3	0.53	64.1	5.34
TOTAL-Apr-Oct	**1.6**	**0.13**	**51.5**	**4.30**

[a]Precipitation is precipitation reported for CIMIS Station at Gerber South (#222).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the reference ET (ETo) reported for the Gerber South CIMIS Station.

TABLE 4

Anderson Cottonwood Irrigation District – 2015 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	177,952	30	123	16	526	24,511	(25,022)
Laterals	871,324	10	200	26	859	11,202	(12,035)
TOTAL			323	42	1,386	35,713	(37,056)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 5

Anderson Cottonwood Irrigation District – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

	Acres[a]	Crop Et[b]	Effective Precipitation[c]		ETAW	Leaching Requirement	
Crop Name	(crop acres)	(AF/Ac)	(AF/Ac)	(acre-feet)	(acre-feet)	(AF/Ac)	(acre-feet)
Alfalfa	230	3.14	0.04	9	713	0.11	25
Pasture	6,650	3.26	0.04	269	21,383	0.03	200
Walnuts	1,700	3.18	0.04	69	5,338	0.16	272
Crop Acres	8,580			347	27,434		497
Total Irrig. Acres	8,580	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Station at Gerber South (#222) x Kc based on ITRC Dry Year ETc for Zone 14 surface irrigation for water balances. Water Needs do not include water required for cultural practices.

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season.

District/Company **Anderson Cottonwood Irrigation District**

TABLE 6

Anderson Cottonwood Irrigation District – 2015 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	87,315
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,123
Available Soil Moisture[c]	Estimated	423
	Total Water Supplies =	**88,861**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	35,713
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,343
Riparian ET[d] (Canals/Laterals)	Estimated	1,361
Conveyance System Filling[e] (Canals/Laterals)	Estimated	873
	Total Distribution System =	**39,290**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	27,434
Evapotranspiration of Precip - ET_{pr}	Table 5	347
Cultural Practices *(includes Leaching Requirement)*	Table 5	497
	Total Crop Water Needs =	**28,278**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Upslope Drainwater Flow Through[h]	Estimated	0
Remainder Drainwater Outflow[i]	District Records	1,150
	Total District Outflow *(from District Records)* **=**	**1,150**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**3,350**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**20,143**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs. Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on crop acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for cultural practices.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Anderson Cottonwood Irrigation District**

TABLE 7

Anderson Cottonwood Irrigation District – 2015 Annual Water Quantities Delivered under Each Right or Contract (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2006	93,168	-	-	-	93,168	2,935	3,606
2007	111,903	-	-	-	111,903	3,525	4,331
2008	109,864	-	-	-	109,864	3,464	4,252
2009	106,922	-	-	-	106,922	3,368	4,138
2010	100,009	-	-	-	100,009	3,151	15,000
2011	89,814	0	0	0	89,814	3,150	15,000
2012	101,229	0	0	0	101,229	3,239	15,000
2013	108,600	0	0	0	108,600	3,340	2,755
2014	86,702	0	0	0	86,702	3,215	1,240
2015	87,315	0	0	0	87,315	3,350	1,150
Total	995,526	0	0	0	995,526	32,737	66,471
Average	99,553	0	0	0	99,553	3,274	6,647

[a]Federal Ag Water Supply from Reclamation Water Account Records. Data prior to 2011 are not available.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2011 are not available.

[c]Estimated by District based on observation and historical information. Data prior to 2011 are not available.

[d]Estimated by District based on observation and historical information.

Glenn-Colusa Irrigation District

District/Company **_Glenn-Colusa Irrigation District_**

TABLE 1

Glenn-Colusa Irrigation District – 2013 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	86,278	0	0	400	86,678
May	153,331	0	0	250	153,581
June	165,897	0	0	200	166,097
July	128,187	41,238	0	200	169,625
August	88,326	31,036	0	200	119,562
September	21,071	0	0	200	21,271
October	55,535	0	0	200	55,735
TOTAL	698,625	72,274	0	1,650	772,549

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Glenn-Colusa Irrigation District – 2013 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	1,367
May	0	1,542
June	0	1,719
July	1,775	1,826
August	1,799	2,153
September	1,426	933
October	0	594
TOTAL	5,000	10,134

[a]Estimated by District based on observation and historical information.

TABLE 3

Glenn-Colusa Irrigation District – 2013 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	86,678	0	86,678
May	153,581	0	153,581
June	166,097	0	166,097
July	169,625	1,775	171,400
August	119,562	1,799	121,361
September	21,271	1,426	22,697
October	55,735	0	55,735
TOTAL	772,549	5,000	777,549

[a]In addition to the water supplies shown in Table 3, 217,694 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Glenn-Colusa Irrigation District**

Glenn-Colusa Irrigation District – 2013 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.02	2.9	0.25
Mar	1.2	0.10	4.4	0.37
Apr	0.7	0.06	7.4	0.62
May	0.1	0.01	8.3	0.69
Jun	0.2	0.02	8.3	0.69
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	7.6	0.63
Sept	0.6	0.05	5.7	0.48
Oct	0.0	0.00	4.6	0.39
Nov	0.9	0.07	2.8	0.23
Dec	0.3	0.02	2.1	0.18
TOTAL-YR	5.1	0.42	64.8	5.40
TOTAL-Apr-Oct	**1.6**	**0.13**	**50.9**	**4.24**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Glenn-Colusa Irrigation District – 2013 Distribution System Evaporation and Seepage (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	341,200	70	548	72	2,324	10,966	(13,218)
Pipeline	26,400	2	0	0	0	0	0
Laterals	3,495,360	12	963	126	4,081	4,815	(8,770)
Watershed Drains	2,919,840	15	1,005	132	4,262	5,027	(9,157)
TOTAL			2,517	330	10,667	20,808	(31,145)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **Glenn-Colusa Irrigation District**

TABLE 5

Glenn-Colusa Irrigation District – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,523	3.23	0.01	20	4,900	0.11	168
Almonds	6,612	3.05	0.01	86	20,081	0.18	1,190
Beans	250	0.86	0.01	2	212	0.47	118
Corn	2,544	1.97	0.01	21	4,981	0.14	356
Cotton	228	2.41	0.01	3	548	0.02	5
Grapes	64	2.02	0.01	1	129	0.18	12
Habitat	582	2.59	0.01	8	1,503	0.03	17
Oats	486	0.86	0.01	4	412	0.02	10
Olives	215	2.91	0.01	3	623	0.09	19
Onions	259	0.95	0.01	2	244	0.28	73
Pasture	3,512	3.42	0.01	46	11,950	0.03	105
Prunes	255	3.02	0.01	3	768	0.18	46
Rice	106,720	3.06	0.01	1,387	325,539	0.06	6,403
Rice Straw Decomp	45,746	0.50	0.01	595	22,278	0.00	0
Sudan	604	3.42	0.01	8	2,055	0.07	42
Sunflowers	881	1.94	0.01	7	1,700	0.06	53
Tomatoes	1,844	1.69	0.01	15	3,102	0.08	148
Vegetables	410	0.99	0.01	5	401	0.18	74
Vineseed	703	0.99	0.01	9	687	0.18	127
Walnuts	4,051	3.25	0.01	53	13,102	0.16	648
Wheat	929	0.86	0.01	8	788	0.03	28
Crop Acres	178,418			2,285	416,002		9,642
Total Irrig. Acres	132,672	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 133,000 to 160,000 acre-feet in 2013).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Glenn-Colusa Irrigation District**

TABLE 6

Glenn-Colusa Irrigation District – 2013 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	777,549
Private Groundwater	Table 2	10,134
Inflow From Precip[b]	Estimated	17,395
Available Soil Moisture[c]	Estimated	1,629
	Total Water Supplies =	**806,707**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	20,808
Evaporation - Precipitation (Canals/Laterals)	Table 4	10,337
Riparian ET[d] (Canals/Laterals)	Estimated	6,450
Conveyance System Filling[e] (Canals/Laterals)	Estimated	8,000
	Total Distribution System =	**45,595**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	416,002
Evapotranspiration of Precip - ET_{pr}	Table 5	2,285
Cultural Practices *(includes Leaching Requirement)*	Table 5	9,642
	Total Crop Water Needs =	**427,928**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	35,556
Irrigation Season Rainfall Runoff[g]	Estimated	13,992
Rice Cultural and Ecosystem Requirement[h]	Estimated	106,720
Upslope Drainwater Flow Through[i]	Estimated	425
Remainder Drainwater Outflow[j]	Calculated	50,461
	Total District Outflow *(from District Records)* =	207,154
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**217,694**
	Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**126,030**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Glenn-Colusa Irrigation District_**

TABLE 7

Glenn-Colusa Irrigation District – 2013 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District Recapture (acre-feet)	District Outflow (acre-feet)
2004	665,314	59,491	0	22,500	747,305	179,137	227,987
2005	581,437	77,072	0	22,500	681,009	144,819	223,045
2006	538,589	77,144	0	22,500	638,233	159,934	220,871
2007	635,209	52,485	0	22,500	710,194	185,560	219,207
2008	691,219	55,423	0	22,500	769,142	204,255	183,373
2009	636,777	49,911	0	22,500	709,188	190,980	171,743
2010	572,352	91,017	0	22,500	685,869	194,677	229,665
2011	571,617	86,014	0	40,500	698,131	190,994	255,999
2012	605,963	90,277	0	40,500	736,740	206,542	197,899
2013	698,625	72,274	0	1,650	772,549	217,694	207,154
Total	6,197,102	711,108	0	240,150	7,148,360	1,874,592	2,136,943
Average	619,710	71,111	0	24,015	714,836	187,459	213,694

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.

District/Company **Glenn-Colusa Irrigation District**

TABLE 1

Glenn-Colusa Irrigation District – 2014 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	14,848	0	0	350	15,198
May	127,415	0	0	300	127,715
June	133,613	0	0	250	133,863
July	112,864	19,188	0	200	132,252
August	64,606	32,983	0	200	97,789
September	26,531	0	0	200	26,731
October	17,038	0	0	200	17,238
TOTAL	496,915	52,171	0	1,700	550,786

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Glenn-Colusa Irrigation District – 2014 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	**M-1**	**E-1**
April	0	1,117
May	459	1,675
June	0	2,234
July	0	2,234
August	0	1,675
September	0	1,117
October	0	1,117
TOTAL	459	11,169

[a]Estimated by District based on observation and historical information.

TABLE 3

Glenn-Colusa Irrigation District – 2014 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	15,198	0	15,198
May	127,715	459	128,174
June	133,863	0	133,863
July	132,252	0	132,252
August	97,789	0	97,789
September	26,731	0	26,731
October	17,238	0	17,238
TOTAL	550,786	459	551,245

[a]In addition to the water supplies shown in Table 3, 131,520 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Glenn-Colusa Irrigation District_**

Glenn-Colusa Irrigation District – 2014 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.02	2.4	0.20
Feb	3.7	0.31	2.0	0.17
Mar	1.6	0.14	4.1	0.34
Apr	1.2	0.10	5.9	0.49
May	0.1	0.01	8.4	0.70
Jun	0.0	0.00	9.1	0.76
Jul	0.0	0.00	8.9	0.74
Aug	0.1	0.01	7.3	0.61
Sept	0.4	0.03	5.8	0.48
Oct	0.3	0.03	4.1	0.34
Nov	1.2	0.10	1.8	0.15
Dec	7.3	0.60	1.1	0.09
TOTAL-YR	16.0	1.33	60.9	5.07
TOTAL-Apr-Oct	**2.1**	**0.17**	**49.5**	**4.13**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Glenn-Colusa Irrigation District – 2014 Distribution System Evaporation and Seepage (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	341,200	70	548	94	2,262	10,966	(13,134)
Pipeline	26,400	2	0	0	0	0	0
Laterals	3,495,360	12	963	165	3,972	4,815	(8,621)
Watershed Drains	2,919,840	15	1,005	173	4,148	5,027	(9,002)
TOTAL			2,517	432	10,381	20,808	(30,757)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Glenn-Colusa Irrigation District_**

TABLE 5

Glenn-Colusa Irrigation District – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,169	3.14	0.03	38	3,630	0.11	129
Almonds	5,394	2.98	0.03	175	15,917	0.18	971
Beans	354	0.75	0.03	12	253	0.47	166
Corn	918	1.96	0.03	30	1,770	0.14	129
Cotton	36	2.38	0.03	1	84	0.02	1
Grapes	22	2.01	0.03	1	44	0.18	4
Habitat	642	2.51	0.03	21	1,590	0.03	19
Misc. Deciduous	1	2.86	0.03	0	3	0.16	0
Olives	111	2.86	0.03	4	314	0.09	10
Onions	110	0.87	0.03	4	92	0.28	31
Pasture	3,108	3.33	0.03	101	10,262	0.03	93
Prunes	213	2.98	0.03	7	627	0.18	38
Rice	91,878	3.08	0.03	2,986	279,814	0.06	5,513
Rice Straw Decomp	1,200	0.50	0.03	39	561	0.00	0
Sudan	1,309	3.33	0.03	43	4,322	0.07	92
Sunflowers	1,347	1.90	0.03	44	2,517	0.06	81
Tomatoes	3,113	1.71	0.03	101	5,227	0.08	249
Vineseed	567	0.87	0.03	18	477	0.18	102
Walnuts	3,668	3.21	0.03	119	11,666	0.16	587
Wheat	344	0.75	0.03	11	246	0.03	10
Crop Acres	115,504			3,754	339,415		8,225
Total Irrig. Acres	114,304	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 115,000 to 140,000 acre-feet in 2014).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Glenn-Colusa Irrigation District**

TABLE 6

Glenn-Colusa Irrigation District – 2014 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	551,245
Private Groundwater	Table 2	11,169
Inflow From Precip[b]	Estimated	19,622
Available Soil Moisture[c]	Estimated	3,531
	Total Water Supplies =	**585,567**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	20,808
Evaporation - Precipitation (Canals/Laterals)	Table 4	9,949
Riparian ET[d] (Canals/Laterals)	Estimated	6,450
Conveyance System Filling[e] (Canals/Laterals)	Estimated	8,000
	Total Distribution System =	**45,207**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	339,415
Evapotranspiration of Precip - ET_{pr}	Table 5	3,754
Cultural Practices *(includes Leaching Requirement)*	Table 5	8,225
	Total Crop Water Needs =	**351,394**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	9,402
Irrigation Season Rainfall Runoff[g]	Estimated	15,772
Rice Cultural and Ecosystem Requirement[h]	Estimated	45,000
Upslope Drainwater Flow Through[i]	Estimated	450
Remainder Drainwater Outflow[j]	Calculated	31,544
	Total District Outflow *(from District Records)* =	102,168
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**131,520**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**86,798**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Glenn-Colusa Irrigation District_**

TABLE 7

Glenn-Colusa Irrigation District – 2014 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow (acre-feet)
2005	581,437	77,072	0	22,500	681,009	144,819	223,045
2006	538,589	77,144	0	22,500	638,233	159,934	220,871
2007	635,209	52,485	0	22,500	710,194	185,560	219,207
2008	691,219	55,423	0	22,500	769,142	204,255	183,373
2009	636,777	49,911	0	22,500	709,188	190,980	171,743
2010	572,352	91,017	0	22,500	685,869	194,677	229,665
2011	571,617	86,014	0	40,500	698,131	190,994	255,999
2012	605,963	90,277	0	40,500	736,740	206,542	197,899
2013	698,625	72,274	0	1,650	772,549	217,694	207,154
2014	496,915	52,171	0	1,700	550,786	131,520	102,168
Total	5,531,788	651,617	0	217,650	6,401,055	1,695,455	1,908,956
Average	614,643	72,402	0	24,183	711,228	188,384	212,106

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.

District/Company **Glenn-Colusa Irrigation District**

TABLE 1

Glenn-Colusa Irrigation District – 2015 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	37,770	0	0	300	38,070
May	113,870	0	0	150	114,020
June	109,766	0	0	200	109,966
July	88,171	29,974	0	180	118,325
August	53,030	30,407	0	180	83,617
September	19,498	0	0	150	19,648
October[d]	30,576	0	0	200	30,776
TOTAL	452,681	60,381	0	1,360	514,422

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.
[d]Quantities include water diverted under the extension of the contract season during November - December 10.

TABLE 2

Glenn-Colusa Irrigation District – 2015 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	2,784
May	0	8,394
June	929	12,366
July	795	8,761
August	0	5,184
September	0	2,564
October	0	1,784
TOTAL	1,724	41,837

[a]Estimated by District based on observation and historical information.

TABLE 3

Glenn-Colusa Irrigation District – 2015 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	38,070	0	38,070
May	114,020	0	114,020
June	109,966	929	110,895
July	118,325	795	119,120
August	83,617	0	83,617
September	19,648	0	19,648
October	30,776	0	30,776
TOTAL	514,422	1,724	516,146

[a]In addition to the water supplies shown in Table 3, 115,694 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Glenn-Colusa Irrigation District_**

Glenn-Colusa Irrigation District – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.01	1.3	0.11
Feb	2.1	0.18	2.3	0.19
Mar	0.2	0.02	4.6	0.38
Apr	1.1	0.09	6.6	0.55
May	0.0	0.00	7.5	0.62
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	8.8	0.73
Aug	0.0	0.00	7.8	0.65
Sept	0.0	0.00	5.7	0.48
Oct	0.1	0.01	4.3	0.36
Nov	1.7	0.14	2.2	0.19
Dec	1.3	0.11	1.3	0.11
TOTAL-YR	6.7	0.56	61.0	5.08
TOTAL-Apr-Oct	**1.3**	**0.10**	**49.3**	**4.10**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Glenn-Colusa Irrigation District – 2015 Distribution System Evaporation and Seepage (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	341,200	70	548	57	2,251	10,966	(13,160)
Pipeline	26,400	2	0	0	0	0	0
Laterals	3,495,360	12	963	100	3,953	4,815	(8,667)
Watershed Drains	2,919,840	15	1,005	105	4,127	5,027	(9,050)
TOTAL			2,517	262	10,330	20,808	(30,876)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **Glenn-Colusa Irrigation District**

TABLE 5

Glenn-Colusa Irrigation District – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,325	3.13	0.03	40	4,103	0.11	146
Almonds	7,925	2.96	0.03	238	23,227	0.18	1,427
Beans	540	0.77	0.03	16	398	0.47	254
Corn	1,320	1.94	0.03	40	2,523	0.14	185
Cotton	36	2.39	0.03	1	85	0.02	1
Grapes	21	1.99	0.03	1	41	0.18	4
Habitat	1,270	2.51	0.03	38	3,144	0.03	38
Misc. Deciduous	12	2.83	0.03	0	34	0.16	2
Olives	133	2.83	0.03	4	373	0.09	12
Onions	100	0.86	0.03	3	83	0.28	28
Pasture	2,720	3.31	0.03	82	8,929	0.03	82
Prunes	228	2.95	0.03	7	665	0.18	41
Rice	80,759	3.01	0.03	2,423	241,058	0.06	4,846
Rice Straw Decomp	20,837	0.50	0.03	625	9,793	0.00	0
Sudan	404	3.31	0.03	12	1,326	0.07	28
Sunflowers	927	1.84	0.03	28	1,677	0.06	56
Tomatoes	1,767	1.65	0.03	53	2,868	0.08	141
Vegetables	162	0.91	0.03	5	143	0.18	29
Vineseed	1,128	0.91	0.03	34	997	0.18	203
Walnuts	5,105	3.18	0.03	153	16,083	0.16	817
Wheat	325	0.77	0.03	10	240	0.03	10
Crop Acres	127,044			3,811	317,791		8,350
Total Irrig. Acres	106,207	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 100,900 to 121,200 acre-feet in 2015).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Glenn-Colusa Irrigation District_**

TABLE 6

Glenn-Colusa Irrigation District – 2015 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	516,146
Private Groundwater	Table 2	41,837
Inflow From Precip[b]	Estimated	11,063
Available Soil Moisture[c]	Estimated	1,505
	Total Water Supplies =	**570,551**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	20,808
Evaporation - Precipitation (Canals/Laterals)	Table 4	10,068
Riparian ET[d] (Canals/Laterals)	Estimated	6,450
Conveyance System Filling[e] (Canals/Laterals)	Estimated	8,000
	Total Distribution System =	**45,326**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	317,791
Evapotranspiration of Precip - ET_{pr}	Table 5	3,811
Cultural Practices *(includes Leaching Requirement)*	Table 5	8,350
	Total Crop Water Needs =	**329,952**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	16,855
Irrigation Season Rainfall Runoff[g]	Estimated	8,412
Rice Cultural and Ecosystem Requirement[h]	Estimated	50,000
Upslope Drainwater Flow Through[i]	Estimated	325
Remainder Drainwater Outflow[j]	Calculated	3,646
	Total District Outflow *(from District Records)* =	79,238
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**115,694**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**116,035**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Glenn-Colusa Irrigation District**

TABLE 7

Glenn-Colusa Irrigation District – 2015 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow (acre-feet)
2006	538,589	77,144	0	22,500	638,233	159,934	220,871
2007	635,209	52,485	0	22,500	710,194	185,560	219,207
2008	691,219	55,423	0	22,500	769,142	204,255	183,373
2009	636,777	49,911	0	22,500	709,188	190,980	171,743
2010	572,352	91,017	0	22,500	685,869	194,677	229,665
2011	571,617	86,014	0	40,500	698,131	190,994	255,999
2012	605,963	90,277	0	40,500	736,740	206,542	197,899
2013	698,625	72,274	0	1,650	772,549	217,694	207,154
2014	496,915	52,171	0	1,700	550,786	131,520	102,168
2015	452,681	60,381	0	1,360	514,422	115,694	79,238
Total	5,899,947	687,097	0	198,210	6,785,254	1,797,850	1,867,317
Average	589,995	68,710	0	19,821	678,525	179,785	186,732

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.

Provident Irrigation District

District/Company **Provident Irrigation District**

TABLE 1

Provident Irrigation District – 2013 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	7,137	0	1,177	2,945	11,259
May	8,144	0	2,773	7,281	18,198
June	10,036	0	5,517	10,441	25,994
July	6,300	2,008	5,828	12,086	26,222
August	2,500	421	3,669	10,498	17,088
September	37	0	1,381	2,108	3,526
October	0	0	1,850	1,924	3,774
TOTAL	34,154	2,429	22,195	47,283	106,061

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Provident Irrigation District – 2013 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	535	0
May	245	43
June	29	0
July	47	0
August	0	0
September	0	0
October	0	0
TOTAL	856	43

[a]Estimated by District based on observation and historical information.

TABLE 3

Provident Irrigation District – 2013 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	11,259	535	11,794
May	18,198	245	18,443
June	25,994	29	26,023
July	26,222	47	26,269
August	17,088	0	17,088
September	3,526	0	3,526
October	3,774	0	3,774
TOTAL	106,061	856	106,917

[a]In addition to the water supplies shown in Table 3, 6,022 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Provident Irrigation District_**

Provident Irrigation District – 2013 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.02	2.9	0.25
Mar	1.2	0.10	4.4	0.37
Apr	0.7	0.06	7.4	0.62
May	0.1	0.01	8.3	0.69
Jun	0.2	0.02	8.3	0.69
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	7.6	0.63
Sept	0.6	0.05	5.7	0.48
Oct	0.0	0.00	4.6	0.39
Nov	0.9	0.07	2.8	0.23
Dec	0.3	0.02	2.1	0.18
TOTAL-YR	5.1	0.42	64.8	5.40
TOTAL-Apr-Oct	**1.6**	**0.13**	**50.9**	**4.24**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Provident Irrigation District – 2013 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	65,472	35	53	7	223	1,315	(1,531)
Laterals	206,448	12	57	7	241	569	(802)
Water Shed Drains	175,276	15	60	8	256	302	(550)
TOTAL			170	22	720	2,186	(2,883)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Provident Irrigation District_**

TABLE 5

Provident Irrigation District – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Rice	15,118	3.06	0.01	197	46,115	0.06	907
Rice Straw Decomp	10,293	0.50	0.01	134	5,013	0.00	0
Crop Acres	25,411			330	51,128		907

Total Irrig. Acres 15,118 (If this number is larger than your known total, it may be due to double cropping.)

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 19,000 to 22,750 acre-feet in 2013).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Provident Irrigation District_**

TABLE 6

Provident Irrigation District – 2013 District Water Balance
(April through October Period Only)
2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	106,917
Private Groundwater	Table 2	43
Inflow From Precip[b]	Estimated	1,982
Available Soil Moisture[c]	Estimated	0
	Total Water Supplies =	**108,942**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	2,186
Evaporation - Precipitation (Canals/Laterals)	Table 4	698
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,061
	Total Distribution System =	**4,044**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	51,128
Evapotranspiration of Precip - ET_{pr}	Table 5	330
Cultural Practices *(includes Leaching Requirement)*	Table 5	907
	Total Crop Water Needs =	**52,365**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	1,982
Rice Cultural and Ecosystem Requirement[h]	Estimated	15,118
Upslope Drainwater Flow Through	Estimated	10,334
Remainder Drainwater Outflow[i]	Calculated	3,060
	Total District Outflow *(from District Records)* **=**	**30,493**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**6,022**
	Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**22,040**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Provident Irrigation District**

TABLE 7

Provident Irrigation District – 2013 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b,c] (acre-feet)	Upslope Drainwater[c,d] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[d] (acre-feet)
2004	45,948	0	12,931	-	58,879	-	-
2005	35,050	4,500	7,028	-	46,578	-	-
2006	33,282	4,500	5,597	-	43,379	-	-
2007	39,263	3,385	8,779	-	51,427	-	-
2008	47,280	1,747	0	-	49,027	-	-
2009	35,471	4,500	11,883	-	51,854	-	-
2010	31,879	4,500	6,727	70,534	113,640	10,233	49,935
2011	26,671	3,346	6,619	73,953	110,589	9,983	53,382
2012	31,466	3,278	27,068	23,651	85,463	9,210	25,268
2013	34,154	2,429	22,195	47,283	106,061	6,022	30,493
Total	360,464	32,185	108,827	215,421	716,897	35,448	159,077
Average	36,046	3,219	10,883	53,855	71,690	8,862	39,769

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.

[d]Data prior to 2010 are not available.

District/Company **_Provident Irrigation District_**

TABLE 1

Provident Irrigation District – 2014 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	350	40	0	56	446
May	6,300	0	2,798	5,352	14,450
June	5,202	0	0	7,026	12,228
July	6,176	0	0	8,740	14,916
August	2,077	0	0	8,389	10,466
September	0	0	0	0	0
October	7,742	0	0	775	8,517
TOTAL	27,847	40	2,798	30,338	61,023

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Provident Irrigation District – 2014 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	931	0
June	157	0
July	56	0
August	20	0
September	0	0
October	1,128	0
TOTAL	2,292	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Provident Irrigation District – 2014 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	446	0	446
May	14,450	931	15,381
June	12,228	157	12,385
July	14,916	56	14,972
August	10,466	20	10,486
September	0	0	0
October	8,517	1,128	9,645
TOTAL	61,023	2,292	63,315

[a]In addition to the water supplies shown in Table 3, 2,617 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Provident Irrigation District**

Provident Irrigation District – 2014 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.02	2.4	0.20
Feb	3.7	0.31	2.0	0.17
Mar	1.6	0.14	4.1	0.34
Apr	1.2	0.10	5.9	0.49
May	0.1	0.01	8.4	0.70
Jun	0.0	0.00	9.1	0.76
Jul	0.0	0.00	8.9	0.74
Aug	0.1	0.01	7.3	0.61
Sept	0.4	0.03	5.8	0.48
Oct	0.3	0.03	4.1	0.34
Nov	1.2	0.10	1.8	0.15
Dec	7.3	0.60	1.1	0.09
TOTAL-YR	16	1.33	60.9	5.07
TOTAL-Apr-Oct	**2.1**	**0.17**	**49.5**	**4.13**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).
[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Provident Irrigation District – 2014 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	65,472	35	53	9	217	1,315	(1,523)
Laterals	206,448	12	57	10	235	569	(794)
Water Shed Drains	175,276	15	60	10	249	302	(540)
TOTAL			170	29	701	2,186	(2,857)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Provident Irrigation District_**

TABLE 5

Provident Irrigation District – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Rice	9,407	3.08	0.03	306	28,649	0.06	564
Rice Straw Decomp	7,775	0.50	0.03	253	3,635	0.00	0
Crop Acres	17,182			558	32,284		564
Total Irrig. Acres	9,407	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 11,750 to 14,150 acre-feet in 2014).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Provident Irrigation District**

TABLE 6

Provident Irrigation District – 2014 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	63,315
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,615
Available Soil Moisture[c]	Estimated	0
	Total Water Supplies =	**64,930**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	2,186
Evaporation - Precipitation (Canals/Laterals)	Table 4	671
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	610
	Total Distribution System =	**3,567**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	32,284
Evapotranspiration of Precip - ET_{pr}	Table 5	558
Cultural Practices *(includes Leaching Requirement)*	Table 5	564
	Total Crop Water Needs =	**33,406**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	1,615
Rice Cultural and Ecosystem Requirement[h]	Estimated	9,407
Upslope Drainwater Flow Through	Estimated	6,217
Remainder Drainwater Outflow[i]	Calculated	3,379
	Total District Outflow *(from District Records)* **=**	**20,618**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**2,617**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**7,339**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Provident Irrigation District_**

TABLE 7

Provident Irrigation District – 2014 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b,c] (acre-feet)	Upslope Drainwater[c,d] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[d] (acre-feet)
2005	35,050	4,500	7,028	-	46,578	-	-
2006	33,282	4,500	5,597	-	43,379	-	-
2007	39,263	3,385	8,779	-	51,427	-	-
2008	47,280	1,747	0	-	49,027	-	-
2009	35,471	4,500	11,883	-	51,854	-	-
2010	31,879	4,500	6,727	70,534	113,640	10,233	49,935
2011	26,671	3,346	6,619	73,953	110,589	9,983	53,382
2012	31,466	3,278	27,068	23,651	85,463	9,210	25,268
2013	34,154	2,429	22,195	47,283	106,061	6,022	30,493
2014	27,847	40	2,798	30,338	61,023	2,617	20,618
Total	314,516	32,185	95,896	215,421	658,018	35,448	159,077
Average	34,946	3,576	10,655	53,855	73,113	8,862	39,769

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.
[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.
[d]Data prior to 2010 are not available.

District/Company **_Provident Irrigation District_**

TABLE 1

Provident Irrigation District – 2015 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	2,331	0	273	527	3,131
May	6,734	0	0	5,338	12,072
June	6,720	0	0	6,103	12,823
July	6,001	0	0	8,427	14,428
August	2,332	0	0	7,209	9,541
September	0	0	0	1,267	1,267
October[d]	8,712	0	0	623	9,335
TOTAL	32,830	0	273	29,494	62,597

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.
[d]Quantities include water diverted under the extension of the contract season during November - December 10.

TABLE 2

Provident Irrigation District – 2015 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	436	0
May	682	0
June	832	0
July	197	0
August	0	0
September	0	0
October	1,146	0
TOTAL	3,293	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Provident Irrigation District – 2015 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	3,131	436	3,567
May	12,072	682	12,754
June	12,823	832	13,655
July	14,428	197	14,625
August	9,541	0	9,541
September	1,267	0	1,267
October	9,335	1,146	10,481
TOTAL	62,597	3,293	65,890

[a]In addition to the water supplies shown in Table 3, 6,619 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Provident Irrigation District_**

Provident Irrigation District – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.01	1.3	0.11
Feb	2.1	0.18	2.3	0.19
Mar	0.2	0.02	4.6	0.38
Apr	1.1	0.09	6.6	0.55
May	0.0	0.00	7.5	0.62
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	8.8	0.73
Aug	0.0	0.00	7.8	0.65
Sept	0.0	0.00	5.7	0.48
Oct	0.1	0.01	4.3	0.36
Nov	1.7	0.14	2.2	0.19
Dec	1.3	0.11	1.3	0.11
TOTAL-YR	6.7	0.56	61.0	5.08
TOTAL-Apr-Oct	**1.3**	**0.10**	**49.3**	**4.10**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Provident Irrigation District – 2015 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	65,472	35	53	5	216	1,315	(1,526)
Laterals	206,448	12	57	6	233	569	(796)
Water Shed Drains	175,276	15	60	6	248	302	(543)
TOTAL			170	18	697	2,186	(2,865)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Provident Irrigation District_**

TABLE 5

Provident Irrigation District – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Rice	10,371	3.01	0.03	311	30,958	0.06	622
Rice Straw Decomp	8,362	0.50	0.03	251	3,930	0.00	0
Crop Acres	18,733			562	34,888		622
Total Irrig. Acres	15,095	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 13,000 to 15,750 acre-feet in 2015).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Provident Irrigation District**

TABLE 6

Provident Irrigation District – 2015 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	65,890
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,080
Available Soil Moisture[c]	Estimated	0
	Total Water Supplies =	**66,970**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	2,186
Evaporation - Precipitation (Canals/Laterals)	Table 4	679
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	626
	Total Distribution System =	**3,591**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	34,888
Evapotranspiration of Precip - ET_{pr}	Table 5	562
Cultural Practices *(includes Leaching Requirement)*	Table 5	622
	Total Crop Water Needs =	**36,072**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	1,080
Rice Cultural and Ecosystem Requirement[h]	Estimated	10,371
Upslope Drainwater Flow Through	Estimated	5,984
Remainder Drainwater Outflow[i]	Calculated	5,044
	Total District Outflow *(from District Records)* **=**	**22,479**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**6,619**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**4,828**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Provident Irrigation District**

TABLE 7

Provident Irrigation District – 2015 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b,c] (acre-feet)	Upslope Drainwater[c,d] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[d] (acre-feet)
2006	33,282	4,500	5,597	-	43,379	-	-
2007	39,263	3,385	8,779	-	51,427	-	-
2008	47,280	1,747	0	-	49,027	-	-
2009	35,471	4,500	11,883	-	51,854	-	-
2010	31,879	4,500	6,727	70,534	113,640	10,233	49,935
2011	26,671	3,346	6,619	73,953	110,589	9,983	53,382
2012	31,466	3,278	27,068	23,651	85,463	9,210	25,268
2013	34,154	2,429	22,195	47,283	106,061	6,022	30,493
2014	27,847	40	2,798	30,338	61,023	2,617	20,618
2015	32,830	0	273	29,494	62,597	6,619	22,479
Total	340,143	27,725	91,939	275,253	735,060	44,684	202,175
Average	34,014	2,773	9,194	45,876	73,506	7,447	33,696

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.
[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.
[d]Data prior to 2010 are not available.

Princeton-Codora-Glenn Irrigation District

District/Company **Princeton-Codora-Glenn Irrigation District**

TABLE 1

Princeton-Codora-Glenn Irrigation District – 2013 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	8,136	0	408	408	8,952
May	11,644	0	2,664	2,664	16,972
June	11,556	164	4,401	4,401	20,522
July	6,740	4,124	0	5,375	16,239
August	2,780	5,943	0	3,980	12,703
September	1,229	0	3,980	0	5,209
October	5,805	0	0	0	5,805
TOTAL	47,890	10,231	11,453	16,828	86,402

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Princeton-Codora-Glenn Irrigation District – 2013 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	295	0
June	556	0
July	1,323	0
August	422	0
September	0	0
October	0	0
TOTAL	2,596	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Princeton-Codora-Glenn Irrigation District – 2013 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	8,952	0	8,952
May	16,972	295	17,267
June	20,522	556	21,078
July	16,239	1,323	17,562
August	12,703	422	13,125
September	5,209	0	5,209
October	5,805	0	5,805
TOTAL	86,402	2,596	88,998

[a]In addition to the water supplies shown in Table 3, 7,383 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

Princeton-Codora-Glenn Irrigation District – 2013 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.02	2.9	0.25
Mar	1.2	0.10	4.4	0.37
Apr	0.7	0.06	7.4	0.62
May	0.1	0.01	8.3	0.69
Jun	0.2	0.02	8.3	0.69
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	7.6	0.63
Sept	0.6	0.05	5.7	0.48
Oct	0.0	0.00	4.6	0.39
Nov	0.9	0.07	2.8	0.23
Dec	0.3	0.02	2.1	0.18
TOTAL-YR	5.1	0.42	64.8	5.40
TOTAL-Apr-Oct	**1.6**	**0.13**	**50.9**	**4.24**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Princeton-Codora-Glenn Irrigation District – 2013 Distribution System Evaporation and Seepage (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	68,640	30	47	6	200	11,818	(12,012)
Laterals	219,384	15	76	10	320	5,666	(5,976)
Water Shed Drains	113,520	15	39	5	166	1,955	(2,115)
TOTAL			162	21	686	19,439	(20,104)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Princeton-Codora-Glenn Irrigation District – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	20	3.23	0.01	0	64	0.11	2
Almonds	80	3.05	0.01	1	243	0.18	14
Beans	46	0.86	0.01	0	39	0.47	22
Corn	147	1.97	0.01	1	288	0.14	21
Onions	4	0.95	0.01	0	4	0.28	1
Pasture	26	3.42	0.01	0	88	0.03	1
Rice	7,812	3.06	0.01	102	23,830	0.06	469
Rice Straw Decomp	2,427	0.50	0.01	32	1,182	0.00	0
Safflowers	36	1.94	0.01	0	69	0.06	2
Sunflowers	70	1.94	0.01	1	135	0.06	4
Walnuts	1,119	3.25	0.01	15	3,619	0.16	179
Watermelon	1	1.12	0.00	0	1	0.04	0
Wheat	43	0.86	0.01	0	36	0.03	1
Crop Acres	11,831			152	29,599		716
Total Irrig. Acres	9,404	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 9,750 to 11,750 acre-feet in 2013).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Princeton-Codora-Glenn Irrigation District**

TABLE 6

Princeton-Codora-Glenn Irrigation District – 2013 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	88,998
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,233
Available Soil Moisture[c]	Estimated	102
	Total Water Supplies =	**90,333**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	19,439
Evaporation - Precipitation (Canals/Laterals)	Table 4	665
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	864
	Total Distribution System =	**21,068**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	29,599
Evapotranspiration of Precip - ET_{pr}	Table 5	152
Cultural Practices *(includes Leaching Requirement)*	Table 5	716
	Total Crop Water Needs =	**30,467**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	1,024
Rice Cultural and Ecosystem Requirement[h]	Estimated	7,812
Upslope Drainwater Flow Through	Estimated	8,414
Remainder Drainwater Outflow[i]	Calculated	496
	Total District Outflow *(from District Records)* **=**	**17,747**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**7,383**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**21,052**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 7

Princeton-Codora-Glenn Irrigation District – 2013 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[c] (acre-feet)
2004	50,181	10,991	0	-	61,172	9,156	-
2005	44,961	15,659	0	-	60,620	7,088	-
2006	40,671	14,600	0	-	55,271	4,860	-
2007	50,875	14,800	0	-	65,675	5,276	-
2008	52,810	16,398	0	-	69,208	5,682	-
2009	50,800	13,847	0	-	64,647	6,078	-
2010	44,869	14,428	0	23,736	83,033	5,531	27,428
2011	38,257	12,485	0	26,189	76,931	7,664	26,460
2012	43,303	12,950	17,908	12,856	87,017	8,702	26,388
2013	47,890	10,231	11,453	16,828	86,402	7,383	17,747
Total	464,617	136,389	29,361	79,609	709,976	67,420	98,022
Average	46,462	13,639	2,936	19,902	70,998	6,742	24,506

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

[d] Estimated by District based on observation and historical information.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 1

Princeton-Codora-Glenn Irrigation District – 2014 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	352	0	0	0	352
May	10,507	0	1,084	1,804	13,395
June	7,807	0	0	1,917	9,724
July	9,939	0	0	2,398	12,337
August	5,856	2,789	0	3,147	11,792
September	1,503	0	0	294	1,797
October	2,425	0	0	0	2,425
TOTAL	38,389	2,789	1,084	9,560	51,822

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Princeton-Codora-Glenn Irrigation District – 2014 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	569	0
May	1,470	0
June	1,488	0
July	544	0
August	279	0
September	0	0
October	688	0
TOTAL	5,038	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Princeton-Codora-Glenn Irrigation District – 2014 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	352	569	921
May	13,395	1,470	14,865
June	9,724	1,488	11,212
July	12,337	544	12,881
August	11,792	279	12,071
September	1,797	0	1,797
October	2,425	688	3,113
TOTAL	51,822	5,038	56,860

[a]In addition to the water supplies shown in Table 3, 3,138 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

Princeton-Codora-Glenn Irrigation District – 2014 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.02	2.4	0.20
Feb	3.7	0.31	2.0	0.17
Mar	1.6	0.14	4.1	0.34
Apr	1.2	0.10	5.9	0.49
May	0.1	0.01	8.4	0.70
Jun	0.0	0.00	9.1	0.76
Jul	0.0	0.00	8.9	0.74
Aug	0.1	0.01	7.3	0.61
Sept	0.4	0.03	5.8	0.48
Oct	0.3	0.03	4.1	0.34
Nov	1.2	0.10	1.8	0.15
Dec	7.3	0.60	1.1	0.09
TOTAL-YR	16	1.33	60.9	5.07
TOTAL-Apr-Oct	**2.1**	**0.17**	**49.5**	**4.13**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Princeton-Codora-Glenn Irrigation District – 2014 Distribution System Evaporation and Seepage (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	68,640	30	47	8	195	11,818	(12,005)
Laterals	219,384	15	76	13	312	5,666	(5,965)
Water Shed Drains	113,520	15	39	7	161	1,955	(2,109)
TOTAL			162	28	668	19,439	(20,079)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 5

Princeton-Codora-Glenn Irrigation District – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	20	3.14	0.03	1	62	0.11	2
Almonds	80	2.98	0.03	3	236	0.18	14
Corn	18	1.96	0.03	1	35	0.14	3
Pasture	18	3.33	0.03	1	59	0.03	1
Rice	5,420	3.08	0.03	176	16,507	0.06	325
Rice Straw Decomp	1,076	0.50	0.03	35	503	0.00	0
Walnuts	1,339	3.21	0.03	44	4,259	0.16	214
Watermelon	1	1.12	0.00	0	1	0.04	0
Wheat	171	0.75	0.03	6	122	0.03	5
Crop Acres	8,143			265	21,784		564
Total Irrig. Acres	7,067	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 6,750 to 8,250 acre-feet in 2014).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 6

Princeton-Codora-Glenn Irrigation District – 2014 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	56,860
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,213
Available Soil Moisture[c]	Estimated	267
	Total Water Supplies =	**58,340**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	19,439
Evaporation - Precipitation (Canals/Laterals)	Table 4	640
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	518
	Total Distribution System =	**20,697**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	21,784
Evapotranspiration of Precip - ET_{pr}	Table 5	265
Cultural Practices *(includes Leaching Requirement)*	Table 5	564
	Total Crop Water Needs =	**22,612**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	930
Rice Cultural and Ecosystem Requirement[h]	Estimated	5,420
Upslope Drainwater Flow Through	Estimated	4,780
Remainder Drainwater Outflow[i]	Calculated	1,084
	Total District Outflow *(from District Records)* **=**	**12,215**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**3,138**
	Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**2,816**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 7

Princeton-Codora-Glenn Irrigation District – 2014 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[c] (acre-feet)
2005	44,961	15,659	0	-	60,620	7,088	-
2006	40,671	14,600	0	-	55,271	4,860	-
2007	50,875	14,800	0	-	65,675	5,276	-
2008	52,810	16,398	0	-	69,208	5,682	-
2009	50,800	13,847	0	-	64,647	6,078	-
2010	44,869	14,428	0	23,736	83,033	5,531	27,428
2011	38,257	12,485	0	26,189	76,931	7,664	26,460
2012	43,303	12,950	17,908	12,856	87,017	8,702	26,388
2013	47,890	10,231	11,453	16,828	86,402	7,383	17,747
2014	38,389	2,789	1,084	9,560	51,822	3,138	12,215
Total	414,436	125,398	29,361	79,609	648,804	58,264	98,023
Average	46,048	13,933	3,262	19,902	72,089	6,474	24,506

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.
[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.
[d] Estimated by District based on observation and historical information.

District/Company

Princeton-Codora-Glenn Irrigation District

TABLE 1

Princeton-Codora-Glenn Irrigation District – 2015 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	2,409	0	99	99	2,607
May	10,278	0	0	2,071	12,349
June	8,990	0	0	3,276	12,266
July	10,073	0	0	4,023	14,096
August	2,287	6,457	0	2,555	11,299
September	999	0	0	88	1,087
October	3,852	0	0	412	4,264
TOTAL	38,888	6,457	99	12,524	57,968

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

[d]Quantities include water diverted under the extension of the contract season during November - December 10.

TABLE 2

Princeton-Codora-Glenn Irrigation District – 2015 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	390	0
May	810	325
June	608	325
July	1,156	325
August	294	0
September	0	0
October	201	0
TOTAL	3,459	975

[a]Estimated by District based on observation and historical information.

TABLE 3

Princeton-Codora-Glenn Irrigation District – 2015 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	2,607	390	2,997
May	12,349	810	13,159
June	12,266	608	12,874
July	14,096	1,156	15,252
August	11,299	294	11,593
September	1,087	0	1,087
October	4,264	201	4,465
TOTAL	57,968	3,459	61,427

[a]In addition to the water supplies shown in Table 3, 2,627 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

Princeton-Codora-Glenn Irrigation District – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.01	1.3	0.11
Feb	2.1	0.18	2.3	0.19
Mar	0.2	0.02	4.6	0.38
Apr	1.1	0.09	6.6	0.55
May	0.0	0.00	7.5	0.62
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	8.8	0.73
Aug	0.0	0.00	7.8	0.65
Sept	0.0	0.00	5.7	0.48
Oct	0.1	0.01	4.3	0.36
Nov	1.7	0.14	2.2	0.19
Dec	1.3	0.11	1.3	0.11
TOTAL-YR	6.7	0.56	61.0	5.08
TOTAL-Apr-Oct	**1.3**	**0.10**	**49.3**	**4.10**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Princeton-Codora-Glenn Irrigation District – 2015 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	68,640	30	47	5	194	11,818	(12,007)
Laterals	219,384	15	76	8	310	5,666	(5,968)
Water Shed Drains	113,520	15	39	4	160	1,955	(2,111)
TOTAL			162	17	665	19,439	(20,086)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 5

Princeton-Codora-Glenn Irrigation District – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Almonds	80	2.96	0.03	2	234	0.18	14
Pasture	24	3.31	0.03	1	79	0.03	1
Peach	1	2.91	0.03	0	3	0.14	0
Rice	5,991	3.01	0.03	180	17,883	0.06	359
Rice Straw Decomp	1,593	0.50	0.03	48	749	0.00	0
Sunflowers	27	1.84	0.03	1	49	0.06	2
Walnuts	1,339	3.18	0.03	40	4,219	0.16	214
Watermelon	10	1.12	0.00	0	11	0.04	0
Crop Acres	9,065			272	23,226		590
Total Irrig. Acres	7,472	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 7,500 to 9,000 acre-feet in 2015).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 6

Princeton-Codora-Glenn Irrigation District – 2015 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	61,427
Private Groundwater	Table 2	975
Inflow From Precip[b]	Estimated	778
Available Soil Moisture[c]	Estimated	92
	Total Water Supplies =	**63,273**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	19,439
Evaporation - Precipitation (Canals/Laterals)	Table 4	648
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	580
	Total Distribution System =	**20,766**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	23,226
Evapotranspiration of Precip - ET_{pr}	Table 5	272
Cultural Practices *(includes Leaching Requirement)*	Table 5	590
	Total Crop Water Needs =	**24,088**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	624
Rice Cultural and Ecosystem Requirement[h]	Estimated	5,991
Upslope Drainwater Flow Through	Estimated	6,262
Remainder Drainwater Outflow[i]	Calculated	720
	Total District Outflow *(from District Records)* **=**	**13,598**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**2,627**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**4,821**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 7

Princeton-Codora-Glenn Irrigation District – 2015 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[c] (acre-feet)
2006	40,671	14,600	0	-	55,271	4,860	-
2007	50,875	14,800	0	-	65,675	5,276	-
2008	52,810	16,398	0	-	69,208	5,682	-
2009	50,800	13,847	0	-	64,647	6,078	-
2010	44,869	14,428	0	23,736	83,033	5,531	27,428
2011	38,257	12,485	0	26,189	76,931	7,664	26,460
2012	43,303	12,950	17,908	12,856	87,017	8,702	26,388
2013	47,890	10,231	11,453	16,828	86,402	7,383	26,388
2014	38,389	2,789	1,084	12,524	51,822	3,138	17,747
2015	38,888	6,457	99	12,524	57,968	2,627	13,598
Total	446,752	118,985	30,544	104,657	697,974	56,941	138,008
Average	44,675	11,899	3,054	17,443	69,797	5,694	23,001

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

[d] Estimated by District based on observation and historical information.

Reclamation District 108

District/Company **Reclamation District 108**

TABLE 1

Reclamation District 108 – 2013 Surface Water Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	11,713	0	0	127	11,840
May	46,314	0	0	611	46,925
June	45,027	0	0	561	45,588
July	31,500	16,957	0	180	48,637
August	16,500	8,647	0	340	25,487
September	3,410	0	0	58	3,468
October	7,204	0	0	0	7,204
TOTAL	161,668	25,604	0	1,877	189,149

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 108 – 2013 Groundwater Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 108 – 2013 Total District Water Supply (excluding reuse)

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	11,840	0	11,840
May	46,925	0	46,925
June	45,588	0	45,588
July	48,637	0	48,637
August	25,487	0	25,487
September	3,468	0	3,468
October	7,204	0	7,204
TOTAL	189,149	0	189,149

[a]In addition to the water supplies shown in Table 3, 28,616 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Reclamation District 108**

Reclamation District 108 – 2013 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.02	2.9	0.25
Mar	1.2	0.10	4.4	0.37
Apr	0.7	0.06	7.4	0.62
May	0.1	0.01	8.3	0.69
Jun	0.2	0.02	8.3	0.69
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	7.6	0.63
Sept	0.6	0.05	5.7	0.48
Oct	0.0	0.00	4.6	0.39
Nov	0.9	0.07	2.8	0.23
Dec	0.3	0.02	2.1	0.18
TOTAL-YR	5.1	0.42	64.8	5.40
TOTAL-Apr-Oct	**1.6**	**0.13**	**50.9**	**4.24**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Reclamation District 108 – 2013 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	528,000	24	291	38	1,233	2,909	(4,104)
Laterals	158,400	24	87	11	370	873	(1,231)
Water Shed Drains	0	0	0	0	0	0	0
TOTAL			378	50	1,603	3,782	(5,335)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Reclamation District 108_**

TABLE 5

Reclamation District 108 – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a]	Crop ET[b]	Effective Precipitation[c]		ETAW	Leaching Requirement	
	(crop acres)	(AF/Ac)	(AF/Ac)	(acre-feet)	(acre-feet)	(AF/Ac)	(acre-feet)
Alfalfa	1,911	3.23	0.01	25	6,149	0.11	210
Barley	66	0.86	0.01	1	56	0.02	1
Beans	350	0.86	0.01	3	297	0.47	165
Corn	1,646	1.97	0.01	13	3,223	0.14	230
Idle	459	0.17	0.01	6	74	0.00	0
Melons	122	1.12	0.00	1	137	0.04	5
Milo	10	1.97	0.01	0	20	0.02	0
Pasture	163	3.42	0.01	2	555	0.03	5
Rice	31,230	3.06	0.01	406	95,264	0.06	1,874
Rice Straw Decomp	6,104	0.50	0.01	79	2,973	0.00	0
Safflowers	765	1.94	0.01	6	1,476	0.06	46
Sunflowers	3,108	1.94	0.01	25	5,999	0.06	186
Tomatoes	3,469	1.69	0.01	28	5,836	0.08	278
Vineseed	1,328	0.99	0.01	17	1,297	0.18	239
Walnuts	1,307	3.25	0.01	17	4,227	0.16	209
Wheat	1,616	0.86	0.01	13	1,370	0.03	48
Crop Acres	53,654			643	128,952		3,496
Total Irrig. Acres	47,091	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 39,000 to 47,000 acre-feet in 2013).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Reclamation District 108_**

TABLE 6

Reclamation District 108 – 2013 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	189,149
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	6,234
Available Soil Moisture[c]	Estimated	1,048
	Total Water Supplies =	**196,431**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	3,782
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,553
Riparian ET[d] (Canals/Laterals)	Estimated	3,890
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,891
	Total Distribution System =	11,116
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	128,952
Evapotranspiration of Precip - ET_{pr}	Table 5	643
Cultural Practices *(includes Leaching Requirement)*	Table 5	3,496
	Total Crop Water Needs =	**133,091**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	4,095
Rice Cultural and Ecosystem Requirement[h]	Estimated	31,230
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	43,170
	Total District Outflow *(from District Records)* **=**	**78,495**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**28,616**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(26,271)**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Reclamation District 108_**

TABLE 7

Reclamation District 108 – 2013 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[c] (acre-feet)
2004	157,751	0	-	4,566	162,317	60,623	54,576
2005	123,889	14,231	-	2,263	140,383	50,086	51,970
2006	153,886	0	-	5,571	159,457	54,230	79,837
2007	139,071	3,779	-	3,773	146,623	51,488	31,472
2008	174,949	4,389	-	779	180,117	46,161	43,865
2009	153,995	0	-	2,433	156,428	50,212	35,458
2010	124,132	20,245	0	2,984	147,361	84,430	22,080
2011	143,793	14,913	0	1,415	160,121	51,819	50,434
2012	141,324	17,967	0	1,160	160,451	53,739	39,975
2013	161,668	25,604	0	1,877	189,149	28,616	78,495
Total	1,474,458	101,128	0	26,820	1,602,406	531,404	488,162
Average	147,446	10,113	0	2,682	160,241	53,140	48,816

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

District/Company **_Reclamation District 108_**

TABLE 1

Reclamation District 108 – 2014 Surface Water Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	2,220	0	0	4	2,224
May	31,295	0	0	54	31,349
June	27,463	0	0	157	27,620
July	30,223	0	0	238	30,461
August	19,727	0	0	223	19,950
September	6,343	0	0	77	6,420
October	5,063	0	0	27	5,090
TOTAL	122,334	0	0	780	123,114

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 108 – 2014 Groundwater Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	2,057	0
May	2,034	0
June	2,154	0
July	742	0
August	1,109	0
September	114	0
October	126	0
TOTAL	8,336	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 108 – 2014 Total District Water Supply (excluding reuse)

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	2224	2057	4281
May	31349	2034	33383
June	27620	2154	29774
July	30461	742	31203
August	19950	1109	21059
September	6420	114	6534
October	5090	126	5216
TOTAL	123114	8336	131450

[a]In addition to the water supplies shown in Table 3, 51,216 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Reclamation District 108_**

Reclamation District 108 – 2014 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.02	2.4	0.20
Feb	3.7	0.31	2.0	0.17
Mar	1.6	0.14	4.1	0.34
Apr	1.2	0.10	5.9	0.49
May	0.1	0.01	8.4	0.70
Jun	0.0	0.00	9.1	0.76
Jul	0.0	0.00	8.9	0.74
Aug	0.1	0.01	7.3	0.61
Sept	0.4	0.03	5.8	0.48
Oct	0.3	0.03	4.1	0.34
Nov	1.2	0.10	1.8	0.15
Dec	7.3	0.60	1.1	0.09
TOTAL-YR	16	1.33	60.9	5.07
TOTAL-Apr-Oct	**2.1**	**0.17**	**49.5**	**4.13**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).
[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Reclamation District 108 – 2014 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	528,000	24	291	50	1,200	2,909	(4,059)
Laterals	158,400	24	87	15	360	873	(1,218)
Water Shed Drains	0	0	0	0	0	0	0
TOTAL			378	65	1,560	3,782	(5,277)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Reclamation District 108_**

TABLE 5

Reclamation District 108 – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,900	3.14	0.03	62	5,900	0.11	209
Barley	46	0.75	0.03	1	33	0.02	1
Beans	121	0.75	0.03	4	86	0.47	57
Corn	354	1.96	0.03	12	683	0.14	50
Idle	6,715	0.15	0.03	218	793	0.00	0
Melons	602	1.12	0.00	0	673	0.04	24
Onions	25	0.87	0.03	1	21	0.28	7
Pasture	163	3.33	0.03	5	538	0.03	5
Rice	25,481	3.08	0.03	828	77,602	0.06	1,529
Rice Straw Decomp	3,145	0.50	0.03	102	1,470	0.00	0
Safflowers	1,087	1.90	0.03	35	2,031	0.06	65
Sunflowers	2,286	1.90	0.03	74	4,271	0.06	137
Tomatoes	3,641	1.71	0.03	118	6,113	0.08	291
Vineseed	1,131	0.87	0.03	37	951	0.18	204
Walnuts	1,720	3.21	0.03	56	5,470	0.16	275
Wheat	2,287	0.75	0.03	74	1,634	0.03	69
Crop Acres	50,704			1,628	108,269		2,923
Total Irrig. Acres	40,844	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 31,850 to 38,250 acre-feet in 2014).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Reclamation District 108_**

TABLE 6

Reclamation District 108 – 2014 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	131,450
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	8,164
Available Soil Moisture[c]	Estimated	3,578
	Total Water Supplies =	**143,193**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	3,782
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,495
Riparian ET[d] (Canals/Laterals)	Estimated	3,370
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,231
	Total Distribution System =	9,878
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	108,269
Evapotranspiration of Precip - ET_{pr}	Table 5	1,628
Cultural Practices *(includes Leaching Requirement)*	Table 5	2,923
	Total Crop Water Needs =	**112,820**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	4,374
Rice Cultural and Ecosystem Requirement[h]	Estimated	25,481
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	11,362
	Total District Outflow *(from District Records)* **=**	**41,217**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**51,216**
	Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**(20,723)**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Reclamation District 108_**

TABLE 7

Reclamation District 108 – 2014 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[c] (acre-feet)
2005	123,889	14,231	-	2,263	140,383	50,086	51,970
2006	153,886	0	-	5,571	159,457	54,230	79,837
2007	139,071	3,779	-	3,773	146,623	51,488	31,472
2008	174,949	4,389	-	779	180,117	46,161	43,865
2009	153,995	0	-	2,433	156,428	50,212	35,458
2010	124,132	20,245	0	2,984	147,361	84,430	22,080
2011	143,793	14,913	0	1,415	160,121	51,819	50,434
2012	141,324	17,967	0	1,160	160,451	53,739	39,975
2013	161,668	25,604	0	1,877	189,149	28,616	78,495
2014	122,334	0	0	780	123,114	51,216	41,217
Total	1,316,707	101,128	0	22,254	1,440,089	470,781	433,586
Average	146,301	11,236	0	2,473	160,010	52,309	48,176

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

District/Company **Reclamation District 108**

TABLE 1

Reclamation District 108 – 2015 Surface Water Supply
(April through December Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	7,992	0	0	111	8,103
May	28,994	0	0	217	29,211
June	26,692	0	0	133	26,825
July	26,796	0	0	190	26,986
August	15,256	1,210	681	145	17,292
September	4,635	0	715	25	5,375
October[d]	4,733	0	0	0	4,733
TOTAL	115,098	1,210	1,396	821	118,525

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

[d]Quantities include water diverted under the extension of the contract season during November - December 10.

TABLE 2

Reclamation District 108 – 2015 Groundwater Supply
(April through December Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	480	0
May	2,471	0
June	1,962	420
July	1,760	1,200
August	1,691	230
September	642	0
October	0	0
TOTAL	9,006	1,850

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 108 – 2015 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	8,103	480	8,583
May	29,211	2,471	31,682
June	26,825	1,962	28,787
July	26,986	1,760	28,746
August	17,292	1,691	18,983
September	5,375	642	6,017
October	4,733	0	4,733
TOTAL	118,525	9,006	127,531

[a]In addition to the water supplies shown in Table 3, 45,510 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Reclamation District 108**

Reclamation District 108 – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	**Precipitation[a]**		**Evaporation[b]**	
	inches	**feet**	**inches**	**feet**
Jan	0.1	0.01	1.3	0.11
Feb	2.1	0.18	2.3	0.19
Mar	0.2	0.02	4.6	0.38
Apr	1.1	0.09	6.6	0.55
May	0.0	0.00	7.5	0.62
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	8.8	0.73
Aug	0.0	0.00	7.8	0.65
Sept	0.0	0.00	5.7	0.48
Oct	0.1	0.01	4.3	0.36
Nov	1.7	0.14	2.2	0.19
Dec	1.3	0.11	1.3	0.11
TOTAL-YR	6.7	0.56	61.0	5.08
TOTAL-Apr-Oct	**1.3**	**0.10**	**49.3**	**4.10**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Reclamation District 108 – 2015 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	**Length[a] (feet)**	**Width[b] (feet)**	**Surface Area (acres)**	**Precipitation[c] (acre-feet)**	**Evaporation[d] (acre-feet)**	**Seepage[e] (acre-feet)**	**Total (acre-feet)**
Canal	528,000	24	291	30	1,194	2,909	(4,073)
Laterals	158,400	24	87	9	358	873	(1,222)
Water Shed Drains	0	0	0	0	0	0	0
TOTAL			378	39	1,552	3,782	(5,295)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Reclamation District 108_**

TABLE 5

Reclamation District 108 – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,775	3.13	0.03	53	5,497	0.11	195
Beans	174	0.77	0.03	5	128	0.47	82
Corn	369	1.94	0.03	11	705	0.14	52
Idle	9,390	0.16	0.03	282	1,222	0.00	0
Melons	266	1.12	0.00	0	299	0.04	11
Milo	36	1.94	0.03	1	69	0.02	1
Oats	211	0.77	0.03	6	156	0.02	4
Walnuts	2,373	3.18	0.03	71	7,476	0.16	380
Pasture	163	3.31	0.03	5	535	0.03	5
Rice	22,299	3.01	0.03	669	66,560	0.06	1,338
Rice Straw Decomp	2,674	0.50	0.03	80	1,257	0.00	0
Safflowers	978	1.84	0.03	29	1,769	0.06	59
Sunflowers	1,781	1.84	0.03	53	3,221	0.06	107
Tomatoes	4,293	1.65	0.03	129	6,969	0.08	343
Vineseed	1,047	0.91	0.03	31	925	0.18	188
Wheat	2,190	0.77	0.03	66	1,614	0.03	66
Crop Acres	50,019			1,493	98,402		2,831
Total Irrig. Acres	37,955	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 27,875 to 33,450 acre-feet in 2015).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Reclamation District 108**

TABLE 6

Reclamation District 108 – 2015 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	127,531
Private Groundwater	Table 2	1,850
Inflow From Precip[b]	Estimated	4,932
Available Soil Moisture[c]	Estimated	1,559
	Total Water Supplies =	**135,872**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	3,782
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,513
Riparian ET[d] (Canals/Laterals)	Estimated	3,130
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,185
	Total Distribution System =	9,610
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	98,402
Evapotranspiration of Precip - ET_{pr}	Table 5	1,493
Cultural Practices *(includes Leaching Requirement)*	Table 5	2,831
	Total Crop Water Needs =	**102,726**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	2,323
Rice Cultural and Ecosystem Requirement[h]	Estimated	22,299
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	8,499
	Total District Outflow *(from District Records)* **=**	**33,121**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**45,510**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(9,585)**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Reclamation District 108**

TABLE 7

Reclamation District 108 – 2015 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[c] (acre-feet)
2006	153,886	0	-	5,571	159,457	54,230	79,837
2007	139,071	3,779	-	3,773	146,623	51,488	31,472
2008	174,949	4,389	-	779	180,117	46,161	43,865
2009	153,995	0	-	2,433	156,428	50,212	35,458
2010	124,132	20,245	0	2,984	147,361	84,430	22,080
2011	143,793	14,913	0	1,415	160,121	51,819	50,434
2012	141,324	17,967	0	1,160	160,451	53,739	39,975
2013	161,668	25,604	0	1,877	189,149	28,616	78,495
2014	122,334	0	0	780	123,114	51,216	41,217
2015	115,098	1,210	1,396	821	118,525	45,510	33,121
Total	1,430,250	88,107	1,396	21,593	1,541,346	517,421	455,954
Average	143,025	8,811	233	2,159	154,135	51,742	45,595

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

Reclamation District 1004

District/Company **Reclamation District 1004**

TABLE 1

Reclamation District 1004 – 2013 Surface Water Supply
(April through October Period Only)
2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	5,647	-	1,417	0	7,064
May	10,234	-	3,628	0	13,862
June	9,667	-	5,658	0	15,325
July	6,100	5,495	6,459	0	18,054
August	3,600	4,888	4,533	0	13,021
September	1,025	232	1,800	0	3,057
October	5,300	187	2,182	0	7,669
TOTAL	41,573	10,802	25,677	0	78,052

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 1004 – 2013 Groundwater Supply
(April through October Period Only)
2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	599	0
May	194	0
June	338	0
July	314	2,946
August	4	2,973
September	0	2,157
October	262	0
TOTAL	1,711	8,077

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 1004 – 2013 Total District Water Supply (excluding reuse)
(April through October Period Only)
2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	7,064	599	7,663
May	13,862	194	14,056
June	15,325	338	15,663
July	18,054	314	18,368
August	13,021	4	13,025
September	3,057	0	3,057
October	7,669	262	7,931
TOTAL	78,052	1,711	79,763

[a]In addition to the water supplies shown in Table 3, 16,095 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Reclamation District 1004**

Reclamation District 1004 – Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.02	2.9	0.25
Mar	1.2	0.10	4.4	0.37
Apr	0.7	0.06	7.4	0.62
May	0.1	0.01	8.3	0.69
Jun	0.2	0.02	8.3	0.69
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	7.6	0.63
Sep	0.6	0.05	5.7	0.48
Oct	0.0	0.00	4.6	0.39
Nov	0.9	0.07	2.8	0.23
Dec	0.3	0.02	2.1	0.18
TOTAL-YR	5.1	0.42	64.8	5.40
TOTAL-Apr-Oct	**1.6**	**0.13**	**50.9**	**4.24**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Reclamation District 1004 – 2013 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canals	25,872	135	80	10	339	2,000	(2,329)
Canals	28,512	51	34	4	142	838	(975)
Canals	23,232	41	22	3	92	540	(629)
Laterals	42,768	32	31	4	131	773	(900)
Laterals	63,096	22	32	4	135	797	(928)
Laterals	47,256	15	16	2	69	410	(477)
Drains	29,568	44	30	4	126	742	(863)
Drains	29,568	28	19	3	81	480	(559)
Drains	85,536	15	29	4	125	736	(857)
Drains	12,144	12	3	0	14	84	(97)
TOTAL			296	39	1,254	7,399	(8,615)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Reclamation District 1004_**

TABLE 5

Reclamation District 1004 – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Beans	92	0.86	0.01	1	78	0.47	43
Corn	289	1.97	0.01	2	566	0.14	40
Habitat	4,533	2.59	0.01	59	11,703	0.03	136
Rice	12,371	3.06	0.01	161	37,737	0.06	742
Crop Acres	17,285			223	50,083		961
Total Irrig. Acres	17,285	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 15,500 to 18,550 acre-feet in 2013).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Reclamation District 1004**

TABLE 6

Reclamation District 1004 – 2013 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	79,763
Private Groundwater	Table 2	8,077
Inflow From Precip[b]	Estimated	2,266
Available Soil Moisture[c]	Estimated	24
	Total Water Supplies =	**90,130**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	7,399
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,216
Riparian ET[d] (Canals/Laterals)	Estimated	550
Conveyance System Filling[e] (Canals/Laterals)	Estimated	781
	Total Distribution System =	**9,946**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	50,083
Evapotranspiration of Precip - ET_{pr}	Table 5	223
Cultural Practices *(includes Leaching Requirement)*	Table 5	961
	Total Crop Water Needs =	**51,267**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	12,371
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**0**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**16,095**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**28,917**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Reclamation District 1004_**

TABLE 7

Reclamation District 1004 – 2013 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[e] (acre-feet)
2004	56,400	8,727	20,000	0	85,127	12,800	0
2005	39,939	12,953	20,000	0	72,892	10,900	0
2006	33,584	13,497	20,000	0	67,081	10,100	0
2007	46,168	9,973	20,000	0	76,141	11,400	0
2008	47,605	9,761	20,158	0	77,524	11,600	0
2009	38,151	12,170	20,255	0	70,576	10,600	0
2010	48,218	11,250	23,473	0	82,941	12,500	0
2011	35,874	10,639	23,395	0	69,908	7,436	0
2012	43,022	10,048	23,395	0	76,465	16,095	0
2013	41,573	10,802	25,677	0	78,052	16,095	0
Total	430,534	109,820	216,353	0	756,707	119,526	0
Average	43,053	10,982	21,635	0	75,671	11,953	0

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information.

[d]Estimated by District based on observation and historical information.

[e]District operates a closed system with little or no outflow; drainwater from rice fields is recaptured and delivered for rice straw decomposition and habitat lands.

District/Company **Reclamation District 1004**

TABLE 1

Reclamation District 1004 – 2014 Surface Water Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	669	0	1,829	0	2,498
May	6,758	0	4,694	0	11,452
June	7,177	0	4,709	0	11,886
July	8,924	0	6,175	0	15,099
August	4,203	0	5,652	0	9,855
September	1,210	0	2,601	0	3,811
October	11,125	0	1,205	0	12,330
TOTAL	40,066	0	26,865	0	66,931

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 1004 – 2014 Groundwater Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	22	0
May	1,248	600
June	1,584	822
July	1,467	2,022
August	854	1,625
September	1,248	695
October	1,632	33
TOTAL	8,055	5,797

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 1004 – 2014 Total District Water Supply (excluding reuse)

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	2,498	22	2,520
May	11,452	1,248	12,700
June	11,886	1,584	13,470
July	15,099	1,467	16,566
August	9,855	854	10,709
September	3,811	1,248	5,059
October	12,330	1,632	13,962
TOTAL	66,931	8,055	74,986

[a]In addition to the water supplies shown in Table 3, 12,070 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Reclamation District 1004**

Reclamation District 1004 – 2014 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.02	2.4	0.20
Feb	3.7	0.31	2.0	0.17
Mar	1.6	0.14	4.1	0.34
Apr	1.2	0.10	5.9	0.49
May	0.1	0.01	8.4	0.70
Jun	0.0	0.00	9.1	0.76
Jul	0.0	0.00	8.9	0.74
Aug	0.1	0.01	7.3	0.61
Sept	0.4	0.03	5.8	0.48
Oct	0.3	0.03	4.1	0.34
Nov	1.2	0.10	1.8	0.15
Dec	7.3	0.60	1.1	0.09
TOTAL-YR	16	1.33	60.9	5.07
TOTAL-Apr-Oct	**2.1**	**0.17**	**49.5**	**4.13**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Reclamation District 1004 – 2014 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canals	25,872	135	80	14	330	2,000	(2,316)
Canals	28,512	51	34	6	138	838	(970)
Canals	23,232	41	22	4	89	540	(625)
Laterals	42,768	32	31	5	128	773	(895)
Laterals	63,096	22	32	5	131	797	(923)
Laterals	47,256	15	16	3	68	410	(474)
Drains	29,568	44	30	5	122	742	(859)
Drains	29,568	28	19	3	79	480	(556)
Drains	85,536	15	29	5	122	736	(853)
Drains	12,144	12	3	1	14	84	(97)
TOTAL			296	51	1,221	7,399	(8,569)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Reclamation District 1004_**

TABLE 5

Reclamation District 1004 – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Beans	67	0.75	0.03	2	48	0.47	31
Habitat	5,589	2.51	0.03	182	13,844	0.03	168
Rice	11,578	3.08	0.03	376	35,261	0.06	695
Crop Acres	17,234			560	49,152		894
Total Irrig. Acres	17,234	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface water irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 14,470 to 17,350 acre-feet in 2014).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Reclamation District 1004**

TABLE 6

Reclamation District 1004 – 2014 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	74,986
Private Groundwater	Table 2	5,797
Inflow From Precip[b]	Estimated	2,959
Available Soil Moisture[c]	Estimated	11
	Total Water Supplies =	**83,753**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	7,399
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,170
Riparian ET[d] (Canals/Laterals)	Estimated	550
Conveyance System Filling[e] (Canals/Laterals)	Estimated	669
	Total Distribution System =	**9,788**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	49,152
Evapotranspiration of Precip - ET_{pr}	Table 5	560
Cultural Practices *(includes Leaching Requirement)*	Table 5	894
	Total Crop Water Needs =	**50,607**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	11,578
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**0**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**12,070**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**23,358**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Reclamation District 1004**

TABLE 7

Reclamation District 1004 – 2014 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[e] (acre-feet)
2005	39,939	12,953	20,000	0	72,892	10,900	0
2006	33,584	13,497	20,000	0	67,081	10,100	0
2007	46,168	9,973	20,000	0	76,141	11,400	0
2008	47,605	9,761	20,158	0	77,524	11,600	0
2009	38,151	12,170	20,255	0	70,576	10,600	0
2010	48,218	11,250	23,473	0	82,941	12,500	0
2011	35,874	10,639	23,395	0	69,908	7,436	0
2012	43,022	10,048	23,395	0	76,465	16,095	0
2013	41,573	10,802	25,677	0	78,052	16,095	0
2014	40,066	0	26,865	0	66,931	12,070	0
Total	374,134	101,093	196,353	0	671,580	106,726	0
Average	41,570	11,233	21,817	0	74,620	11,858	0

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information.

[d]Estimated by District based on observation and historical information.

[e]District operates a closed system with little or no outflow; drainwater from rice fields is recaptured and delivered for rice straw decomposition and habitat lands.

District/Company **Reclamation District 1004**

TABLE 1

Reclamation District 1004 – 2015 Surface Water Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	2,460	0	1,234	0	3,694
May	6,411	0	1,021	0	7,432
June	8,993	0	1,886	0	10,879
July	6,235	2,433	2,023	0	10,691
August	585	2,611	1,526	0	4,722
September	1,617	0	591	0	2,208
October	3,975	0	663	0	4,638
TOTAL	30,276	5,044	8,944	0	44,264

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 1004 – 2015 Groundwater Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	601	0
May	1,574	474
June	1,878	711
July	1,788	992
August	1,465	738
September	534	533
October	494	0
TOTAL	8,334	3,448

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 1004 – 2015 Total District Water Supply (excluding reuse)

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	3,694	601	4,295
May	7,432	1,574	9,006
June	10,879	1,878	12,757
July	10,691	1,788	12,479
August	4,722	1,465	6,187
September	2,208	534	2,742
October	4,638	494	5,132
TOTAL	44,264	8,334	52,598

[a]In addition to the water supplies shown in Table 3, 8,050 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Reclamation District 1004**

Reclamation District 1004 – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.01	1.3	0.11
Feb	2.1	0.18	2.3	0.19
Mar	0.2	0.02	4.6	0.38
Apr	1.1	0.09	6.6	0.55
May	0.0	0.00	7.5	0.62
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	8.8	0.73
Aug	0.0	0.00	7.8	0.65
Sept	0.0	0.00	5.7	0.48
Oct	0.1	0.01	4.3	0.36
Nov	1.7	0.14	2.2	0.19
Dec	1.3	0.11	1.3	0.11
TOTAL-YR	6.7	0.56	61.0	5.08
TOTAL-Apr-Oct	**1.3**	**0.10**	**49.3**	**4.10**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Reclamation District 1004 – 2015 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canals	25,872	135	80	8	328	2,000	(2,320)
Canals	28,512	51	34	3	138	838	(972)
Canals	23,232	41	22	2	89	540	(626)
Laterals	42,768	32	31	3	127	773	(897)
Laterals	63,096	22	32	3	131	797	(924)
Laterals	47,256	15	16	2	67	410	(475)
Drains	29,568	44	30	3	122	742	(860)
Drains	29,568	28	19	2	79	480	(557)
Drains	85,536	15	29	3	121	736	(854)
Drains	12,144	12	3	0	14	84	(97)
TOTAL			296	31	1,215	7,399	(8,583)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Reclamation District 1004_**

TABLE 5

Reclamation District 1004 – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Beans	257	0.77	0.03	8	189	0.47	121
Corn	360	1.94	0.03	11	688	0.14	50
Habitat	5,671	2.51	0.03	170	14,038	0.03	170
Rice	10,441	3.01	0.03	313	31,165	0.06	626
Sunflowers	103	1.84	0.03	3	186	0.06	6
Tomatoes	464	1.65	0.03	14	753	0.08	37
Crop Acres	17,296			519	47,021		1,010
Total Irrig. Acres	17,296	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface water irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 13,050 to 15,650 acre-feet in 2015).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Reclamation District 1004_**

TABLE 6

Reclamation District 1004 – 2015 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	52,598
Private Groundwater	Table 2	3,448
Inflow From Precip[b]	Estimated	1,802
Available Soil Moisture[c]	Estimated	74
	Total Water Supplies =	**57,921**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	7,399
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,184
Riparian ET[d] (Canals/Laterals)	Estimated	550
Conveyance System Filling[e] (Canals/Laterals)	Estimated	443
	Total Distribution System =	**9,576**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	47,021
Evapotranspiration of Precip - ET_{pr}	Table 5	519
Cultural Practices *(includes Leaching Requirement)*	Table 5	1,010
	Total Crop Water Needs =	**48,550**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	10,441
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**0**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**8,050**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(205)**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Reclamation District 1004_**

TABLE 7

Reclamation District 1004 – 2015 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[e] (acre-feet)
2006	33,584	13,497	20,000	0	67,081	10,100	0
2007	46,168	9,973	20,000	0	76,141	11,400	0
2008	47,605	9,761	20,158	0	77,524	11,600	0
2009	38,151	12,170	20,255	0	70,576	10,600	0
2010	48,218	11,250	23,473	0	82,941	12,500	0
2011	35,874	10,639	23,395	0	69,908	7,436	0
2012	43,022	10,048	23,395	0	76,465	16,095	0
2013	41,573	10,802	25,677	0	78,052	16,095	0
2014	40,066	0	26,865	0	66,931	12,070	0
2015	30,276	5,044	8,944	0	44,264	8,050	0
Total	404,537	93,184	212,162	0	709,883	115,946	0
Average	40,454	9,318	21,216	0	70,988	11,595	0

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information.

[d]Estimated by District based on observation and historical information.

[e]District operates a closed system with little or no outflow; drainwater from rice fields is recaptured and delivered for rice straw decomposition and habitat lands.

Meridian Farms Water Company

District/Company **Meridian Farms Water Company**

TABLE 1

Meridian Farms Water Company – 2013 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	2,339	0	0	0	2,339
May	5,187	0	0	200	5,387
June	6,981	0	0	300	7,281
July	3,655	5,000	0	200	8,855
August	2,000	4,281	0	100	6,381
September	1,461	0	0	0	1,461
October	276	0	0	0	276
TOTAL	21,899	9,281	0	800	31,980

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Meridian Farms Water Company – 2013 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	785	0
June	1,980	0
July	1,900	0
August	400	0
September	0	0
October	0	0
TOTAL	5,065	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Meridian Farms Water Company – 2013 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	2,339	0	2,339
May	5,387	785	6,172
June	7,281	1,980	9,261
July	8,855	1,900	10,755
August	6,381	400	6,781
September	1,461	0	1,461
October	276	0	276
Total	31,980	5,065	37,045

[a]In addition to the water supplies shown in Table 3, 20,618 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Meridian Farms Water Company**

Meridian Farms Water Company – 2013 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.02	2.9	0.25
Mar	1.2	0.10	4.4	0.37
Apr	0.7	0.06	7.4	0.62
May	0.1	0.01	8.3	0.69
Jun	0.2	0.02	8.3	0.69
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	7.6	0.63
Sep	0.6	0.05	5.7	0.48
Oct	0.0	0.00	4.6	0.39
Nov	0.9	0.07	2.8	0.23
Dec	0.3	0.02	2.1	0.18
TOTAL-YR	5.1	0.42	64.8	5.40
TOTAL-Apr-Oct	**1.6**	**0.13**	**50.9**	**4.24**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Meridian Farms Water Company – 2013 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	84,480	12	23	3	99	698	(794)
Pipeline	0	0	0	0	0	0	0
Laterals	100,320	12	28	4	117	829	(943)
Water Shed Drains	0	0	0	0	0	0	0
Reservoir	0	0	0	0	0	0	0
TOTAL			51	7	216	1,527	(1,736)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Meridian Farms Water Company_**

TABLE 5

Meridian Farms Water Company – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	249	3.23	0.01	3	801	0.11	27
Beans	424	0.86	0.01	3	359	0.47	199
Chestnuts	4	3.05	0.01	0	12	0.18	1
Corn	548	1.97	0.01	4	1,073	0.14	77
Hay	22	0.86	0.01	0	19	0.03	1
Idle	27	0.17	0.01	0	4	0.00	0
Milo	118	1.97	0.01	1	231	0.02	2
Onions	25	0.95	0.01	0	24	0.28	7
Pecans	18	3.05	0.01	0	55	0.18	3
Persimmons	26	3.02	0.01	0	78	0.18	5
Prunes	63	3.02	0.01	1	190	0.18	11
Rice	4,842	3.06	0.01	63	14,770	0.06	291
Safflowers	272	1.94	0.01	2	525	0.06	16
Strawberries	5	1.77	0.01	0	9	0.47	2
Sunflowers	659	1.94	0.01	5	1,272	0.06	40
Tomatoes	343	1.69	0.01	3	577	0.08	27
Vineseed	124	0.99	0.01	2	121	0.18	22
Walnuts	834	3.25	0.01	11	2,697	0.16	133
Wheat	881	0.86	0.01	7	747	0.03	26
Crop Acres	9,484			107	23,564		890
Total Irrig. Acres	9,457	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 6,000 to 7,500 acre-feet in 2013).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Meridian Farms Water Company**

TABLE 6

Meridian Farms Water Company – 2013 District Water Balance
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	37,045
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,240
Available Soil Moisture[c]	Estimated	298
	Total Water Supplies =	**38,583**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	1,527
Evaporation - Precipitation (Canals/Laterals)	Table 4	209
Riparian ET[d] (Canals/Laterals)	Estimated	1,706
Conveyance System Filling[e] (Canals/Laterals)	Estimated	320
	Total Distribution System =	**3,762**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	23,564
Evapotranspiration of Precip - ET_{pr}	Table 5	107
Cultural Practices *(includes Leaching Requirement)*	Table 5	890
	Total Crop Water Needs =	**24,562**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	4,842
Uplslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**3,871**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**20,618**
	Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**6,388**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Meridian Farms Water Company**

TABLE 7

Meridian Farms Water Company – 2013 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2004	22,568	7,970	-	7,968	38,506	7,968	11,359
2005	15,272	9,903	-	5,767	30,942	5,767	8,272
2006	12,398	9,224	-	12,565	34,187	12,565	11,138
2007	17,506	5,130	-	11,927	34,563	11,927	3,396
2008	19,122	8,579	-	6,925	34,626	6,925	3,631
2009	17,090	8,611	-	7,420	33,121	7,420	3,165
2010	17,530	9,512	0	8,695	35,737	8,695	5,499
2011	16,792	10,565	0	10,915	38,272	10,915	6,750
2012	19,349	11,208	0	11,625	42,182	11,625	5,825
2013	21,899	9,281	0	800	31,980	20,618	3,871
Total	179,526	89,983	0	84,607	354,116	104,425	62,906
Average	17,953	8,998	0	8,461	35,412	10,442	6,291

[a]Federal Ag Water Supply from Reclamation Water Account Records. Data prior to 2010 are not available.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.
[d]Estimated by District based on observation and historical information.

District/Company **Meridian Farms Water Company**

TABLE 1

Meridian Farms Water Company – 2014 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	672	0	0	0	672
May	4,348	0	0	200	4,548
June	5,208	0	0	300	5,508
July	4,430	867	0	200	5,497
August	825	3,176	0	150	4,151
September	1,147	0	0	50	1,197
October	0	0	0	0	0
TOTAL	16,630	4,043	0	900	21,573

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Meridian Farms Water Company – 2014 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	785	0
June	1,980	0
July	1,900	0
August	400	0
September	0	0
October	0	0
TOTAL	5,065	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Meridian Farms Water Company – 2014 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	672	0	672
May	4548	785	5333
June	5508	1980	7488
July	5497	1900	7397
August	4151	400	4551
September	1197	0	1197
October	0	0	0
TOTAL	21573	5065	26638

[a]In addition to the water supplies shown in Table 3, 10,663 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Meridian Farms Water Company**

Meridian Farms Water Company – 2014 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.02	2.4	0.20
Feb	3.7	0.31	2.0	0.17
Mar	1.6	0.14	4.1	0.34
Apr	1.2	0.10	5.9	0.49
May	0.1	0.01	8.4	0.70
Jun	0.0	0.00	9.1	0.76
Jul	0.0	0.00	8.9	0.74
Aug	0.1	0.01	7.3	0.61
Sept	0.4	0.03	5.8	0.48
Oct	0.3	0.03	4.1	0.34
Nov	1.2	0.10	1.8	0.15
Dec	7.3	0.60	1.1	0.09
TOTAL-YR	16	1.33	60.9	5.07
TOTAL-Apr-Oct	**2.1**	**0.17**	**49.5**	**4.13**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Meridian Farms Water Company – 2014 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	84,480	12	23	4	96	698	(790)
Pipeline	0	0	0	0	0	0	0
Laterals	100,320	12	28	5	114	829	(938)
Water Shed Drains	0	0	0	0	0	0	0
Reservoir	0	0	0	0	0	0	0
TOTAL			51	9	210	1,527	(1,729)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Meridian Farms Water Company_**

TABLE 5

Meridian Farms Water Company – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	147	3.14	0.03	5	456	0.11	16
Beans	362	0.75	0.03	12	259	0.47	170
Chestnuts	4	2.98	0.03	0	12	0.18	1
Corn	154	1.96	0.03	5	297	0.14	22
Idle	1,411	0.15	0.03	46	167	0.00	0
Onions	11	0.87	0.00	0	10	0.28	3
Pecans	18	2.98	0.00	0	54	0.18	3
Persimmons	26	2.98	0.00	0	77	0.18	5
Prunes	63	2.98	0.00	0	188	0.18	11
Rice	3,161	3.08	0.00	0	9,730	0.06	190
Safflowers	77	1.90	0.00	0	146	0.06	5
Strawberries	5	1.77	0.03	0	9	0.18	1
Sunflowers	704	1.90	0.03	23	1,315	0.06	42
Tomatoes	807	1.71	0.03	26	1,355	0.08	65
Vetch	111	3.33	0.03	4	367	0.06	7
Walnuts	906	3.21	0.03	29	2,882	0.16	145
Wheat	1,062	0.75	0.03	35	759	0.03	32
Crop Acres	9,029			184	18,080		718
Total Irrig. Acres	7,618	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrgation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 3,950 to 4,700 acre-feet in 2014).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Meridian Farms Water Company**

TABLE 6

Meridian Farms Water Company – 2014 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	26,638
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	1,308
Available Soil Moisture[c]	Estimated	951
	Total Water Supplies =	**28,897**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	1,527
Evaporation - Precipitation (Canals/Laterals)	Table 4	201
Riparian ET[d] (Canals/Laterals)	Estimated	1,706
Conveyance System Filling[e] (Canals/Laterals)	Estimated	216
	Total Distribution System =	**3,651**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	18,080
Evapotranspiration of Precip - ET_{pr}	Table 5	184
Cultural Practices *(includes Leaching Requirement)*	Table 5	718
	Total Crop Water Needs =	**18,982**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	3,161
Uplslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**2,574**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**10,663**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**3,690**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Meridian Farms Water Company_**

TABLE 7

Meridian Farms Water Company – 2014 Annual Water Quantities Delivered under Each Right or Contract

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

	Federal Ag Water Supply[a]					District	
Year	Base Supply (acre-feet)	Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	Recapture (acre-feet)	Outflow[d] (acre-feet)
2005	15,272	9,903	-	5,767	30,942	5,767	8,272
2006	12,398	9,224	-	12,565	34,187	12,565	11,138
2007	17,506	5,130	-	11,927	34,563	11,927	3,396
2008	19,122	8,579	-	6,925	34,626	6,925	3,631
2009	17,090	8,611	-	7,420	33,121	7,420	3,165
2010	17,530	9,512	0	8,695	35,737	8,695	5,499
2011	16,792	10,565	0	10,915	38,272	10,915	6,750
2012	19,349	11,208	0	11,625	42,182	11,625	5,825
2013	21,899	9,281	0	800	31,980	20,618	3,871
2014	16,630	4,043	0	900	21,573	10,663	2,574
Total	156,958	82,013	0	76,639	315,610	96,457	51,547
Average	17,440	9,113	0	8,515	35,068	10,717	5,727

[a]Federal Ag Water Supply from Reclamation Water Account Records. Data prior to 2010 are not available.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.

[d]Estimated by District based on observation and historical information.

District/Company **Meridian Farms Water Company**

TABLE 1

Meridian Farms Water Company – 2015 Surface Water Supply
(April through December Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	934	0	0	0	934
May	3,898	0	0	100	3,998
June	4,017	0	0	200	4,217
July	4,458	0	0	250	4,708
August	1,393	2,229	0	100	3,722
September	1,229	0	0	100	1,329
October	424	0	0	0	424
TOTAL	16,353	2,229	0	750	19,332

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Meridian Farms Water Company – 2015 Groundwater Supply
(April through December Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	500	0
May	1,800	0
June	1,980	400
July	1,860	1,330
August	900	670
September	0	0
October	0	0
November	0	0
December	0	0
TOTAL	7,040	2,400

[a]Estimated by District based on observation and historical information.

TABLE 3

Meridian Farms Water Company – 2015 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	934	500	1434
May	3998	1800	5798
June	4217	1980	6197
July	4708	1860	6568
August	3722	900	4622
September	1329	0	1329
October	424	0	424
TOTAL	19332	7040	26372

[a]In addition to the water supplies shown in Table 3, 11,000 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Meridian Farms Water Company**

Meridian Farms Water Company – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.01	1.3	0.11
Feb	2.1	0.18	2.3	0.19
Mar	0.2	0.02	4.6	0.38
Apr	1.1	0.09	6.6	0.55
May	0.0	0.00	7.5	0.62
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	8.8	0.73
Aug	0.0	0.00	7.8	0.65
Sep	0.0	0.00	5.7	0.48
Oct	0.1	0.01	4.3	0.36
Nov	1.7	0.14	2.2	0.19
Dec	1.3	0.11	1.3	0.11
TOTAL-YR	6.7	0.56	61.0	5.08
TOTAL-Apr-Oct	**1.3**	**0.10**	**49.3**	**4.10**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).
[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Meridian Farms Water Company – 2015 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	84,480	12	23	2	96	698	(791)
Pipeline	0	0	0	0	0	0	0
Laterals	100,320	12	28	3	113	829	(940)
Water Shed Drains	0	0	0	0	0	0	0
Reservoir	0	0	0	0	0	0	0
TOTAL			51	5	209	1,527	(1,731)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Meridian Farms Water Company_**

TABLE 5

Meridian Farms Water Company – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	181	3.13	0.03	5	561	0.11	20
Beans	338	0.77	0.03	10	249	0.47	159
Chestnuts	4	2.96	0.03	0	12	0.18	1
Corn	194	1.94	0.03	6	371	0.14	27
Idle	1,983	0.16	0.03	59	258	0.00	0
Melons	38	1.12	0.00	0	43	0.04	2
Onions	22	0.86	0.03	1	18	0.28	6
Persimmons	26	2.95	0.03	1	76	0.18	5
Prunes	63	2.95	0.03	2	184	0.18	11
Rice	3,197	3.01	0.03	96	9,543	0.06	192
Safflowers	246	1.84	0.03	7	445	0.06	15
Sunflowers	297	1.84	0.03	9	537	0.06	18
Tomatoes	779	1.65	0.03	23	1,265	0.08	62
Vetch	93	3.31	0.03	3	305	0.06	6
Vineseed	95	0.91	0.03	3	84	0.18	17
Walnuts	884	3.18	0.03	27	2,785	0.16	141
Wheat	690	0.77	0.03	21	509	0.03	21
Crop Acres	9,130			273	17,243		703
Total Irrig. Acres	7,147	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 4,050 to 4,875 acre-feet in 2015).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Meridian Farms Water Company**

TABLE 6

Meridian Farms Water Company – 2015 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	26,372
Private Groundwater	Table 2	2,400
Inflow From Precip[b]	Estimated	744
Available Soil Moisture[c]	Estimated	369
	Total Water Supplies =	**29,886**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	1,527
Evaporation - Precipitation (Canals/Laterals)	Table 4	204
Riparian ET[d] (Canals/Laterals)	Estimated	1,706
Conveyance System Filling[e] (Canals/Laterals)	Estimated	193
	Total Distribution System =	**3,630**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	17,243
Evapotranspiration of Precip - ET_{pr}	Table 5	273
Cultural Practices *(includes Leaching Requirement)*	Table 5	703
	Total Crop Water Needs =	**18,219**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	333
Rice Cultural and Ecosystem Requirement[h]	Estimated	3,197
Uplslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**2,426**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**11,000**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**5,611**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Meridian Farms Water Company_**

TABLE 7

Meridian Farms Water Company – 2015 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2006	12,398	9,224	-	12,565	34,187	12,565	11,138
2007	17,506	5,130	-	11,927	34,563	11,927	3,396
2008	19,122	8,579	-	6,925	34,626	6,925	3,631
2009	17,090	8,611	-	7,420	33,121	7,420	3,165
2010	17,530	9,512	0	8,695	35,737	8,695	5,499
2011	16,792	10,565	0	10,915	38,272	10,915	6,750
2012	19,349	11,208	0	11,625	42,182	11,625	5,825
2013	21,899	9,281	0	800	31,980	20,618	3,871
2014	16,630	4,043	0	900	21,573	10,663	2,574
2015	16,353	2,229	0	750	19,332	11,000	2,426
Total	174,669	78,382	0	72,522	325,573	112,353	48,275
Average	17,467	7,838	0	7,252	32,557	11,235	4,827

[a]Federal Ag Water Supply from Reclamation Water Account Records. Data prior to 2010 are not available.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.

[d]Estimated by District based on observation and historical information.

Sutter Mutual Water Company

District/Company **Sutter Mutual Water Company**

TABLE 1

Sutter Mutual Water Company – 2013 Surface Water Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	16,591	0	0	0	16,591
May	42,500	0	0	0	42,500
June	48,000	755	0	0	48,755
July	28,500	24,744	0	0	53,244
August	20,000	13,874	0	0	33,874
September	2,589	0	0	0	2,589
October	5,500	2,302	0	0	7,802
TOTAL	163,680	41,675	0	0	205,355

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Sutter Mutual Water Company – 2013 Groundwater Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Sutter Mutual Water Company – 2013 Total District Water Supply (excluding reuse)

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	16,591	0	16,591
May	42,500	0	42,500
June	48,755	0	48,755
July	53,244	0	53,244
August	33,874	0	33,874
September	2,589	0	2,589
October	7,802	0	7,802
TOTAL	205,355	0	205,355

[a]In addition to the water supplies shown in Table 3, 33,062 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Sutter Mutual Water Company_**

Sutter Mutual Water Company – 2013 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.02	2.9	0.25
Mar	1.2	0.10	4.4	0.37
Apr	0.7	0.06	7.4	0.62
May	0.1	0.01	8.3	0.69
Jun	0.2	0.02	8.3	0.69
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	7.6	0.63
Sept	0.6	0.05	5.7	0.48
Oct	0.0	0.00	4.6	0.39
Nov	0.9	0.07	2.8	0.23
Dec	0.3	0.02	2.1	0.18
TOTAL-YR	5.1	0.42	64.8	5.40
TOTAL-Apr-Oct	**1.6**	**0.13**	**50.9**	**4.24**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Sutter Mutual Water Company – 2013 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Main Canal	39,690	90	82	11	348	2,460	(2,797)
West Canal	52,530	90	109	14	460	3,256	(3,702)
Central Canal	50,640	75	87	11	370	2,180	(2,538)
East Canal	71,970	75	124	16	525	3,098	(3,607)
Laterals	533,390	12	147	19	623	3,673	(4,277)
Sub-Laterals	146,060	8	27	4	114	268	(378)
TOTAL			575	75	2,439	14,935	(17,299)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Sutter Mutual Water Company_**

TABLE 5

Sutter Mutual Water Company – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres (crop acres)	Crop ET[a] (AF/Ac)	Effective Precipitation[b] (AF/Ac)	Effective Precipitation[b] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	494	3.23	0.01	6	1,589	0.11	54
Beans	1,181	0.86	0.01	10	1,001	0.47	555
Corn	4,986	1.97	0.01	41	9,762	0.14	698
Idle	127	0.17	0.01	2	20	0.00	0
Melons	340	1.12	0.00	2	381	0.04	14
Milo	914	1.97	0.01	7	1,790	0.02	18
Pumpkins	35	1.12	0.00	0	39	0.04	1
Rice	26,827	3.06	0.01	349	81,833	0.06	1,610
Rice Straw Decomp	11,210	0.50	0.01	146	5,459	0.00	0
Safflowers	99	1.94	0.01	1	191	0.06	6
Sunflowers	5,712	1.94	0.01	47	11,025	0.06	343
Tomatoes	4,169	1.69	0.01	34	7,014	0.08	334
Vineseed	707	0.99	0.01	9	691	0.18	127
Walnuts	29	3.25	0.01	0	94	0.16	5
Wheat	981	0.86	0.01	8	832	0.03	29
Crop Acres	57,811			661	121,721		3,794

Total Irrig. Acres 46,474 (If this number is larger than known total, it may be due to double cropping.)

[a]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 33,500 to 40,250 acre-feet in 2013).

[b]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Sutter Mutual Water Company_**

TABLE 6

Sutter Mutual Water Company – 2013 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	205,355
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	6,110
Available Soil Moisture[c]	Estimated	1,270
	Total Water Supplies =	**212,735**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	14,935
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,364
Riparian ET[d] (Canals/Laterals)	Estimated	500
Conveyance System Filling[e] (Canals/Laterals)	Estimated	2,054
	Total Distribution System =	**19,853**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	121,721
Evapotranspiration of Precip - ET_{pr}	Table 5	661
Cultural Practices *(includes Leaching Requirement)*	Table 5	3,794
	Total Crop Water Needs =	**126,177**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	3,517
Rice Cultural and Ecosystem Requirement[h]	Estimated	26,827
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	41,281
	Total District Outflow *(from District Records)* **=**	**71,625**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**33,062**
	Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**(4,920)**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f] Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Sutter Mutual Water Company_**

TABLE 7

Sutter Mutual Water Company – 2013 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2004	162,114	66,211	-	-	228,325	29,624	-
2005	136,706	54,241	-	-	190,947	12,344	-
2006	143,983	73,001	-	-	216,984	24,799	-
2007	167,922	56,467	-	-	224,389	38,231	-
2008	169,435	30,275	-	-	199,710	45,248	-
2009	153,526	35,436	-	-	188,962	57,303	-
2010	142,185	58,326	0	0	200,511	62,316	77,886
2011	136,388	57,423	0	0	193,811	55,954	98,092
2012	134,711	47,314	0	0	182,025	68,493	60,618
2013	163,680	41,675	0	0	205,355	33,062	71,625
Total	1,510,650	520,369	0	0	2,031,019	427,374	308,221
Average	151,065	52,037	0	0	203,102	42,737	77,055

[a]Federal Ag Water Supply from Reclamation Water Account Records. Includes Project water transferred into SMWC in 2006 and 2010.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2010 are not available.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

[d]The Department quit measuring outflow Karnak after 2003; SMWC has calculated outflow since 2010. Data prior to 2010 are not available.

District/Company **Sutter Mutual Water Company**

TABLE 1

Sutter Mutual Water Company – 2014 Surface Water Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	6,048	0	0	0	6,048
May	30,749	0	0	0	30,749
June	32,065	0	0	0	32,065
July	35,388	2,440	0	0	37,828
August	15,000	12,620	0	0	27,620
September	3,750	1,364	0	0	5,114
October	4,125	3,604	0	0	7,729
TOTAL	127,125	20,028	0	0	147,153

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Sutter Mutual Water Company – 2014 Groundwater Supply

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Sutter Mutual Water Company – 2014 Total District Water Supply (excluding reuse)

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	6,048	0	6,048
May	30,749	0	30,749
June	32,065	0	32,065
July	37,828	0	37,828
August	27,620	0	27,620
September	5,114	0	5,114
October	7,729	0	7,729
TOTAL	147,153	0	147,153

[a]In addition to the water supplies shown in Table 3, 74,162 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Sutter Mutual Water Company_**

Sutter Mutual Water Company – 2014 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.02	2.4	0.20
Feb	3.7	0.31	2.0	0.17
Mar	1.6	0.14	4.1	0.34
Apr	1.2	0.10	5.9	0.49
May	0.1	0.01	8.4	0.70
Jun	0.0	0.00	9.1	0.76
Jul	0.0	0.00	8.9	0.74
Aug	0.1	0.01	7.3	0.61
Sept	0.4	0.03	5.8	0.48
Oct	0.3	0.03	4.1	0.34
Nov	1.2	0.10	1.8	0.15
Dec	7.3	0.60	1.1	0.09
TOTAL-YR	16	1.33	60.9	5.07
TOTAL-Apr-Oct	**2.1**	**0.17**	**49.5**	**4.13**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).
[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Sutter Mutual Water Company – 2014 Distribution System Evaporation and Seepage
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Main Canal	39,690	90	82	14	338	2,460	(2,784)
West Canal	52,530	90	109	19	448	3,256	(3,685)
Central Canal	50,640	75	87	15	360	2,180	(2,524)
East Canal	71,970	75	124	21	511	3,098	(3,588)
Laterals	533,390	12	147	25	606	3,673	(4,254)
Sub-Laterals	146,060	8	27	5	111	268	(374)
TOTAL			575	99	2,374	14,935	(17,210)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Sutter Mutual Water Company_**

TABLE 5

Sutter Mutual Water Company – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres (crop acres)	Crop ET[a] (AF/Ac)	Effective Precipitation[b] (AF/Ac)	Effective Precipitation[b] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	837	3.14	0.03	27	2,599	0.11	92
Beans	2,257	0.75	0.03	73	1,612	0.47	1,061
Corn	2,011	1.96	0.03	65	3,877	0.14	282
Idle	6,188	0.15	0.03	201	731	0.00	0
Melons	399	1.12	0.00	0	446	0.04	16
Milo	554	1.96	0.03	18	1,068	0.02	11
Rice	22,932	3.08	0.03	745	69,838	0.06	1,376
Safflowers	160	1.90	0.03	5	299	0.06	10
Sunflowers	5,732	1.90	0.03	186	10,709	0.06	344
Tomatoes	4,317	1.71	0.03	140	7,248	0.08	345
Vineseed	591	0.87	0.03	19	497	0.18	106
Walnuts	29	3.21	0.03	1	92	0.16	5
Wheat	723	0.75	0.03	23	516	0.03	22
Crop Acres	46,730			1,506	99,533		3,670
Total Irrig. Acres	40,542	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 28,500 to 35,000 acre-feet in 2014).

[b]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Sutter Mutual Water Company_**

TABLE 6

Sutter Mutual Water Company – 2014 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	147,153
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	8,022
Available Soil Moisture[c]	Estimated	3,857
	Total Water Supplies =	**159,032**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	14,935
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,275
Riparian ET[d] (Canals/Laterals)	Estimated	411
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,472
	Total Distribution System =	**19,093**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	99,533
Evapotranspiration of Precip - ET_{pr}	Table 5	1,506
Cultural Practices *(includes Leaching Requirement)*	Table 5	3,670
	Total Crop Water Needs =	**104,709**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	22,932
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**5,123**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**74,162**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**30,107**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f] Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Sutter Mutual Water Company_**

TABLE 7

Sutter Mutual Water Company – 2014 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2005	136,706	54,241	-	-	190,947	12,344	-
2006	143,983	73,001	-	-	216,984	24,799	-
2007	167,922	56,467	-	-	224,389	38,231	-
2008	169,435	30,275	-	-	199,710	45,248	-
2009	153,526	35,436	-	-	188,962	57,303	-
2010	142,185	58,326	0	0	200,511	62,316	77,886
2011	136,388	57,423	0	0	193,811	55,954	98,092
2012	134,711	47,314	0	0	182,025	68,493	60,618
2013	163,680	41,675	0	0	205,355	33,062	71,625
2014	127,125	20,028	0	0	147,153	74,162	5,123
Total	1,348,536	454,158	0	0	1,802,694	397,750	308,221
Average	149,837	50,462	0	0	200,299	44,194	77,055

[a]Federal Ag Water Supply from Reclamation Water Account Records. Includes Project water transferred into SMWC in 2006 and 2010.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2010 are not available.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

[d]The Department quit measuring outflow Karnak after 2003; SMWC has calculated outflow since 2010. Data prior to 2010 are not available.

District/Company **Sutter Mutual Water Company**

TABLE 1

Sutter Mutual Water Company – 2015 Surface Water Supply
(April through October Period Only)
2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	10,537	0	0	0	10,537
May	32,120	0	0	0	32,120
June	32,728	0	0	0	32,728
July	28,865	7,421	0	0	36,286
August	15,000	8,590	0	0	23,590
September	2,818	0	0	0	2,818
October	4,125	651	0	0	4,776
TOTAL	126,193	16,662	0	0	142,855

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Sutter Mutual Water Company – 2015 Groundwater Supply
(April through October Period Only)
2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
November	0	0
December	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Sutter Mutual Water Company – 2015 Total District Water Supply (excluding reuse)
(April through October Period Only)
2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	10,537	0	10,537
May	32,120	0	32,120
June	32,728	0	32,728
July	36,286	0	36,286
August	23,590	0	23,590
September	2,818	0	2,818
October	4,776	0	4,776
TOTAL	142,855	0	142,855

[a]In addition to the water supplies shown in Table 3, 73,068 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Sutter Mutual Water Company**

Sutter Mutual Water Company – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.01	1.3	0.11
Feb	2.1	0.18	2.3	0.19
Mar	0.2	0.02	4.6	0.38
Apr	1.1	0.09	6.6	0.55
May	0.0	0.00	7.5	0.62
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	8.8	0.73
Aug	0.0	0.00	7.8	0.65
Sept	0.0	0.00	5.7	0.48
Oct	0.1	0.01	4.3	0.36
Nov	1.7	0.14	2.2	0.19
Dec	1.3	0.11	1.3	0.11
TOTAL-YR	6.7	0.56	61.0	5.08
TOTAL-Apr-Oct	**1.3**	**0.10**	**49.3**	**4.10**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Sutter Mutual Water Company – 2015 Distribution System Evaporation and Seepage (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Main Canal	39,690	90	82	9	337	2,460	(2,788)
West Canal	52,530	90	109	11	446	3,256	(3,690)
Central Canal	50,640	75	87	9	358	2,180	(2,529)
East Canal	71,970	75	124	13	509	3,098	(3,594)
Laterals	533,390	12	147	15	603	3,673	(4,261)
Sub-Laterals	146,060	8	27	3	110	268	(376)
TOTAL			575	60	2,362	14,935	(17,237)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Sutter Mutual Water Company_**

TABLE 5

Sutter Mutual Water Company – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

	Acres	Crop ET[a]	Effective Precipitation[b]		ETAW	Leaching Requirement	
Crop Name	**(crop acres)**	**(AF/Ac)**	**(AF/Ac)**	**(acre-feet)**	**(acre-feet)**	**(AF/Ac)**	**(acre-feet)**
Alfalfa	820	3.13	0.03	25	2,539	0.11	90
Beans	2,008	0.77	0.03	60	1,480	0.47	944
Corn	1,015	1.94	0.03	30	1,940	0.14	142
Idle	4,993	0.16	0.03	150	650	0.00	0
Melons	651	1.12	0.00	0	732	0.04	26
Milo	235	1.94	0.03	7	449	0.02	5
Rice	24,899	3.01	0.03	747	74,321	0.06	1,494
Rice Straw Decomp	3,963	0.50	0.03	119	1,863	0.00	0
Safflowers	977	1.84	0.03	29	1,767	0.06	59
Sunflowers	3,945	1.84	0.03	118	7,135	0.06	237
Tomatoes	5,412	1.65	0.03	162	8,785	0.08	433
Vineseed	894	0.91	0.03	27	790	0.18	161
Walnuts	45	3.18	0.03	1	142	0.16	7
Wheat	414	0.77	0.03	12	305	0.03	12
Crop Acres	50,271			1,489	102,897		3,610
Total Irrig. Acres	41,315	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 31,000 to 37,500 acre-feet in 2015).

[b]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Sutter Mutual Water Company**

TABLE 6

Sutter Mutual Water Company – 2015 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	142,855
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	4,824
Available Soil Moisture[c]	Estimated	1,333
	Total Water Supplies =	**149,011**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	14,935
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,302
Riparian ET[d] (Canals/Laterals)	Estimated	411
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,429
	Total Distribution System =	**19,077**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	102,897
Evapotranspiration of Precip - ET_{pr}	Table 5	1,489
Cultural Practices *(includes Leaching Requirement)*	Table 5	3,610
	Total Crop Water Needs =	**107,996**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	24,899
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	2,603
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**73,068**
	Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**19,335**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f] Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

District/Company **_Sutter Mutual Water Company_**

TABLE 7

Sutter Mutual Water Company – 2015 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2006	143,983	73,001	-	-	216,984	24,799	-
2007	167,922	56,467	-	-	224,389	38,231	-
2008	169,435	30,275	-	-	199,710	45,248	-
2009	153,526	35,436	-	-	188,962	57,303	-
2010	142,185	58,326	0	0	200,511	62,316	77,886
2011	136,388	57,423	0	0	193,811	55,954	98,092
2012	134,711	47,314	0	0	182,025	68,493	60,618
2013	163,680	41,675	0	0	205,355	33,062	71,625
2014	127,125	20,028	0	0	147,153	74,162	5,123
2015	126,193	16,662	0	0	142,855	73,068	2,603
Total	1,465,148	436,607	0	0	1,901,755	532,636	315,947
Average	146,515	43,661	0	0	190,176	53,264	52,658

[a]Federal Ag Water Supply from Reclamation Water Account Records. Includes Project water transferred into SMWC in 2006 and 2010.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2010 are not available.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

[d]The Department quit measuring outflow Karnak after 2003; SMWC has calculated outflow since 2010. Data prior to 2010 are not available.

Natomas Central Mutual Water Company

District/Company **Natomas Central Mutual Water District**

TABLE 1

Natomas Central Mutual Water District – 2013 Surface Water Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[b] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	4,350	0	0	0	4,350
May	19,198	0	0	0	19,198
June	14,776	0	0	0	14,776
July	13,085	7,200	0	0	20,285
August	3,900	9,197	0	0	13,097
September	2,209	0	0	0	2,209
October	136	0	0	0	136
TOTAL	57,654	16,397	0	0	74,051

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Water from non-Company lands enters the drainage system throughout the April through October period. The quantity for 2013 is unknown at this time but is included in the quantity recycled and reused shown in Table 6.

TABLE 2

Natomas Central Mutual Water District – 2013 Groundwater Supply
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	10	0
May	10	0
June	10	0
July	10	0
August	10	0
September	10	0
October	0	0
TOTAL	60	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Natomas Central Mutual Water District – 2013 Total District Water Supply (excluding reuse)
(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	4,350	10	4,360
May	19,198	10	19,208
June	14,776	10	14,786
July	20,285	10	20,295
August	13,097	10	13,107
September	2,209	10	2,219
October	136	0	136
TOTAL	74,051	60	74,111

[a]In addition to the water supplies shown in Table 3, 49,466 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Natomas Central Mutual Water District_**

Natomas Central Mutual Water District – 2013 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2013	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.9	0.07	1.7	0.14
Feb	0.2	0.02	2.9	0.25
Mar	1.2	0.10	4.4	0.37
Apr	0.7	0.06	7.4	0.62
May	0.1	0.01	8.3	0.69
Jun	0.2	0.02	8.3	0.69
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	7.6	0.63
Sept	0.6	0.05	5.7	0.48
Oct	0.0	0.00	4.6	0.39
Nov	0.9	0.07	2.8	0.23
Dec	0.3	0.02	2.1	0.18
TOTAL-YR	5.1	0.42	64.8	5.40
TOTAL-Apr-Oct	**1.6**	**0.13**	**50.9**	**4.24**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Natomas Central Mutual Water District – 2013 Distribution System Evaporation and Seepage (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Bennet System	44,700	56	58	8	245	579	(816)
Northern System	146,400	54	180	24	765	1,805	(2,546)
Prichard Lake Sys	204,400	54	252	33	1,066	2,515	(3,548)
Elkhorn System	75,100	44	76	10	323	762	(1,075)
Riverside System	65,800	46	69	9	293	692	(976)
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL			635	83	2,693	6,353	(8,962)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Natomas Central Mutual Water District_**

TABLE 5

Natomas Central Mutual Water District – 2013 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	841	3.23	0.01	11	2,707	0.11	93
Corn	398	1.97	0.01	3	778	0.14	56
Golf Course	215	3.38	0.01	3	723	0.03	6
Hops	99	0.99	0.01	1	97	0.18	18
Idle	259	0.17	0.01	3	42	0.00	0
Managed Marsh	760	2.97	0.01	10	2,247	0.00	0
Melons	22	1.12	0.00	0	25	0.04	1
Milo	152	1.97	0.01	1	297	0.02	3
Misc. Deciduous	7	2.91	0.01	0	21	0.16	1
Misc. field crops	448	1.77	0.01	4	787	0.18	81
Mixed Truck	20	0.99	0.01	0	20	0.18	4
Oats	150	0.86	0.01	1	127	0.02	3
Onions	10	0.95	0.01	0	9	0.28	3
Pasture	36	3.42	0.01	0	122	0.03	1
Pears	2	3.02	0.01	0	6	0.18	0
Pumpkins	57	1.12	0.00	0	64	0.04	2
Rice	14,688	3.06	0.01	191	44,803	0.06	881
Rice Straw Decomp	0	0.50	0.01	0	0	0.00	0
Safflowers	63	1.94	0.01	1	122	0.06	4
Squash	17	1.12	0.00	0	19	0.04	1
Sunflowers	812	1.94	0.01	7	1,567	0.06	49
Tomatoes	25	1.69	0.01	0	42	0.08	2
Wheat	737	0.86	0.01	6	625	0.03	22
Crop Acres	19,817			243	55,250		1,231
Total Irrig. Acres	19,558	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 18,250 to 22,000 acre-feet in 2013).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Natomas Central Mutual Water District_**

TABLE 6

Natomas Central Mutual Water District – 2013 District Water Balance

(April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	74,111
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	2,598
Available Soil Moisture[c]	Estimated	281
	Total Water Supplies =	**76,990**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	6,353
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,609
Riparian ET[d] (Canals/Laterals)	Estimated	526
Conveyance System Filling[e] (Canals/Laterals)	Estimated	741
	Total Distribution System =	**10,229**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	55,250
Evapotranspiration of Precip - ET_{pr}	Table 5	243
Cultural Practices *(includes Leaching Requirement)*	Table 5	1,231
	Total Crop Water Needs =	**56,725**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	14,688
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* =	3,952
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**49,466**
	Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**6,084**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Natomas Central Mutual Water District_**

TABLE 7

Natomas Central Mutual Water District – 2013 Annual Water Quantities Delivered under Each Right or Contract (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District Recapture (acre-feet)	District Outflow[d] (acre-feet)
2004	80,229	13,476	-	-	93,705	35,443	0
2005	58,239	22,000	-	-	80,239	33,030	0
2006	51,146	21,694	-	-	72,840	21,441	0
2007	51,847	13,008	-	-	64,855	39,502	0
2008	48,297	8,919	-	-	57,216	43,359	0
2009	41,778	10,997	-	-	52,775	44,224	0
2010	37,349	8,707	0	0	46,056	39,989	15,000
2011	35,685	8,322	0	0	44,007	59,923	15,115
2012	48,050	13,073	0	28,288	89,411	51,433	10,317
2013	57,654	16,397	0	0	74,051	49,466	3,952
Total	510,274	136,593	0	28,288	675,155	417,811	44,384
Average	51,027	13,659	0	7,072	67,516	41,781	4,438

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2010 not available.

[c]Estimated by District based on observation and historical information. Data prior to 2010 not available.

[d]Data prior to 2010 are not available.

District/Company **_Natomas Central Mutual Water District_**

TABLE 1

Natomas Central Mutual Water District – 2014 Surface Water Supply

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[b] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	636	0	0	0	636
May	19,511	0	0	0	19,511
June	16,659	0	0	0	16,659
July	14,962	5,400	0	0	20,362
August	2,925	9,693	0	0	12,618
September	842	0	0	0	842
October	2,720	0	0	0	2,720
TOTAL	58,255	15,093	0	0	73,348

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Water from non-Company lands enters the drainage system throughout the April through October period. The quantity for 2014 is unknown at this time but is included in the quantity recycled and reused shown in Table 6.

TABLE 2

Natomas Central Mutual Water District – 2014 Groundwater Supply

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	10	0
May	10	380
June	10	1,870
July	10	2,388
August	10	2,025
September	10	371
October	0	0
TOTAL	60	7,033

[a]Estimated by District based on observation and historical information.

TABLE 3

Natomas Central Mutual Water District – 2014 Total District Water Supply (excluding reuse)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	636	10	646
May	19,511	10	19,521
June	16,659	10	16,669
July	20,362	10	20,372
August	12,618	10	12,628
September	842	10	852
October	2,720	0	2,720
TOTAL	73,348	60	73,408

[a]In addition to the water supplies shown in Table 3, 65,147 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Natomas Central Mutual Water District_**

Natomas Central Mutual Water District – 2014 Distribution System Evaporation and Seepage Worksheet
2015 Sacramento Valley Regional Water Management Plan Annual Update

2014	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.2	0.02	2.4	0.20
Feb	3.7	0.31	2.0	0.17
Mar	1.6	0.14	4.1	0.34
Apr	1.2	0.10	5.9	0.49
May	0.1	0.01	8.4	0.70
Jun	0.0	0.00	9.1	0.76
Jul	0.0	0.00	8.9	0.74
Aug	0.1	0.01	7.3	0.61
Sept	0.4	0.03	5.8	0.48
Oct	0.3	0.03	4.1	0.34
Nov	1.2	0.10	1.8	0.15
Dec	7.3	0.60	1.1	0.09
TOTAL-YR	16.0	1.33	60.9	5.07
TOTAL-Apr-Oct	**2.1**	**0.17**	**49.5**	**4.13**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).
[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4
Natomas Central Mutual Water District – 2014 Distribution System Evaporation and Seepage
2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Bennet System	44,700	56	58	10	239	579	(808)
Northern System	146,400	54	180	31	744	1,805	(2,518)
Prichard Lake Sys	204,400	54	252	43	1,037	2,515	(3,509)
Elkhorn System	75,100	44	76	13	314	762	(1,063)
Riverside System	65,800	46	69	12	285	692	(965)
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL			635	109	2,620	6,353	(8,864)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Natomas Central Mutual Water District_**

TABLE 5

Natomas Central Mutual Water District – 2014 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	457	3.14	0.03	15	1,419	0.11	50
Corn	483	1.96	0.03	16	931	0.14	68
Golf Course	148	3.38	0.03	5	496	0.03	4
Hops	108	0.87	0.03	4	91	0.18	19
Idle	374	0.15	0.03	12	44	0.00	0
Managed Marsh	726	2.97	0.03	24	2,131	0.00	0
Melons	32	1.12	0.00	0	36	0.04	1
Milo	50	1.96	0.03	2	96	0.02	1
Misc. Deciduous	93	2.86	0.03	3	264	0.16	15
Misc. field crops	309	1.77	0.03	10	536	0.18	56
Mixed Truck	1	0.87	0.03	0	1	0.18	0
Oats	55	0.75	0.03	2	39	0.02	1
Onions	15	0.87	0.03	0	13	0.28	4
Pasture	21	3.33	0.03	1	69	0.03	1
Pears	2	2.98	0.03	0	6	0.18	0
Pumpkins	10	1.12	0.00	0	11	0.04	0
Rice	16,519	3.08	0.03	537	50,310	0.06	991
Rice Straw Decomp	2,929	0.50	0.03	95	1,369	0.00	0
Safflowers	66	1.90	0.03	2	123	0.06	4
Squash	52	1.12	0.00	0	58	0.04	2
Sunflowers	685	1.90	0.03	22	1,280	0.06	41
Tomatoes	145	1.71	0.03	5	243	0.08	12
Wheat	530	0.75	0.03	17	378	0.03	16
Crop Acres	23,810			771	59,946		1,286
Total Irrig. Acres	20,507	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 20,550 to 24,850 acre-feet in 2014).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Natomas Central Mutual Water District**

TABLE 6

Natomas Central Mutual Water District – 2014 District Water Balance

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	73,408
Private Groundwater	Table 2	7,033
Inflow From Precip[b]	Estimated	3,017
Available Soil Moisture[c]	Estimated	589
	Total Water Supplies =	**84,048**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	6,353
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,511
Riparian ET[d] (Canals/Laterals)	Estimated	559
Conveyance System Filling[e] (Canals/Laterals)	Estimated	733
	Total Distribution System =	**10,156**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	59,946
Evapotranspiration of Precip - ET_{pr}	Table 5	771
Cultural Practices *(includes Leaching Requirement)*	Table 5	1,286
	Total Crop Water Needs =	**62,003**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	16,519
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	2,028
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**65,147**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**9,862**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Natomas Central Mutual Water District_**

TABLE 7

Natomas Central Mutual Water District – 2014 Annual Water Quantities Delivered under Each Right or Contract

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2005	58,239	22,000	-	-	80,239	33,030	-
2006	51,146	21,694	-	-	72,840	21,441	-
2007	51,847	13,008	-	-	64,855	39,502	-
2008	48,297	8,919	-	-	57,216	43,359	-
2009	41,778	10,997	-	-	52,775	44,224	-
2010	37,349	8,707	0	0	46,056	39,989	15,000
2011	35,685	8,322	0	0	44,007	59,923	15,115
2012	48,050	13,073	0	0	89,411	51,433	10,317
2013	57,654	16,397	0	0	74,051	49,466	3,952
2014	58,255	15,093	0	0	73,348	65,147	2,028
Total	430,045	123,117	0	0	581,450	382,368	44,384
Average	47,783	13,680	0	0	64,606	42,485	11,096

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2010 not available.

[c]Estimated by District based on observation and historical information. Data prior to 2010 not available.

[d]Data prior to 2010 are not available.

District/Company **Natomas Central Mutual Water District**

TABLE 1

Natomas Central Mutual Water District – 2015 Surface Water Supply

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[b] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	3,620	0	0	0	3,620
May	17,147	0	0	0	17,147
June	16,821	0	0	0	16,821
July	13,341	5,400	0	0	18,741
August	2,925	8,018	0	0	10,943
September	316	0	0	0	316
October	30	0	0	0	30
TOTAL	54,200	13,418	0	0	67,618

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Water from non-Company lands enters the drainage system throughout the April through October period. The quantity for 2015 is unknown at this time but is included in the quantity recycled and reused shown in Table 6.

TABLE 2

Natomas Central Mutual Water District – 2015 Groundwater Supply

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	10	2,171
June	10	3,916
July	10	3,149
August	10	3,420
September	10	1,991
October	0	0
TOTAL	50	14,647

[a]Estimated by District based on observation and historical information.

TABLE 3

Natomas Central Mutual Water District – 2015 Total District Water Supply (excluding reuse)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	3,620	0	3,620
May	17,147	10	17,157
June	16,821	10	16,831
July	18,741	10	18,751
August	10,943	10	10,953
September	316	10	326
October	30	0	30
TOTAL	67,618	50	67,668

[a]In addition to the water supplies shown in Table 3, 53,092 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Natomas Central Mutual Water District**

Natomas Central Mutual Water District – 2015 Distribution System Evaporation and Seepage Worksheet

2015 Sacramento Valley Regional Water Management Plan Annual Update

2015	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.01	1.3	0.11
Feb	2.1	0.18	2.3	0.19
Mar	0.2	0.02	4.6	0.38
Apr	1.1	0.09	6.6	0.55
May	0.0	0.00	7.5	0.62
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	8.8	0.73
Aug	0.0	0.00	7.8	0.65
Sept	0.0	0.00	5.7	0.48
Oct	0.1	0.01	4.3	0.36
Nov	1.7	0.14	2.2	0.19
Dec	1.3	0.11	1.3	0.11
TOTAL-YR	6.7	0.56	61.0	5.08
TOTAL-Apr-Oct	**1.3**	**0.10**	**49.3**	**4.10**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

TABLE 4

Natomas Central Mutual Water District – 2015 Distribution System Evaporation and Seepage

2015 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Bennet System	44,700	56	58	6	238	579	(810)
Northern System	146,400	54	180	19	741	1,805	(2,527)
Prichard Lake Sys	204,400	54	252	26	1,032	2,515	(3,521)
Elkhorn System	75,100	44	76	8	313	762	(1,067)
Riverside System	65,800	46	69	7	284	692	(969)
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL			635	66	2,608	6,353	(8,894)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Natomas Central Mutual Water District_**

TABLE 5

Natomas Central Mutual Water District – 2015 Crop Consumptive Use Water Needs (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	570	3.13	0.03	17	1,765	0.11	63
Beans	85	0.77	0.03	3	63	0.47	40
Corn	49	1.94	0.03	1	93	0.14	7
Golf Course	120	3.38	0.03	4	402	0.03	4
Hops	4	0.91	0.03	0	4	0.18	1
Idle	1,132	0.16	0.03	34	147	0.00	0
Kiwis	1	2.92	0.03	0	2	0.18	0
Managed Marsh	743	2.97	0.03	22	2,184	0.00	0
Melons	3	1.12	0.00	0	4	0.04	0
Milo	59	1.94	0.03	2	112	0.02	1
Misc. field crops	329	1.74	0.03	10	562	0.18	59
Oats	655	0.77	0.03	20	483	0.02	13
Onions	18	0.86	0.03	1	15	0.28	5
Pasture	31	3.31	0.03	1	102	0.03	1
Pears	1	2.95	0.03	0	2	0.18	0
Peppers	3	1.65	0.03	0	5	0.08	0
Pumpkins	35	1.12	0.00	0	40	0.04	1
Rice	15,876	3.01	0.03	476	47,388	0.06	953
Rice Straw Decomp	0	0.50	0.03	0	0	0.00	0
Squash	165	1.12	0.00	0	185	0.04	7
Sunflowers	205	1.84	0.03	6	370	0.06	12
Tomatoes	58	1.65	0.03	2	94	0.08	5
Crop Acres	20,141			598	54,022		1,172
Total Irrig. Acres	19,009	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 19,850 to 24,000 acre-feet in 2015).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field

District/Company **_Natomas Central Mutual Water District_**

TABLE 6

Natomas Central Mutual Water District – 2015 District Water Balance

2015 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	67,668
Private Groundwater	Table 2	14,647
Inflow From Precip[b]	Estimated	2,098
Available Soil Moisture[c]	Estimated	219
	Total Water Supplies =	**84,632**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	6,353
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,541
Riparian ET[d] (Canals/Laterals)	Estimated	592
Conveyance System Filling[e] (Canals/Laterals)	Estimated	676
	Total Distribution System =	**10,162**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	54,022
Evapotranspiration of Precip - ET_{pr}	Table 5	598
Cultural Practices *(includes Leaching Requirement)*	Table 5	1,172
	Total Crop Water Needs =	**55,793**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	15,876
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* =	2,167
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**53,092**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**16,510**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

District/Company **_Natomas Central Mutual Water District_**

TABLE 7

Natomas Central Mutual Water District – 2015 Annual Water Quantities Delivered under Each Right or Contract (April through October Period Only)

2015 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag	Upslope		District	
	Base Supply (acre-feet)	Project Water (acre-feet)	Water Supply[b] (acre-feet)	Drainwater[c] (acre-feet)	Total (acre-feet)	Recapture (acre-feet)	Outflow[d] (acre-feet)
2006	51,146	21,694	-	-	72,840	21,441	-
2007	51,847	13,008	-	-	64,855	39,502	-
2008	48,297	8,919	-	-	57,216	43,359	-
2009	41,778	10,997	-	-	52,775	44,224	-
2010	37,349	8,707	0	0	46,056	39,989	15,000
2011	35,685	8,322	0	0	44,007	59,923	15,115
2012	48,050	13,073	0	28,288	89,411	51,433	10,317
2013	57,654	16,397	0	0	74,051	49,466	3,952
2014	58,255	15,093	0	0	73,348	65,147	2,028
2015	54,200	13,418	0	0	67,618	53,092	2,167
Total	484,261	129,628	0	28,288	642,177	467,577	48,579
Average	48,426	12,963	0	4,715	64,218	46,758	8,097

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2010 not available.

[c]Estimated by District based on observation and historical information. Data prior to 2010 not available.

[d]Data prior to 2010 are not available.

2013–2015 Crop Evapotranspiration Tables: Redding Sub-basin

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Evapotranspiration and Effective Precipitation - 2013
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	2013	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**0.33**	**0.67**	**0.51**	**0.00**	**0.01**	**0.48**	**0.00**		**0.33**	**0.67**	**0.51**	**0.00**	**0.01**	**0.48**	**0.00**	
	Grass Reference ETo	**6.29**	**7.64**	**8.52**	**9.12**	**7.39**	**5.66**	**4.26**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover	6.53	6.45	7.34	7.60	6.44	4.80	0.00	3.26	0.00	0.10	0.01	0.00	0.00	0.00	0.00	0.01
Pasture	Pasture and Misc. Grasses	5.44	6.96	7.94	8.41	6.77	5.14	0.00	3.39	0.00	0.10	0.01	0.00	0.00	0.00	0.00	0.01
Walnuts	Walnuts	2.91	5.82	8.87	9.39	7.62	5.13	0.00	3.31	0.00	0.10	0.01	0.00	0.00	0.00	0.00	0.01

Source: Kc values from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.
Notes:
Crop ET (ETc) was calculated as ETo for CIMIS Station at Gerber (#8) x Kc based on ITRC Dry Year ETc for Zone 14 surface irrigation for water balances. Water Needs do not include water required for cultural practices
Precipitation is the 2013 monthly precipitation reported for the CIMIS Station at Gerber (#8).
Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

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Evapotranspiration and Effective Precipitation - 2014
2015 Sacramento Valley Regional Water Management Plan Annual Update

	2014	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**0.13**	**0.01**	**0.00**	**0.00**	**0.04**	**0.83**	**1.22**		**0.13**	**0.01**	**0.00**	**0.00**	**0.04**	**0.83**	**1.22**	
	Grass Reference ETo	**4.86**	**7.3**	**8.61**	**8.61**	**7.56**	**5.63**	**2.97**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover	5.05	6.16	7.42	7.18	6.59	4.78	0.00	3.10	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.02
Pasture	Pasture and Misc. Grasses	4.20	6.65	8.02	7.94	6.92	5.11	0.00	3.24	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.02
Walnuts	Walnuts	2.25	5.56	8.96	8.86	7.79	5.10	0.00	3.21	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.02

Source: Kc values from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.
Notes:
Crop ET (ETc) was calculated as ETo for CIMIS Station at Shasta College (#224) x Kc based on ITRC Dry Year ETc for Zone 14 surface irrigation for water balances. Water Needs do not include water required for cultural practices
Precipitation is the 2014 monthly precipitation reported for the CIMIS Station at Shasta College (#224).
Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

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Evapotranspiration and Effective Precipitation - 2015
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	2015	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**1.31**	**0.01**	**0.00**	**0.01**	**0.00**	**0.05**	**0.19**		**1.31**	**0.01**	**0.00**	**0.01**	**0.00**	**0.05**	**0.19**	
	Grass Reference ETo	**6.13**	**7.42**	**8.7**	**8.37**	**7.16**	**5.11**	**3.97**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover	6.37	6.26	7.50	6.98	6.24	4.34	0.00	3.14	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Pasture	Pasture and Misc. Grasses	5.30	6.76	8.10	7.72	6.56	4.64	0.00	3.26	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Walnuts	Walnuts	2.83	5.65	9.06	8.62	7.38	4.63	0.00	3.18	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.04

Source: Kc values from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.
Notes:
Crop ET (ETc) was calculated as ETo for CIMIS Station at Gerber South (#222) x Kc based on ITRC Dry Year ETc for Zone 14 surface irrigation for water balances. Water Needs do not include water required for cultural practices
Precipitation is the 2014 monthly precipitation reported for the CIMIS Station at Gerber South (#222)
Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

2013–2015 Crop Evapotranspiration Tables: Colusa, Butte, Sutter, and American Sub-basins

Regional Water Management Plan Update

Evapotranspiration and Effective Precipitation - 2013

2015 Sacramento Valley Regional Water Management Plan Annual Update

	2013	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**0.66**	**0.13**	**0.18**	**0.00**	**0.00**	**0.60**	**0.00**		**0.66**	**0.13**	**0.18**	**0.00**	**0.00**	**0.60**	**0.00**	
	Grass Reference ETo	**6.73**	**7.50**	**7.54**	**8.17**	**6.90**	**5.19**	**4.21**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover	7.09	6.35	6.47	6.68	6.00	4.37	1.80	3.23	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Almonds	Almonds	4.76	6.05	6.17	6.86	5.60	4.28	2.87	3.05	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Barley	Grain and Grain Hay	6.88	3.39	0.00	0.00	0.00	0.00	0.00	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Beans	Grain and Grain Hay	6.88	3.39	0.00	0.00	0.00	0.00	0.00	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Buckwheat	Grain and Grain Hay	6.88	3.39	0.00	0.00	0.00	0.00	0.00	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Cantelope	Melons, Squash, and Cucumbers	0.00	0.86	1.34	4.57	5.23	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Chestnuts	Almonds	4.76	6.05	6.17	6.86	5.60	4.28	2.87	3.05	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Corn	Corn and Grain Sorghum	2.33	2.46	6.41	7.62	4.77	0.00	0.00	1.97	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Cotton	Cotton	2.24	1.42	4.34	7.98	6.85	4.74	1.41	2.41	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Cover Crop	Pasture and Misc. Grasses	5.88	6.82	6.89	7.39	6.29	4.74	2.97	3.42	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Cucumbers	Melons, Squash, and Cucumbers	0.00	0.86	1.34	4.57	5.23	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Golf course	N/A								3.38	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Grain	Grain and Grain Hay	6.88	3.39	0.00	0.00	0.00	0.00	0.00	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Grapes	Grape Vines with 80% canopy	2.52	3.33	5.45	5.68	4.56	2.71	0.00	2.02	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Habitat	Citrus (no ground cover)	5.53	4.92	4.95	5.18	4.43	3.42	2.70	2.59	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Habitat	N/A								3.24	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Hay	Grain and Grain Hay	6.88	3.39	0.00	0.00	0.00	0.00	0.00	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Hops	Small Vegetables	6.75	1.78	0.19	0.00	1.03	1.37	0.77	0.99	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Idle	Idle	1.45	0.11	0.19	0.00	0.02	0.21	0.12	0.17	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Kiwis	N/A								2.92	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Managed Marsh	N/A								2.97	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Melons	Melons, Squash, and Cucumbers	0.00	0.86	1.34	4.57	5.23	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Melons, Squash	Melons, Squash, and Cucumbers	0.00	0.86	1.34	4.57	5.23	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Milo	Corn and Grain Sorghum	2.33	2.46	6.41	7.62	4.77	0.00	0.00	1.97	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Misc. Deciduous	Misc. Deciduous	4.01	5.67	6.24	6.71	5.75	4.11	2.41	2.91	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Misc. field crops	Misc. field crops	2.33	2.52	6.55	7.23	2.55	0.00	0.00	1.77	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Mixed Truck	Small Vegetables	6.75	1.78	0.19	0.00	1.03	1.37	0.77	0.99	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Oats	Grain and Grain Hay	6.88	3.39	0.00	0.00	0.00	0.00	0.00	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Olives	Avocado	4.01	5.67	6.24	6.71	5.75	4.11	2.41	2.91	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Onions	Onions and Garlic	5.79	4.81	0.81	0.00	0.00	0.00	0.00	0.95	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Pasture	Pasture and Misc. Grasses	5.88	6.82	6.89	7.39	6.29	4.74	2.97	3.42	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Peach	Peach, Nectarine and Apricots	3.87	5.83	6.50	6.97	5.97	4.38	2.28	2.98	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Pears	Apple, Pear, Cherry, Plum and Prune	4.11	5.99	6.52	7.18	5.91	4.37	2.23	3.02	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Pecans	Almonds	4.76	6.05	6.17	6.86	5.60	4.28	2.87	3.05	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Peppers	Tomatoes and Peppers	2.17	3.83	7.34	6.53	0.42	0.00	0.00	1.69	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Persimmons	Apple, Pear, Cherry, Plum and Prune	4.11	5.99	6.52	7.18	5.91	4.37	2.23	3.02	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Prunes	Apple, Pear, Cherry, Plum and Prune	4.11	5.99	6.52	7.18	5.91	4.37	2.23	3.02	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Pumpkins	Melons, Squash, and Cucumbers	0.00	0.86	1.34	4.57	5.23	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Rice	Rice	2.09	6.99	8.38	9.18	7.71	2.41	0.00	3.06	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Rice Straw Decomp	N/A								0.5	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Safflowers	Safflower and Sunflower	6.54	7.91	7.37	1.44	0.00	0.00	0.00	1.94	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Squash	Melons, Squash, and Cucumbers	0.00	0.86	1.34	4.57	5.23	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Strawberries	Strawberries	2.33	2.52	6.55	7.23	2.55	0.00	0.00	1.77	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Sudan	Pasture and Misc. Grasses	5.88	6.82	6.89	7.39	6.29	4.74	2.97	3.42	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Sunflowers	Safflower and Sunflower	6.54	7.91	7.37	1.44	0.00	0.00	0.00	1.94	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Tomatoes	Tomatoes and Peppers	2.17	3.83	7.34	6.53	0.42	0.00	0.00	1.69	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Vegetables	Small Vegetables	6.75	1.78	0.19	0.00	1.03	1.37	0.77	0.99	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01

Regional Water Management Plan Update

Evapotranspiration and Effective Precipitation - 2013

2015 Sacramento Valley Regional Water Management Plan Annual Update

	2013	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**0.66**	**0.13**	**0.18**	**0.00**	**0.00**	**0.60**	**0.00**		**0.66**	**0.13**	**0.18**	**0.00**	**0.00**	**0.60**	**0.00**	
	Grass Reference ETo	**6.73**	**7.50**	**7.54**	**8.17**	**6.90**	**5.19**	**4.21**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Vetch	Pasture and Misc. Grasses	5.88	6.82	6.89	7.39	6.29	4.74	2.97	3.42	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Vineseed	Small Vegetables	6.75	1.78	0.19	0.00	1.03	1.37	0.77	0.99	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Walnuts	Walnuts	3.35	5.62	7.64	8.15	6.84	4.71	2.65	3.25	0.10	0.00	0.00	0.00	0.00	0.06	0.00	0.01
Watermelon	Melons, Squash, and Cucumbers	0.00	0.86	1.34	4.57	5.23	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Wheat	Grain and Grain Hay	6.88	3.39	0.00	0.00	0.00	0.00	0.00	0.86	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01

Source: Kc values from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.

Notes:

Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres.

Precipitation is the 2013 average monthly precipitation reported for the CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

Regional Water Management Plan Update

Evapotranspiration and Effective Precipitation - 2014

2015 Sacramento Valley Regional Water Management Plan Annual Update

	2014	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**1.15**	**0.11**	**0.00**	**0.00**	**0.06**	**0.40**	**0.34**		**1.15**	**0.11**	**0.00**	**0.00**	**0.06**	**0.40**	**0.34**	
	Grass Reference ETo	**5.38**	**7.65**	**8.28**	**8.05**	**6.66**	**5.27**	**3.71**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover	5.67	6.47	7.11	6.58	5.79	4.43	1.59	3.14	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Almonds	Almonds	3.81	6.17	6.78	6.76	5.41	4.34	2.53	2.98	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Barley	Grain and Grain Hay	5.50	3.46	0.00	0.00	0.00	0.00	0.00	0.75	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Beans	Grain and Grain Hay	5.50	3.46	0.00	0.00	0.00	0.00	0.00	0.75	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Buckwheat	Grain and Grain Hay	5.50	3.46	0.00	0.00	0.00	0.00	0.00	0.75	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Cantelope	Melons, Squash, and Cucumbers	0.00	0.88	1.48	4.50	5.05	1.51	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chestnuts	Almonds	3.81	6.17	6.78	6.76	5.41	4.34	2.53	2.98	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Corn	Corn and Grain Sorghum	1.86	2.51	7.04	7.51	4.60	0.00	0.00	1.96	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Cotton	Cotton	1.79	1.45	4.76	7.86	6.61	4.82	1.24	2.38	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Cover Crop	Pasture and Misc. Grasses	4.70	6.95	7.57	7.28	6.08	4.82	2.61	3.33	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Cucumbers	Melons, Squash, and Cucumbers	0.00	0.88	1.48	4.50	5.05	1.51	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Golf course	N/A								3.38	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Grain	Grain and Grain Hay	5.50	3.46	0.00	0.00	0.00	0.00	0.00	0.75	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Grapes	Grape Vines with 80% canopy	2.01	3.40	5.99	5.59	4.41	2.75	0.00	2.01	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Habitat	Citrus (no ground cover)	4.42	5.01	5.44	5.10	4.28	3.48	2.38	2.51	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Habitat	N/A								3.24	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Hay	Grain and Grain Hay	5.50	3.46	0.00	0.00	0.00	0.00	0.00	0.75	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Hops	Small Vegetables	5.40	1.81	0.21	0.00	0.99	1.39	0.68	0.87	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Idle	Idle	1.16	0.11	0.21	0.00	0.02	0.21	0.10	0.15	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Kiwis	N/A								2.92	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Managed Marsh	N/A								2.97	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Melons	Melons, Squash, and Cucumbers	0.00	0.88	1.48	4.50	5.05	1.51	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Melons, Squash	Melons, Squash, and Cucumbers	0.00	0.88	1.48	4.50	5.05	1.51	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Milo	Corn and Grain Sorghum	1.86	2.51	7.04	7.51	4.60	0.00	0.00	1.96	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Misc. Deciduous	Misc. Deciduous	3.20	5.79	6.86	6.61	5.55	4.17	2.12	2.86	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Misc. field crops	Misc. field crops	1.86	2.57	7.19	7.12	2.46	0.00	0.00	1.77	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Mixed Truck	Small Vegetables	5.40	1.81	0.21	0.00	0.99	1.39	0.68	0.87	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Oats	Grain and Grain Hay	5.50	3.46	0.00	0.00	0.00	0.00	0.00	0.75	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Olives	Avocado	3.20	5.79	6.86	6.61	5.55	4.17	2.12	2.86	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Onions	Onions and Garlic	4.63	4.91	0.89	0.00	0.00	0.00	0.00	0.87	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pasture	Pasture and Misc. Grasses	4.70	6.95	7.57	7.28	6.08	4.82	2.61	3.33	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Peach	Peach, Nectarine and Apricots	3.09	5.95	7.15	6.86	5.76	4.44	2.01	2.94	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pears	Apple, Pear, Cherry, Plum and Prune	3.28	6.11	7.16	7.07	5.70	4.43	1.97	2.98	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pecans	Almonds	3.81	6.17	6.78	6.76	5.41	4.34	2.53	2.98	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Peppers	Tomatoes and Peppers	1.73	3.90	8.06	6.44	0.41	0.00	0.00	1.71	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Persimmons	Apple, Pear, Cherry, Plum and Prune	3.28	6.11	7.16	7.07	5.70	4.43	1.97	2.98	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Prunes	Apple, Pear, Cherry, Plum and Prune	3.28	6.11	7.16	7.07	5.70	4.43	1.97	2.98	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pumpkins	Melons, Squash, and Cucumbers	0.00	0.88	1.48	4.50	5.05	1.51	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rice	Rice	1.67	7.13	9.21	9.04	7.44	2.45	0.00	3.08	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Rice Straw Decomp	N/A								0.5	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Safflowers	Safflower and Sunflower	5.23	8.07	8.10	1.42	0.00	0.00	0.00	1.90	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Squash	Melons, Squash, and Cucumbers	0.00	0.88	1.48	4.50	5.05	1.51	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Strawberries	Strawberries	1.86	2.57	7.19	7.12	2.46	0.00	0.00	1.77	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Sudan	Pasture and Misc. Grasses	4.70	6.95	7.57	7.28	6.08	4.82	2.61	3.33	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Sunflowers	Safflower and Sunflower	5.23	8.07	8.10	1.42	0.00	0.00	0.00	1.90	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Tomatoes	Tomatoes and Peppers	1.73	3.90	8.06	6.44	0.41	0.00	0.00	1.71	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03

Regional Water Management Plan Update

Evapotranspiration and Effective Precipitation - 2014

2015 Sacramento Valley Regional Water Management Plan Annual Update

	2014	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**1.15**	**0.11**	**0.00**	**0.00**	**0.06**	**0.40**	**0.34**		**1.15**	**0.11**	**0.00**	**0.00**	**0.06**	**0.40**	**0.34**	
	Grass Reference ETo	**5.38**	**7.65**	**8.28**	**8.05**	**6.66**	**5.27**	**3.71**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Vegetables	Small Vegetables	5.40	1.81	0.21	0.00	0.99	1.39	0.68	0.87	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Vetch	Pasture and Misc. Grasses	4.70	6.95	7.57	7.28	6.08	4.82	2.61	3.33	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Vineseed	Small Vegetables	5.40	1.81	0.21	0.00	0.99	1.39	0.68	0.87	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Walnuts	Walnuts	2.68	5.73	8.39	8.03	6.60	4.79	2.34	3.21	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Watermelon	Melons, Squash, and Cucumbers	0.00	0.88	1.48	4.50	5.05	1.51	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wheat	Grain and Grain Hay	5.50	3.46	0.00	0.00	0.00	0.00	0.00	0.75	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.03

Source: Kc values from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.

Notes:

Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres.

Precipitation is the 2014 average monthly precipitation reported for the CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

Regional Water Management Plan Update

Evapotranspiration and Effective Precipitation - 2015

2015 Sacramento Valley Regional Water Management Plan Annual Update

	2015	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**1.10**	**0.01**	**0.00**	**0.01**	**0.01**	**0.03**	**0.09**		**1.10**	**0.01**	**0.00**	**0.01**	**0.01**	**0.03**	**0.09**	
	Grass Reference ETo	**6.00**	**6.79**	**7.84**	**7.98**	**7.06**	**5.21**	**3.90**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover	6.33	5.74	6.73	6.52	6.14	4.38	1.67	3.13	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Almonds	Almonds	4.25	5.48	6.42	6.70	5.73	4.29	2.66	2.96	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Barley	Grain and Grain Hay	6.13	3.07	0.00	0.00	0.00	0.00	0.00	0.77	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Beans	Grain and Grain Hay	6.13	3.07	0.00	0.00	0.00	0.00	0.00	0.77	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Buckwheat	Grain and Grain Hay	6.13	3.07	0.00	0.00	0.00	0.00	0.00	0.77	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Cantelope	Melons, Squash, and Cucumbers	0.00	0.78	1.40	4.46	5.36	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chestnuts	Almonds	4.25	5.48	6.42	6.70	5.73	4.29	2.66	2.96	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Corn	Corn and Grain Sorghum	2.08	2.23	6.67	7.44	4.88	0.00	0.00	1.94	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Cotton	Cotton	2.00	1.28	4.51	7.79	7.00	4.76	1.30	2.39	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Cover Crop	Pasture and Misc. Grasses	5.25	6.17	7.17	7.22	6.44	4.76	2.75	3.31	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Cucumbers	Melons, Squash, and Cucumbers	0.00	0.78	1.40	4.46	5.36	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Golf course	N/A								3.38	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Grain	Grain and Grain Hay	6.13	3.07	0.00	0.00	0.00	0.00	0.00	0.77	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Grapes	Grape Vines with 80% canopy	2.25	3.01	5.67	5.54	4.67	2.72	0.00	1.99	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Habitat	Citrus (no ground cover)	4.93	4.45	5.15	5.06	4.54	3.44	2.50	2.51	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Habitat	N/A								3.24	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Hay	Grain and Grain Hay	6.13	3.07	0.00	0.00	0.00	0.00	0.00	0.77	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Hops	Small Vegetables	6.02	1.61	0.20	0.00	1.05	1.37	0.71	0.91	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Idle	Idle	1.29	0.10	0.20	0.00	0.02	0.21	0.11	0.16	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Kiwis	N/A								2.92	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Managed Marsh	N/A								2.97	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Melons	Melons, Squash, and Cucumbers	0.00	0.78	1.40	4.46	5.36	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Melons, Squash	Melons, Squash, and Cucumbers	0.00	0.78	1.40	4.46	5.36	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Milo	Corn and Grain Sorghum	2.08	2.23	6.67	7.44	4.88	0.00	0.00	1.94	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Misc. Deciduous	Misc. Deciduous	3.57	5.14	6.50	6.56	5.89	4.12	2.23	2.83	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Misc. field crops	Misc. field crops	2.08	2.28	6.81	7.06	2.61	0.00	0.00	1.74	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Mixed Truck	Small Vegetables	6.02	1.61	0.20	0.00	1.05	1.37	0.71	0.91	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Oats	Grain and Grain Hay	6.13	3.07	0.00	0.00	0.00	0.00	0.00	0.77	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Olives	Avocado	3.57	5.14	6.50	6.56	5.89	4.12	2.23	2.83	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Onions	Onions and Garlic	5.17	4.36	0.85	0.00	0.00	0.00	0.00	0.86	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pasture	Pasture and Misc. Grasses	5.25	6.17	7.17	7.22	6.44	4.76	2.75	3.31	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Peach	Peach, Nectarine and Apricots	3.45	5.28	6.77	6.80	6.11	4.39	2.11	2.91	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pears	Apple, Pear, Cherry, Plum and Prune	3.66	5.42	6.78	7.01	6.04	4.38	2.07	2.95	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pecans	Almonds	4.25	5.48	6.42	6.70	5.73	4.29	2.66	2.96	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Peppers	Tomatoes and Peppers	1.93	3.46	7.63	6.38	0.43	0.00	0.00	1.65	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Persimmons	Apple, Pear, Cherry, Plum and Prune	3.66	5.42	6.78	7.01	6.04	4.38	2.07	2.95	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Prunes	Apple, Pear, Cherry, Plum and Prune	3.66	5.42	6.78	7.01	6.04	4.38	2.07	2.95	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pumpkins	Melons, Squash, and Cucumbers	0.00	0.78	1.40	4.46	5.36	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rice	Rice	1.87	6.32	8.72	8.96	7.89	2.42	0.00	3.01	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Rice Straw Decomp	N/A								0.5	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Safflowers	Safflower and Sunflower	5.83	7.16	7.67	1.40	0.00	0.00	0.00	1.84	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Squash	Melons, Squash, and Cucumbers	0.00	0.78	1.40	4.46	5.36	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Strawberries	Strawberries	2.08	2.28	6.81	7.06	2.61	0.00	0.00	1.74	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Sudan	Pasture and Misc. Grasses	5.25	6.17	7.17	7.22	6.44	4.76	2.75	3.31	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Sunflowers	Safflower and Sunflower	5.83	7.16	7.67	1.40	0.00	0.00	0.00	1.84	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Tomatoes	Tomatoes and Peppers	1.93	3.46	7.63	6.38	0.43	0.00	0.00	1.65	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Vegetables	Small Vegetables	6.02	1.61	0.20	0.00	1.05	1.37	0.71	0.91	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03

Regional Water Management Plan Update

Evapotranspiration and Effective Precipitation - 2015

2015 Sacramento Valley Regional Water Management Plan Annual Update

	2015	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**1.10**	**0.01**	**0.00**	**0.01**	**0.01**	**0.03**	**0.09**		**1.10**	**0.01**	**0.00**	**0.01**	**0.01**	**0.03**	**0.09**	
	Grass Reference ETo	**6.00**	**6.79**	**7.84**	**7.98**	**7.06**	**5.21**	**3.90**									**60%**
Vetch	Pasture and Misc. Grasses	5.25	6.17	7.17	7.22	6.44	4.76	2.75	3.31	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Vineseed	Small Vegetables	6.02	1.61	0.20	0.00	1.05	1.37	0.71	0.91	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Walnuts	Walnuts	2.99	5.09	7.95	7.96	6.99	4.73	2.46	3.18	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Watermelon	Melons, Squash, and Cucumbers	0.00	0.78	1.40	4.46	5.36	1.49	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wheat	Grain and Grain Hay	6.13	3.07	0.00	0.00	0.00	0.00	0.00	0.77	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.03

Source: Kc values from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.

Notes:

Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235) x Kc based on ITRC Dry Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres.

Precipitation is the 2015 average monthly precipitation reported for the CIMIS Stations at Davis (#6), Colusa (#32) and Verona (#235).

Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

Appendix F
2016 Sacramento River Settlement Contractor Water Balance Tables

APPENDIX F

2016 Sacramento River Settlement Contractor Water Balance Tables

Appendix F presents water balance tables for 2016 for the following districts:

- Anderson-Cottonwood Irrigation District
- Glenn-Colusa Irrigation District
- Provident Irrigation District
- Princeton-Codora-Glenn Irrigation District
- Reclamation District No. 108
- Reclamation District No. 1004
- Meridian Farms Water Company
- Sutter Mutual Water Company
- Natomas Central Mutual Water Company

In addition, crop evapotranspiration tables are presented for Redding, Colusa, Butte, Sutter, and American Sub-basins.

Anderson-Cottonwood Irrigation District

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 1

Anderson Cottonwood Irrigation District – 2016 Surface Water Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	12,524	0	0	0	12,524
May	18,086	0	0	0	18,086
June	16,712	0	0	0	16,712
July	17,179	0	0	0	17,179
August	17,310	0	0	0	17,310
September	15,837	0	0	0	15,837
October	5,456	0	0	0	5,456
TOTAL	103,104	0	0	0	103,104

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Anderson Cottonwood Irrigation District – 2016 Groundwater Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Anderson Cottonwood Irrigation District – 2016 Total District Water Supply (excluding reuse)
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	12,524	0	12,524
May	18,086	0	18,086
June	16,712	0	16,712
July	17,179	0	17,179
August	17,310	0	17,310
September	15,837	0	15,837
October	5,456	0	5,456
TOTAL	103,104	0	103,104

[a]In addition to the water supplies shown in Table 3, 3,350 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Anderson Cottonwood Irrigation District**

Anderson Cottonwood Irrigation District – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	0.1	0.01	1.2	0.10
Feb	0.3	0.03	2.6	0.22
Mar	2.5	0.21	3.4	0.28
Apr	0.8	0.07	6.4	0.53
May	1.2	0.10	7.7	0.64
Jun	0.7	0.06	9.1	0.76
Jul	0.0	0.00	9.6	0.80
Aug	0.0	0.00	8.3	0.69
Sept	0.0	0.00	6.5	0.54
Oct	3.2	0.27	3.1	0.26
Nov	2.9	0.24	1.7	0.14
Dec	3.0	0.25	1.4	0.12
TOTAL-YR	14.7	1.23	61.0	5.08
TOTAL-Apr-Oct	**6.0**	**0.50**	**50.6**	**4.22**

[a]Precipitation is precipitation reported for CIMIS Station at Gerber South (#222).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the reference ET (ETo) reported for the Gerber South CIMIS Station.

TABLE 4

Anderson Cottonwood Irrigation District – 2016 Distribution System Evaporation and Seepage
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	177,952	30	123	61	517	24,511	(24,968)
Laterals	871,324	10	200	99	844	11,202	(11,946)
TOTAL			323	160	1,361	35,713	(36,914)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 5

Anderson Cottonwood Irrigation District – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

	Acres[a]	Crop Et[b]	Effective Precipitation[c]		ETAW	Leaching Requirement	
Crop Name	**(crop acres)**	**(AF/Ac)**	**(AF/Ac)**	**(acre-feet)**	**(acre-feet)**	**(AF/Ac)**	**(acre-feet)**
Alfalfa	230	3.02	0.06	14	680	0.11	25
Pasture	6,772	3.25	0.06	413	21,626	0.03	203
Walnuts	1,700	3.18	0.06	104	5,308	0.16	272
Crop Acres	8,702			531	27,614		500
Total Irrig. Acres	8,702	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Station at Gerber South (#222) x Kc based on ITRC Typical Year ETc for Zone 14 surface irrigation for water balances. Water Needs do not include water required for cultural practices.

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season.

District/Company **Anderson Cottonwood Irrigation District**

TABLE 6

Anderson Cottonwood Irrigation District – 2016 District Water Balance
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	103,104
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	0
Available Soil Moisture[c]	Estimated	981
	Total Water Supplies =	**104,085**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	35,713
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,201
Riparian ET[d] (Canals/Laterals)	Estimated	1,345
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,031
	Total Distribution System =	**39,290**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	27,614
Evapotranspiration of Precip - ET_{pr}	Table 5	531
Cultural Practices *(includes Leaching Requirement)*	Table 5	500
	Total Crop Water Needs =	**28,645**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Upslope Drainwater Flow Through[h]	Estimated	0
Remainder Drainwater Outflow[i]	District Records	1,536
	Total District Outflow *(from District Records)* **=**	**1,536**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**3,350**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**34,615**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs. Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Rice Straw Decomp Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on crop acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for cultural practices.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Anderson Cottonwood Irrigation District_**

TABLE 7

Anderson Cottonwood Irrigation District – 2016 Annual Water Quantities Delivered under Each Right or Contract (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2007	111,903	-	-	-	111,903	3,525	4,331
2008	109,864	-	-	-	109,864	3,464	4,252
2009	106,922	-	-	-	106,922	3,368	4,138
2010	100,009	-	-	-	100,009	3,151	15,000
2011	89,814	0	0	0	89,814	3,150	15,000
2012	101,229	0	0	0	101,229	3,239	15,000
2013	108,600	0	0	0	108,600	3,340	2,755
2014	86,702	0	0	0	86,702	3,215	1,240
2015	87,315	0	0	0	87,315	3,350	1,150
2016	103,104	0	0	0	103,104	3,350	1,536
Total	1,005,462	0	0	0	1,005,462	33,152	64,401
Average	100,546	0	0	0	100,546	3,315	6,440

[a]Federal Ag Water Supply from Reclamation Water Account Records. Data prior to 2011 are not available.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2011 are not available.

[c]Estimated by District based on observation and historical information. Data prior to 2011 are not available.

[d]Estimated by District based on observation and historical information.

Glenn-Colusa Irrigation District

District/Company **_Glenn-Colusa Irrigation District_**

TABLE 1

Glenn-Colusa Irrigation District – 2016 Surface Water Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	48,741	4	0	350	49,095
May	140,823	7	0	250	141,080
June	147,277	7	0	200	147,484
July	130,000	34,300	0	200	164,500
August	90,000	31,698	0	200	121,898
September	22,348	14	0	200	22,562
October	44,009	8	0	200	44,217
TOTAL	623,198	66,038	0	1,600	690,836

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Glenn-Colusa Irrigation District – 2016 Groundwater Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	999
May	0	2,060
June	0	2,560
July	0	2,744
August	0	2,709
September	0	2,329
October	0	1,435
TOTAL	0	14,836

[a]Estimated by District based on observation and historical information.

TABLE 3

Glenn-Colusa Irrigation District – 2016 Total District Water Supply (excluding reuse)
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	49,095	0	49,095
May	141,080	0	141,080
June	147,484	0	147,484
July	164,500	0	164,500
August	121,898	0	121,898
September	22,562	0	22,562
October	44,217	0	44,217
TOTAL	690,836	0	690,836

[a]In addition to the water supplies shown in Table 3, 167,918 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Glenn-Colusa Irrigation District_**

Glenn-Colusa Irrigation District – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	4.5	0.37	1.2	0.10
Feb	0.6	0.05	2.7	0.22
Mar	5.5	0.46	3.5	0.29
Apr	0.3	0.02	6.2	0.52
May	0.7	0.05	7.2	0.60
Jun	0.0	0.00	8.5	0.71
Jul	0.0	0.00	9.3	0.77
Aug	0.1	0.01	6.0	0.50
Sept	0.0	0.00	5.9	0.49
Oct	2.2	0.19	3.2	0.27
Nov	1.5	0.13	1.7	0.15
Dec	2.3	0.19	1.4	0.11
TOTAL-YR	17.8	1.48	56.6	4.72
TOTAL-Apr-Oct	**3.3**	**0.28**	**46.1**	**3.85**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32))/Williams (#250), and Verona (#235).

TABLE 4

Glenn-Colusa Irrigation District – 2016 Distribution System Evaporation and Seepage (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	341,200	70	548	152	2,108	10,966	(12,922)
Pipeline	26,400	2	0	0	0	0	0
Laterals	3,495,360	12	963	267	3,703	4,815	(8,250)
Watershed Drains	2,919,840	15	1,005	279	3,866	5,027	(8,615)
TOTAL			2,517	698	9,677	20,808	(29,787)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **Glenn-Colusa Irrigation District**

TABLE 5

Glenn-Colusa Irrigation District – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,269	2.86	0.10	121	3,514	0.11	140
Almonds	7,505	2.72	0.10	713	19,737	0.18	1,351
Beans	348	0.74	0.01	3	255	0.47	164
Corn	2,145	1.82	0.01	16	3,897	0.14	300
Cotton	22	2.20	0.10	2	46	0.02	0
Oats	78	0.74	0.01	1	57	0.02	2
Habitat	596	2.33	0.10	57	1,331	0.03	18
Misc. Deciduous	3	2.59	0.10	0	7	0.16	0
Olives	247	2.59	0.10	23	617	0.09	22
Onions	236	0.85	0.01	2	199	0.28	66
Pasture	3,029	3.09	0.10	288	9,065	0.03	91
Prunes	233	2.70	0.10	22	606	0.18	42
Rice	101,836	2.75	0.01	781	279,056	0.06	6,110
Rice Straw Decomp	6,000	0.50	0.10	570	2,430	0.00	0
Sudan	613	3.09	0.10	58	1,835	0.07	43
Sunflowers	405	1.62	0.01	3	652	0.06	24
Tomatoes	1,821	1.57	0.01	14	2,850	0.08	146
Vegetables	36	0.82	0.05	2	27	0.18	6
Vineseed	1,767	0.93	0.10	168	1,473	0.18	318
Walnuts	5,601	2.93	0.10	532	15,891	0.16	896
Wheat	1,034	0.74	0.01	8	757	0.03	31
Grain	88	0.74	0.01	1	64	0.02	2
Rye Grass	428	0.74	0.01	3	313	0.02	9
Crop Acres	135,340			3,387	344,681		9,781
Total Irrig. Acres	129,340	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 127,295 to 152,754 acre-feet in 2016).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Glenn-Colusa Irrigation District_**

TABLE 6

Glenn-Colusa Irrigation District – 2016 District Water Balance
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	690,836
Private Groundwater	Table 2	14,836
Inflow From Precip[b]	Estimated	10,289
Available Soil Moisture[c]	Estimated	7,590
	Total Water Supplies =	**723,551**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	20,808
Evaporation - Precipitation (Canals/Laterals)	Table 4	8,980
Riparian ET[d] (Canals/Laterals)	Estimated	6,500
Conveyance System Filling[e] (Canals/Laterals)	Estimated	8,000
	Total Distribution System =	**44,287**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	344,681
Evapotranspiration of Precip - ET_{pr}	Table 5	3,387
Cultural Practices *(includes Leaching Requirement)*	Table 5	9,781
	Total Crop Water Needs =	**357,849**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	37,339
Irrigation Season Rainfall Runoff[g]	Estimated	28,231
Rice Cultural and Ecosystem Requirement[h]	Estimated	50,000
Upslope Drainwater Flow Through[i]	Estimated	400
Remainder Drainwater Outflow[j]	Calculated	32,305
	Total District Outflow *(from District Records)* **=**	148,275
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**167,918**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**173,140**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Rice Straw Decomp Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Glenn-Colusa Irrigation District_**

TABLE 7

Glenn-Colusa Irrigation District – 2016 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow (acre-feet)
2007	635,209	52,485	0	22,500	710,194	185,560	219,207
2008	691,219	55,423	0	22,500	769,142	204,255	183,373
2009	636,777	49,911	0	22,500	709,188	190,980	171,743
2010	572,352	91,017	0	22,500	685,869	194,677	229,665
2011	571,617	86,014	0	40,500	698,131	190,994	255,999
2012	605,963	90,277	0	40,500	736,740	206,542	197,899
2013	698,625	72,274	0	1,650	772,549	217,694	207,154
2014	496,915	52,171	0	1,700	550,786	131,520	102,168
2015	452,681	60,381	0	1,360	514,422	115,694	79,238
2016	623,198	66,038	0	1,600	690,836	167,918	148,275
Total	5,984,556	675,991	0	177,310	6,837,857	1,805,834	1,794,721
Average	598,456	67,599	0	17,731	683,786	180,583	179,472

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.

Provident Irrigation District

District/Company **_Provident Irrigation District_**

TABLE 1

Provident Irrigation District – 2016 Surface Water Supply
(April through October Period Only)
2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	5,094	0	780	514	6,388
May	9,041	0	2,208	3,501	14,750
June	8,866	0	8,145	3,693	20,704
July	6,300	584	5,739	5,151	17,774
August	2,500	609	4,773	5,462	13,344
September	177	0	191	2,878	3,246
October	0	0	1,199	657	1,856
TOTAL	31,978	1,193	23,035	21,856	78,062

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Provident Irrigation District – 2016 Groundwater Supply
(April through October Period Only)
2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	305	0
May	456	0
June	564	0
July	185	0
August	23	0
September	0	0
October	83	0
TOTAL	1,616	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Provident Irrigation District – 2016 Total District Water Supply (excluding reuse)
(April through October Period Only)
2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	6,388	305	6,693
May	14,750	456	15,206
June	20,704	564	21,268
July	17,774	185	17,959
August	13,344	23	13,367
September	3,246	0	3,246
October	1,856	83	1,939
TOTAL	78,062	1,616	79,678

[a]In addition to the water supplies shown in Table 3, 6,836 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Provident Irrigation District_**

Provident Irrigation District – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	4.5	0.37	1.2	0.10
Feb	0.6	0.05	2.7	0.22
Mar	5.5	0.46	3.5	0.29
Apr	0.3	0.02	6.2	0.52
May	0.7	0.05	7.2	0.60
Jun	0.0	0.00	8.5	0.71
Jul	0.0	0.00	9.3	0.77
Aug	0.1	0.01	6.0	0.50
Sept	0.0	0.00	5.9	0.49
Oct	2.2	0.19	3.2	0.27
Nov	1.5	0.13	1.7	0.15
Dec	2.3	0.19	1.4	0.11
TOTAL-YR	17.8	1.48	56.6	4.72
TOTAL-Apr-Oct	**3.3**	**0.28**	**46.1**	**3.85**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32)/Willows (#250), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32)/Willows (#250), and Verona (#235).

TABLE 4

Provident Irrigation District – 2016 Distribution System Evaporation and Seepage
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	65,472	35	53	15	202	1,315	(1,503)
Laterals	206,448	12	57	16	219	569	(772)
Water Shed Drains	175,276	15	60	17	232	302	(517)
TOTAL			170	47	653	2,186	(2,792)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Provident Irrigation District_**

TABLE 5

Provident Irrigation District – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

	Acres[a]	Crop ET[b]	Effective Precipitation[c]		ETAW	Leaching Requirement	
Crop Name	**(crop acres)**	**(AF/Ac)**	**(AF/Ac)**	**(acre-feet)**	**(acre-feet)**	**(AF/Ac)**	**(acre-feet)**
Rice	15,744	2.75	0.01	121	43,143	0.06	945
Rice Straw Decomp	10,133	0.50	0.10	963	4,104	0.00	0
Crop Acres	25,877			1,083	47,246		945
Total Irrig. Acres	15,744	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 19,680 to 23,616 acre-feet in 2016).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Provident Irrigation District**

TABLE 6

Provident Irrigation District – 2016 District Water Balance
(April through October Period Only)
2017 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	79,678
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	3,314
Available Soil Moisture[c]	Estimated	0
	Total Water Supplies =	**82,992**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	2,186
Evaporation - Precipitation (Canals/Laterals)	Table 4	606
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	781
	Total Distribution System =	**3,673**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	47,246
Evapotranspiration of Precip - ET_{pr}	Table 5	1,083
Cultural Practices *(includes Leaching Requirement)*	Table 5	945
	Total Crop Water Needs =	**49,275**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	3,168
Irrigation Season Rainfall Runoff[g]	Estimated	3,149
Rice Cultural and Ecosystem Requirement[h]	Estimated	15,744
Upslope Drainwater Flow Through	Estimated	3,854
Remainder Drainwater Outflow[i]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**18,893**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**6,836**
	Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**11,152**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Rice Straw Decomp Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Provident Irrigation District**

TABLE 7

Provident Irrigation District – 2016 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b,c] (acre-feet)	Upslope Drainwater[c,d] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[d] (acre-feet)
2007	39,263	3,385	8,779	-	51,427	-	-
2008	47,280	1,747	0	-	49,027	-	-
2009	35,471	4,500	11,883	-	51,854	-	-
2010	31,879	4,500	6,727	70,534	113,640	10,233	49,935
2011	26,671	3,346	6,619	73,953	110,589	9,983	53,382
2012	31,466	3,278	27,068	23,651	85,463	9,210	25,268
2013	34,154	2,429	22,195	47,283	106,061	6,022	30,493
2014	27,847	40	2,798	30,338	61,023	2,617	20,618
2015	32,830	0	273	29,494	62,597	6,619	22,479
2016	31,978	1,193	23,035	21,856	78,062	6,836	18,893
Total	338,839	24,418	109,377	297,109	769,743	51,520	221,068
Average	33,884	2,442	10,938	42,444	76,974	7,360	31,581

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.
[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.
[d]Data prior to 2010 are not available.

Princeton-Codora-Glenn Irrigation District

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 1

Princeton-Codora-Glenn Irrigation District – 2016 Surface Water Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	5,124	0	321	0	5,445
May	12,220	0	2,634	0	14,854
June	11,473	0	3,424	0	14,897
July	6,740	4,067	4,642	0	15,449
August	2,780	4,202	3,506	0	10,488
September	1,464	0	216	0	1,680
October	4,098	0	352	0	4,450
TOTAL	43,899	8,269	15,095	0	67,263

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Princeton-Codora-Glenn Irrigation District – 2016 Groundwater Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	1,339
June	241	1,339
July	1,541	1,339
August	1,603	1,339
September	964	1,339
October	0	0
TOTAL	4,349	6,695

[a]Estimated by District based on observation and historical information.

TABLE 3

Princeton-Codora-Glenn Irrigation District – 2016 Total District Water Supply (excluding reuse)
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	5,445	0	5,445
May	14,854	0	14,854
June	14,897	241	15,138
July	15,449	1,541	16,990
August	10,488	1,603	12,091
September	1,680	964	2,644
October	4,450	0	4,450
TOTAL	67,263	4,349	71,612

[a]In addition to the water supplies shown in Table 3, 3,514 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Princeton-Codora-Glenn Irrigation District**

Princeton-Codora-Glenn Irrigation District – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	4.5	0.37	1.2	0.10
Feb	0.6	0.05	2.7	0.22
Mar	5.5	0.46	3.5	0.29
Apr	0.3	0.02	6.2	0.52
May	0.7	0.05	7.2	0.60
Jun	0.0	0.00	8.5	0.71
Jul	0.0	0.00	9.3	0.77
Aug	0.1	0.01	6.0	0.50
Sept	0.0	0.00	5.9	0.49
Oct	2.2	0.19	3.2	0.27
Nov	1.5	0.13	1.7	0.15
Dec	2.3	0.19	1.4	0.11
TOTAL-YR	17.8	1.48	56.6	4.72
TOTAL-Apr-Oct	**3.3**	**0.28**	**46.1**	**3.85**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250) and Verona (#235).

TABLE 4

Princeton-Codora-Glenn Irrigation District – 2016 Distribution System Evaporation and Seepage
(April through October Period Only)

2016 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	68,640	30	47	13	182	11,818	(11,987)
Laterals	219,384	15	76	21	290	5,666	(5,935)
Water Shed Drains	113,520	15	39	11	150	1,955	(2,094)
TOTAL			162	45	623	19,439	(20,016)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 5

Princeton-Codora-Glenn Irrigation District – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2016 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Almonds	80	2.72	0.10	8	210	0.18	14
Corn	75	1.82	0.01	1	136	0.14	11
Pasture	94	3.09	0.10	9	281	0.03	3
Rice	7,609	2.75	0.01	58	20,851	0.06	457
Rice Straw Decomp	1,722	0.50	0.10	164	698	0.00	0
Walnuts	1,339	2.93	0.10	127	3,799	0.16	214
Watermelon	19	1.06	0.01	0	20	0.04	1
Crop Acres	10,938			366	25,995		700
Total Irrig. Acres	9,216	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 9,500 to 11,400 acre-feet in 2016).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Princeton-Codora-Glenn Irrigation District**

TABLE 6

Princeton-Codora-Glenn Irrigation District – 2016 District Water Balance
(April through October Period Only)

2016 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	71,612
Private Groundwater	Table 2	6,695
Inflow From Precip[b]	Estimated	1,007
Available Soil Moisture[c]	Estimated	453
	Total Water Supplies =	**79,768**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	19,439
Evaporation - Precipitation (Canals/Laterals)	Table 4	578
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	673
	Total Distribution System =	**20,789**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	25,995
Evapotranspiration of Precip - ET_{pr}	Table 5	366
Cultural Practices *(includes Leaching Requirement)*	Table 5	700
	Total Crop Water Needs =	**27,062**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	2,109
Rice Cultural and Ecosystem Requirement[h]	Estimated	7,609
Upslope Drainwater Flow Through	Estimated	0
Remainder Drainwater Outflow[i]	Calculated	6,689
	Total District Outflow *(from District Records)* **=**	**16,408**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**3,514**
	Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**15,509**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Rice Straw Decomp Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[j]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Princeton-Codora-Glenn Irrigation District_**

TABLE 7

Princeton-Codora-Glenn Irrigation District – 2016 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2016 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[c] (acre-feet)
2007	50,875	14,800	0	-	65,675	5,276	-
2008	52,810	16,398	0	-	69,208	5,682	-
2009	50,800	13,847	0	-	64,647	6,078	-
2010	44,869	14,428	0	23,736	83,033	5,531	27,428
2011	38,257	12,485	0	26,189	76,931	7,664	26,460
2012	43,303	12,950	17,908	12,856	87,017	8,702	26,388
2013	47,890	10,231	11,453	16,828	86,402	7,383	26,388
2014	38,389	2,789	1,084	15,095	51,822	3,138	17,747
2015	38,888	6,457	99	12,524	57,968	2,627	13,598
2016	43,899	8,269	15,095	0	67,263	3,514	16,408
Total	449,980	112,654	45,639	107,228	709,966	55,595	154,416
Average	44,998	11,265	4,564	15,318	70,997	5,560	22,059

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

[d] Estimated by District based on observation and historical information.

Reclamation District 108

District/Company **Reclamation District 108**

TABLE 1

Reclamation District 108 – 2016 Surface Water Supply
(April through December Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	6,790	0	0	26	6,816
May	35,697	0	0	79	35,776
June	35,327	0	0	170	35,497
July	31,500	7,643	0	235	39,378
August	16,500	8,594	0	120	25,214
September	4,858	0	0	0	4,858
October	7,031	0	0	0	7,031
TOTAL	137,703	16,237	0	629	154,569

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 108 – 2016 Groundwater Supply
(April through December Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	46	0
June	44	0
July	4	0
August	0	0
September	0	0
October	0	0
TOTAL	94	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 108 – 2016 Total District Water Supply (excluding reuse)
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	6,816	0	6,816
May	35,776	46	35,822
June	35,497	44	35,541
July	39,378	4	39,382
August	25,214	0	25,214
September	4,858	0	4,858
October	7,031	0	7,031
TOTAL	154,569	94	154,663

[a]In addition to the water supplies shown in Table 3, 43,537 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Reclamation District 108**

Reclamation District 108 – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	4.5	0.37	1.2	0.10
Feb	0.6	0.05	2.7	0.22
Mar	5.5	0.46	3.5	0.29
Apr	0.3	0.02	6.2	0.52
May	0.7	0.05	7.2	0.60
Jun	0.0	0.00	8.5	0.71
Jul	0.0	0.00	9.3	0.77
Aug	0.1	0.01	6.0	0.50
Sept	0.0	0.00	5.9	0.49
Oct	2.2	0.19	3.2	0.27
Nov	1.5	0.13	1.7	0.15
Dec	2.3	0.19	1.4	0.11
TOTAL-YR	17.8	1.48	56.6	4.72
TOTAL-Apr-Oct	**3.3**	**0.28**	**46.1**	**3.85**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

TABLE 4

Reclamation District 108 – 2016 Distribution System Evaporation and Seepage
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	528,000	24	291	81	1,119	2,909	(3,947)
Laterals	158,400	24	87	24	336	873	(1,184)
Water Shed Drains	0	0	0	0	0	0	0
TOTAL			378	105	1,454	3,782	(5,131)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **Reclamation District 108**

TABLE 5

Reclamation District 108 – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,470	2.86	0.10	140	4,070	0.11	162
Beans	242	0.74	0.01	2	177	0.47	114
Corn	123	1.82	0.01	1	223	0.14	17
Melons	305	1.06	0.01	2	321	0.04	12
Pasture	163	3.09	0.10	15	488	0.03	5
Rice	30,167	2.75	0.01	231	82,665	0.06	1,810
Rice Straw Decomp	7,693	0.50	0.10	731	3,115	0.00	0
Safflowers	816	1.62	0.01	6	1,313	0.06	49
Sunflowers	2,023	1.62	0.01	16	3,254	0.06	121
Tomatoes	3,790	1.57	0.01	29	5,931	0.08	303
Vineseed	1,398	0.93	0.10	133	1,165	0.18	252
Walnuts	2,504	2.93	0.10	238	7,104	0.16	401
Wheat	757	0.74	0.01	6	554	0.03	23
Crop Acres	51,451			1,550	110,382		3,269
Total Irrig. Acres	43,758	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 37,700 to 45,250 acre-feet in 2016).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **_Reclamation District 108_**

TABLE 6

Reclamation District 108 – 2016 District Water Balance
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	154,663
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	4,155
Available Soil Moisture[c]	Estimated	3,834
	Total Water Supplies =	**162,652**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	3,782
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,349
Riparian ET[d] (Canals/Laterals)	Estimated	3,610
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,546
	Total Distribution System =	10,287
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	110,382
Evapotranspiration of Precip - ET_{pr}	Table 5	1,550
Cultural Practices *(includes Leaching Requirement)*	Table 5	3,269
	Total Crop Water Needs =	**115,200**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	5,533
Irrigation Season Rainfall Runoff[g]	Estimated	2,979
Rice Cultural and Ecosystem Requirement[h]	Estimated	30,167
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**33,146**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**43,537**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**4,019**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Rice Straw Decomp Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Reclamation District 108_**

TABLE 7

Reclamation District 108 – 2016 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[c] (acre-feet)
2007	139,071	3,779	0	3,773	146,623	51,488	31,472
2008	174,949	4,389	0	779	180,117	46,161	43,865
2009	153,995	0	0	2,433	156,428	50,212	35,458
2010	124,132	20,245	0	2,984	147,361	84,430	22,080
2011	143,793	14,913	0	1,415	160,121	51,819	50,434
2012	141,324	17,967	0	1,160	160,451	53,739	39,975
2013	161,668	25,604	0	1,877	189,149	28,616	78,495
2014	122,334	0	0	780	123,114	51,216	41,217
2015	115,098	1,210	1,396	821	118,525	45,510	33,121
2016	137,703	16,237	0	629	154,569	43,537	33,146
Total	1,414,067	104,344	1,396	16,651	1,536,458	506,728	409,263
Average	141,407	10,434	140	1,665	153,646	50,673	40,926

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

Reclamation District 1004

District/Company **Reclamation District 1004**

TABLE 1

Reclamation District 1004 – 2016 Surface Water Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	2,039	0	1,291	0	3,330
May	8,348	0	4,185	0	12,533
June	10,367	0	5,260	0	15,627
July	6,100	5,493	5,911	0	17,504
August	3,600	4,145	5,270	0	13,015
September	1,660	0	3,491	0	5,151
October	5,300	0	2,605	0	7,905
TOTAL	37,414	9,638	28,013	0	75,065

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 1004 – 2016 Groundwater Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	10	0
May	121	0
June	114	0
July	876	0
August	175	0
September	47	0
October	0	0
TOTAL	1,343	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 1004 – 2016 Total District Water Supply (excluding reuse)
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	3,330	10	3,340
May	12,533	121	12,654
June	15,627	114	15,741
July	17,504	876	18,380
August	13,015	175	13,190
September	5,151	47	5,198
October	7,905	0	7,905
TOTAL	75,065	1,343	76,408

[a]In addition to the water supplies shown in Table 3, 16,095 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Reclamation District 1004_**

Reclamation District 1004 – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	4.5	0.37	1.2	0.10
Feb	0.6	0.05	2.7	0.22
Mar	5.5	0.46	3.5	0.29
Apr	0.3	0.02	6.2	0.52
May	0.7	0.05	7.2	0.60
Jun	0.0	0.00	8.5	0.71
Jul	0.0	0.00	9.3	0.77
Aug	0.1	0.01	6.0	0.50
Sept	0.0	0.00	5.9	0.49
Oct	2.2	0.19	3.2	0.27
Nov	1.5	0.13	1.7	0.15
Dec	2.3	0.19	1.4	0.11
TOTAL-YR	17.8	1.48	56.6	4.72
TOTAL-Apr-Oct	**3.3**	**0.28**	**46.1**	**3.85**

[a]Average precipitation reported for CIMIS Stations at CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250) and Verona (#235).

TABLE 4

Reclamation District 1004 – 2016 Distribution System Evaporation and Seepage
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canals	25,872	135	80	22	308	2,000	(2,286)
Canals	28,512	51	34	9	129	838	(957)
Canals	23,232	41	22	6	83	540	(617)
Laterals	42,768	32	31	9	119	773	(884)
Laterals	63,096	22	32	9	123	797	(910)
Laterals	47,256	15	16	5	63	410	(468)
Drains	29,568	44	30	8	114	742	(847)
Drains	29,568	28	19	5	74	480	(549)
Drains	85,536	15	29	8	113	736	(841)
Drains	12,144	12	3	1	13	84	(96)
TOTAL			296	82	1,138	7,399	(8,455)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Reclamation District 1004_**

TABLE 5

Reclamation District 1004 – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

	Acres[a]	Crop ET[b]	Effective Precipitation[c]		ETAW	Leaching Requirement	
Crop Name	**(crop acres)**	**(AF/Ac)**	**(AF/Ac)**	**(acre-feet)**	**(acre-feet)**	**(AF/Ac)**	**(acre-feet)**
Beans	433	0.74	0.01	3	317	0.47	203
Corn	399	1.82	0.01	3	725	0.14	56
Habitat	13,736	2.33	0.10	1,305	30,684	0.03	412
Rice	5,750	2.75	0.01	44	15,755	0.06	345
Tomatoes	427	1.57	0.01	3	668	0.08	34
Walnuts	181	2.93	0.10	17	514	0.16	29
Wheat	190	0.74	0.01	1	139	0.03	6
Crop Acres	21,116			1,377	48,802		1,085
Total Irrig. Acres	21,116	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12 surface water irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 7,200 to 8,620 acre-feet in 2017).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Reclamation District 1004**

TABLE 6

Reclamation District 1004 – 2016 District Water Balance

(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	76,408
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	3,089
Available Soil Moisture[c]	Estimated	460
	Total Water Supplies =	**79,957**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	7,399
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,056
Riparian ET[d] (Canals/Laterals)	Estimated	550
Conveyance System Filling[e] (Canals/Laterals)	Estimated	751
	Total Distribution System =	**9,756**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	48,802
Evapotranspiration of Precip - ET_{pr}	Table 5	1,377
Cultural Practices *(includes Leaching Requirement)*	Table 5	1,085
	Total Crop Water Needs =	**51,264**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	5,750
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**0**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**16,095**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**18,936**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Habitat Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **_Reclamation District 1004_**

TABLE 7

Reclamation District 1004 – 2016 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[e] (acre-feet)
2007	46,168	9,973	20,000	0	76,141	11,400	0
2008	47,605	9,761	20,158	0	77,524	11,600	0
2009	38,151	12,170	20,255	0	70,576	10,600	0
2010	48,218	11,250	23,473	0	82,941	12,500	0
2011	35,874	10,639	23,395	0	69,908	7,436	0
2012	43,022	10,048	23,395	0	76,465	16,095	0
2013	41,573	10,802	25,677	0	78,052	16,095	0
2014	40,066	0	26,865	0	66,931	12,070	0
2015	30,276	5,044	8,944	0	44,264	8,050	0
2016	37,414	9,638	28,013	0	75,065	16,095	0
Total	408,367	89,325	220,175	0	717,867	121,941	0
Average	40,837	8,933	22,018	0	71,787	12,194	0

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.
[c]Estimated by District based on observation and historical information.
[d]Estimated by District based on observation and historical information.

[e]District operates a closed system with little or no outflow; drainwater from rice fields is recaptured and delivered for rice straw decomposition and habitat lands.

Meridian Farms Water Company

District/Company **Meridian Farms Water Company**

Meridian Farms Water Company – 2016 Surface Water Supply
(April through December Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	2,691	0	0	100	2,791
May	5,138	0	0	100	5,238
June	5,229	0	0	200	5,429
July	2,000	3,932	0	200	6,132
August	1,100	4,631	0	100	5,831
September	1,639	0	0	200	1,839
October	373	0	0	0	373
TOTAL	18,170	8,563	0	900	27,633

100

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2
Meridian Farms Water Company – 2016 Groundwater Supply
(April through December Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	785	0
June	1,980	0
July	1,980	0
August	393	0
September	0	0
October	0	0
TOTAL	5,138	0

[a]Estimated by District based on observation and historical information.

TABLE 3
Meridian Farms Water Company – 2016 Total District Water Supply (excluding reuse)
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	2791	0	2791
May	5238	785	6023
June	5429	1980	7409
July	6132	1980	8112
August	5831	393	6224
September	1839	0	1839
October	373	0	373
TOTAL	27633	5138	32771

[a]In addition to the water supplies shown in Table 3, 19,503 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **Meridian Farms Water Company**

Meridian Farms Water Company – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	4.5	0.37	1.2	0.10
Feb	0.6	0.05	2.7	0.22
Mar	5.5	0.46	3.5	0.29
Apr	0.3	0.02	6.2	0.52
May	0.7	0.05	7.2	0.60
Jun	0.0	0.00	8.5	0.71
Jul	0.0	0.00	9.3	0.77
Aug	0.1	0.01	6.0	0.50
Sep	0.0	0.00	5.9	0.49
Oct	2.2	0.19	3.2	0.27
Nov	1.5	0.13	1.7	0.15
Dec	2.3	0.19	1.4	0.11
TOTAL-YR	17.8	1.48	56.6	4.72
TOTAL-Apr-Oct	**3.3**	**0.28**	**46.1**	**3.85**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

TABLE 4

Meridian Farms Water Company – 2016 Distribution System Evaporation and Seepage (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	84,480	12	23	6	89	698	(781)
Pipeline	0	0	0	0	0	0	0
Laterals	100,320	12	28	8	106	829	(928)
Water Shed Drains	0	0	0	0	0	0	0
Reservoir	0	0	0	0	0	0	0
TOTAL			51	14	196	1,527	(1,709)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **Meridian Farms Water Company**

TABLE 5

Meridian Farms Water Company – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	407	2.86	0.10	39	1,127	0.11	45
Beans	144	0.74	0.01	1	105	0.47	68
Chestnuts	4	2.72	0.10	0	11	0.18	1
Corn	265	1.82	0.01	2	481	0.14	37
Cotton	20	2.20	0.10	2	42	0.02	0
Milo	32	1.82	0.01	0	58	0.02	1
Onions	20	0.85	0.01	0	17	0.28	6
Pecans	18	2.72	0.10	2	47	0.18	3
Persimmons	26	2.70	0.10	2	68	0.18	5
Prunes	63	2.70	0.10	6	164	0.18	11
Rice	4,044	2.75	0.01	31	11,082	0.06	243
Safflowers	341	1.62	0.01	3	549	0.06	20
Strawberries	5	1.64	0.01	0	8	0.47	2
Sunflowers	364	1.62	0.01	3	586	0.06	22
Tomatoes	844	1.57	0.01	6	1,321	0.08	68
Vetch	243	3.09	0.10	23	727	0.06	15
Vineseed	304	0.93	0.10	29	253	0.18	55
Walnuts	936	2.93	0.10	89	2,656	0.16	150
Wheat	733	0.74	0.01	6	537	0.03	22
Crop Acres	8,813			244	19,838		774
Total Irig. Acres	8,813	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 5,055 to 6,060 acre-feet in 2016).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Meridian Farms Water Company**

TABLE 6

Meridian Farms Water Company – 2016 District Water Balance
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	32,771
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	364
Available Soil Moisture[c]	Estimated	1,345
	Total Water Supplies =	**34,480**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	1,527
Evaporation - Precipitation (Canals/Laterals)	Table 4	182
Riparian ET[d] (Canals/Laterals)	Estimated	1,706
Conveyance System Filling[e] (Canals/Laterals)	Estimated	276
	Total Distribution System =	**3,691**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	19,838
Evapotranspiration of Precip - ET_{pr}	Table 5	244
Cultural Practices *(includes Leaching Requirement)*	Table 5	774
	Total Crop Water Needs =	**20,856**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	1,121
Rice Cultural and Ecosystem Requirement[h]	Estimated	4,044
Uplslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* **=**	**3,052**
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**19,503**
Percolation from Agricultural Lands[k] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**6,881**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Rice Straw Decomp Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

[k]Percolation from Agricultural Lands is the closure term in the mass water balance. As such, in addition to any percolation to the groundwater basin, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value indicates assumed percolation to groundwater greater than groundwater pumping. A negative value may indicate uncounted for groundwater pumping from privately owned wells.

District/Company **Meridian Farms Water Company**

TABLE 7

Meridian Farms Water Company – 2016 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2007	17,506	5,130	-	11,927	34,563	11,927	3,396
2008	19,122	8,579	-	6,925	34,626	6,925	3,631
2009	17,090	8,611	-	7,420	33,121	7,420	3,165
2010	17,530	9,512	0	8,695	35,737	8,695	5,499
2011	16,792	10,565	0	10,915	38,272	10,915	6,750
2012	19,349	11,208	0	11,625	42,182	11,625	5,825
2013	20,899	9,281	0	800	30,980	20,618	3,871
2014	16,630	4,043	0	900	21,573	10,663	2,574
2015	16,353	2,229	0	750	19,332	11,000	2,426
2016	18,170	8,563	0	900	27,633	19,503	3,052
Total	179,441	77,721	0	60,857	318,019	119,291	40,189
Average	17,944	7,772	0	6,086	31,802	11,929	4,019

[a]Federal Ag Water Supply from Reclamation Water Account Records. Data prior to 2010 are not available.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information. The methods for estimating and accounting for quantities were refined in 2013.

[d]Estimated by District based on observation and historical information.

Sutter Mutual Water Company

District/Company **_Sutter Mutual Water Company_**

Sutter Mutual Water Company – 2016 Surface Water Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	12,128	0	0	0	12,128
May	31,848	0	0	0	31,848
June	37,314	0	0	0	37,314
July	28,500	13,518	0	0	42,018
August	20,000	11,432	0	0	31,432
September	5,000	1,174	0	0	6,174
October	5,500	0	0	0	5,500
TOTAL	140,290	26,124	0	0	166,414

[a]Federal Ag Water Supply from Reclamation Water Account Records.
[b]Non-Federal Ag Water Supply from District Records.
[c]Estimated by District based on observation and historical information.

TABLE 2
Sutter Mutual Water Company – 2016 Groundwater Supply
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
November	0	0
December	0	0
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3
Sutter Mutual Water Company – 2016 Total District Water Supply (excluding reuse)
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	12,128	0	12,128
May	31,848	0	31,848
June	37,314	0	37,314
July	42,018	0	42,018
August	31,432	0	31,432
September	6,174	0	6,174
October	5,500	0	5,500
TOTAL	166,414	0	166,414

[a]In addition to the water supplies shown in Table 3, 69,499 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Sutter Mutual Water Company_**

Sutter Mutual Water Company – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	4.5	0.37	1.2	0.10
Feb	0.6	0.05	2.7	0.22
Mar	5.5	0.46	3.5	0.29
Apr	0.3	0.02	6.2	0.52
May	0.7	0.05	7.2	0.60
Jun	0.0	0.00	8.5	0.71
Jul	0.0	0.00	9.3	0.77
Aug	0.1	0.01	6.0	0.50
Sept	0.0	0.00	5.9	0.49
Oct	2.2	0.19	3.2	0.27
Nov	1.5	0.13	1.7	0.15
Dec	2.3	0.19	1.4	0.11
TOTAL-YR	17.8	1.48	56.6	4.72
TOTAL-Apr-Oct	**3.3**	**0.28**	**46.1**	**3.85**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250) and Verona (#235).

TABLE 4

Sutter Mutual Water Company – 2016 Distribution System Evaporation and Seepage (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Main Canal	39,690	90	82	23	315	2,460	(2,753)
West Canal	52,530	90	109	30	417	3,256	(3,643)
Central Canal	50,640	75	87	24	335	2,180	(2,491)
East Canal	71,970	75	124	34	476	3,098	(3,540)
Laterals	533,390	12	147	41	565	3,673	(4,198)
Sub-Laterals	146,060	8	27	7	103	268	(364)
TOTAL			575	160	2,213	14,935	(16,989)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **_Sutter Mutual Water Company_**

TABLE 5

Sutter Mutual Water Company – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres (crop acres)	Crop ET[a] (AF/Ac)	Effective Precipitation[b] (AF/Ac)	Effective Precipitation[b] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	826	2.86	0.10	78	2,287	0.11	91
Beans	2,220	0.74	0.01	17	1,625	0.47	1,043
Corn	3,073	1.82	0.01	24	5,583	0.14	430
Cilantro	113	0.82	0.05	6	86	0.18	20
Melons	709	1.06	0.01	5	745	0.04	28
Milo	78	1.82	0.01	1	142	0.02	2
Rice	29,567	2.75	0.01	227	81,021	0.06	1,774
Rice Straw Decomp	15,362	0.50	0.10	1,459	6,222	0.00	0
Safflowers	242	1.62	0.01	2	389	0.06	15
Sunflowers	4,953	1.62	0.01	38	7,968	0.06	297
Tomatoes	3,370	1.57	0.01	26	5,274	0.08	270
Vineseed	614	0.93	0.10	58	512	0.18	111
Walnuts	45	2.93	0.10	4	128	0.16	7
Wheat	990	0.74	0.01	8	725	0.03	30
Crop Acres	62,162			1,953	112,706		4,118
Total Irrig. Acres	46,800	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250) and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 37,000 to 44,350 acre-feet in 2016).

[b]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

District/Company **Sutter Mutual Water Company**

TABLE 6

Sutter Mutual Water Company – 2016 District Water Balance
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	166,414
Private Groundwater	Table 2	0
Inflow From Precip[b]	Estimated	5,537
Available Soil Moisture[c]	Estimated	4,861
	Total Water Supplies =	**176,812**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	14,935
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,053
Riparian ET[d] (Canals/Laterals)	Estimated	500
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,664
	Total Distribution System =	**19,153**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	112,706
Evapotranspiration of Precip - ET_{pr}	Table 5	1,953
Cultural Practices *(includes Leaching Requirement)*	Table 5	4,118
	Total Crop Water Needs =	**118,777**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	8,197
Rice Cultural and Ecosystem Requirement[h]	Estimated	29,567
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	15,787
	Total District Outflow *(from District Records)* **=**	53,551
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**69,499**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(14,669)**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Rice Straw Decomp Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f] Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

District/Company **_Sutter Mutual Water Company_**

TABLE 7

Sutter Mutual Water Company – 2016 Annual Water Quantities Delivered under Each Right or Contract
(April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2007	167,922	56,467	-	-	224,389	38,231	-
2008	169,435	30,275	-	-	199,710	45,248	-
2009	153,526	35,436	-	-	188,962	57,303	-
2010	142,185	58,326	0	0	200,511	62,316	77,886
2011	136,388	57,423	0	0	193,811	55,954	98,092
2012	134,711	47,314	0	0	182,025	68,493	60,618
2013	163,680	41,675	0	0	205,355	33,062	71,625
2014	127,125	20,028	0	0	147,153	74,162	5,123
2015	126,193	16,662	0	0	142,855	73,068	2,603
2016	140,290	26,124	0	0	166,414	69,499	53,551
Total	1,461,455	389,730	0	0	1,851,185	577,336	369,498
Average	146,146	38,973	0	0	185,119	57,734	52,785

[a]Federal Ag Water Supply from Reclamation Water Account Records. Includes Project water transferred into SMWC in 2006 and 2010.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2010 are not available.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

[d]The Department quit measuring outflow Karnak after 2003; SMWC has calculated outflow since 2010. Data prior to 2010 are not available.

Natomas Central Mutual Water Company

District/Company **Natomas Central Mutual Water District**

TABLE 1

Natomas Central Mutual Water District – 2016 Surface Water Supply

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a] Base Supply (acre-feet)	Federal Ag Water Supply[a] Project Water (acre-feet)	Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[b] (acre-feet)	Total (acre-feet)
Method	M-1	M-1	M-1	E-3	
April	768	0	0	0	768
May	19,347	0	0	0	19,347
June	15,337	0	0	0	15,337
July	11,500	7,200	0	0	18,700
August	3,900	9,682	0	0	13,582
September	1,806	0	0	0	1,806
October	793	0	0	0	793
TOTAL	53,451	16,882	0	0	70,333

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Water from non-Company lands enters the drainage system throughout the April through October period. The quantity for 2016 is unknown at this time but is included in the quantity recycled and reused shown in Table 6.

TABLE 2

Natomas Central Mutual Water District – 2016 Groundwater Supply

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	0
May	10	100
June	10	0
July	10	0
August	10	0
September	0	0
October	0	0
TOTAL	40	100

[a]Estimated by District based on observation and historical information.

TABLE 3

Natomas Central Mutual Water District – 2016 Total District Water Supply (excluding reuse)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply[a] (acre-feet)
Method	M-1	M-1	M-1
April	768	0	768
May	19,347	10	19,357
June	15,337	10	15,347
July	18,700	10	18,710
August	13,582	10	13,592
September	1,806	0	1,806
October	793	0	793
TOTAL	70,333	40	70,373

[a]In addition to the water supplies shown in Table 3, 55,967 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

District/Company **_Natomas Central Mutual Water District_**

Natomas Central Mutual Water District – 2016 Distribution System Evaporation and Seepage Worksheet

2017 Sacramento Valley Regional Water Management Plan Annual Update

2016	**Precipitation**[a]		**Evaporation**[b]	
	inches	**feet**	**inches**	**feet**
Jan	4.5	0.37	1.2	0.10
Feb	0.6	0.05	2.7	0.22
Mar	5.5	0.46	3.5	0.29
Apr	0.3	0.02	6.2	0.52
May	0.7	0.05	7.2	0.60
Jun	0.0	0.00	8.5	0.71
Jul	0.0	0.00	9.3	0.77
Aug	0.1	0.01	6.0	0.50
Sept	0.0	0.00	5.9	0.49
Oct	2.2	0.19	3.2	0.27
Nov	1.5	0.13	1.7	0.15
Dec	2.3	0.19	1.4	0.11
TOTAL-YR	17.8	1.48	56.6	4.72
TOTAL-Apr-Oct	**3.3**	**0.28**	**46.1**	**3.85**

[a]Average precipitation reported for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235).

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250) and Verona (#235).

TABLE 4

Natomas Central Mutual Water District – 2016 Distribution System Evaporation and Seepage

2017 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	**Length**[a] **(feet)**	**Width**[b] **(feet)**	**Surface Area (acres)**	**Precipitation**[c] **(acre-feet)**	**Evaporation**[d] **(acre-feet)**	**Seepage**[e] **(acre-feet)**	**Total (acre-feet)**
Bennet System	44,700	56	58	16	223	579	(785)
Northern System	146,400	54	180	50	694	1,805	(2,449)
Prichard Lake Sys	204,400	54	252	70	967	2,515	(3,413)
Elkhorn System	75,100	44	76	21	293	762	(1,034)
Riverside System	65,800	46	69	19	266	692	(939)
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL			635	176	2,443	6,353	(8,619)

[a]From District statistics.
[b]Average width of the conveyance facilities.
[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.
[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.
[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

District/Company **Natomas Central Mutual Water District**

TABLE 5

Natomas Central Mutual Water District – 2016 Crop Consumptive Use Water Needs (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

	Acres[a]	Crop ET[b]	Effective Precipitation[c]		ETAW	Leaching Requirement	
Crop Name	(crop acres)	(AF/Ac)	(AF/Ac)	(acre-feet)	(acre-feet)	(AF/Ac)	(acre-feet)
Alfalfa	458	2.86	0.10	44	1,268	0.11	50
Beans	65	0.74	0.01	0	48	0.47	31
Corn	333	1.82	0.01	3	605	0.14	47
Golf Course	120	3.38	0.10	11	394	0.03	4
Hay	47	0.74	0.01	0	34	0.03	1
Hops	5	0.93	0.10	0	4	0.18	1
Managed Marsh	743	2.97	0.10	71	2,136	0.00	0
Melons	16	1.06	0.01	0	17	0.04	1
Misc. field crops	365	1.64	0.01	3	597	0.18	66
Onions	10	0.85	0.01	0	8	0.28	3
Pasture	22	3.09	0.10	2	66	0.03	1
Pears	11	2.70	0.10	1	29	0.18	2
Peppers	68	1.57	0.01	1	106	0.08	5
Pumpkins	75	1.06	0.01	1	79	0.04	3
Rice	15,820	2.75	0.01	121	43,351	0.06	949
Rice Straw Decomp	12,314	0.50	0.10	1,170	4,987	0.00	0
Safflowers	111	1.62	0.01	1	179	0.06	7
Squash	162	1.06	0.01	1	170	0.04	6
Sunflowers	319	1.62	0.01	2	513	0.06	19
Tomatoes	72	1.57	0.01	1	113	0.08	6
Wheat	405	0.74	0.01	3	296	0.03	12
Crop Acres	31,541			1,436	55,001		1,214
Total Irrig. Acres	31,217	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Acres include lands, if any, irrigated by private wells.

[b]Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250), and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 19,775 to 24,000 acre-feet in 2016).

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field

District/Company **Natomas Central Mutual Water District**

TABLE 6

Natomas Central Mutual Water District – 2016 District Water Balance

2017 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	70,373
Private Groundwater	Table 2	100
Inflow From Precip[b]	Estimated	3,729
Available Soil Moisture[c]	Estimated	751
	Total Water Supplies =	**74,954**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	6,353
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,267
Riparian ET[d] (Canals/Laterals)	Estimated	592
Conveyance System Filling[e] (Canals/Laterals)	Estimated	703
	Total Distribution System =	**9,914**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	55,001
Evapotranspiration of Precip - ET_{pr}	Table 5	1,436
Cultural Practices *(includes Leaching Requirement)*	Table 5	1,214
	Total Crop Water Needs =	**57,651**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	0
Irrigation Season Rainfall Runoff[g]	Estimated	0
Rice Cultural and Ecosystem Requirement[h]	Estimated	15,820
Upslope Drainwater Flow Through[i]	Estimated	0
Remainder Drainwater Outflow[j]	Calculated	0
	Total District Outflow *(from District Records)* =	3,418
Internal Recirculation and Reuse		
Total Quantity Recirculated for Reuse	District Records	**55,967**
Percolation from Agricultural Lands[j] *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**3,971**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - September precipitation x Total Rice Acres plus October precipitation X Total Rice Straw Decomp Acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

District/Company **_Natomas Central Mutual Water District_**

TABLE 7

Natomas Central Mutual Water District – 2016 Annual Water Quantities Delivered under Each Right or Contract (April through October Period Only)

2017 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag	Upslope		District	
	Base Supply (acre-feet)	Project Water (acre-feet)	Water Supply[b] (acre-feet)	Drainwater[c] (acre-feet)	Total (acre-feet)	Recapture (acre-feet)	Outflow[d] (acre-feet)
2007	51,847	13,008	-	-	64,855	39,502	-
2008	48,297	8,919	-	-	57,216	43,359	-
2009	41,778	10,997	-	-	52,775	44,224	-
2010	37,349	8,707	0	0	46,056	39,989	15,000
2011	35,685	8,322	0	0	44,007	59,923	15,115
2012	48,050	13,073	0	28,288	89,411	51,433	10,317
2013	57,654	16,397	0	0	74,051	49,466	3,952
2014	58,255	15,093	0	0	73,348	65,147	2,028
2015	54,200	13,418	0	0	67,618	53,092	2,167
2016	53,451	16,882	0	0	70,333	55,967	3,418
Total	486,566	124,816	0	28,288	639,670	502,103	51,997
Average	48,657	12,482	0	4,041	63,967	50,210	7,428

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records. Data prior to 2010 not available.

[c]Estimated by District based on observation and historical information. Data prior to 2010 not available.

[d]Data prior to 2010 are not available.

2016 Crop Evapotranspiration Tables: Redding Sub-basin

Regional Water Management Plan Update
Evapotranspiration and Effective Precipitation - 2016
2017 Sacramento Valley Regional Water Management Plan Annual Update

	2016	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**0.8**	**1.22**	**0.7**	**0.00**	**0**	**0**	**3.24**		**0.8**	**1.22**	**0.7**	**0.00**	**0**	**0**	**3.24**	
	Grass Reference ETo	**5.81**	**6.98**	**8.27**	**8.76**	**7.53**	**5.88**	**2.8**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover	4.81	5.89	7.15	7.24	6.13	4.99	0.00	3.02	0.18	0.43	0.12	0.00	0.00	0.00	0.00	0.06
Pasture	Pasture and Misc. Grasses	4.49	6.40	7.69	8.06	7.06	5.34	0.00	3.25	0.18	0.43	0.12	0.00	0.00	0.00	0.00	0.06
Walnuts	Walnuts	1.79	5.31	8.68	9.01	7.85	5.56	0.00	3.18	0.18	0.43	0.12	0.00	0.00	0.00	0.00	0.06
									2.38								

Source: Kc values from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.
Notes:
Crop ET (ETc) was calculated as ETo for CIMIS Station at Gerber South (#222) x Kc based on ITRC Typical Year ETc for Zone 14 surface irrigation for water balances. Water Needs do not include water required for cultural practices
Precipitation is the 2016 monthly precipitation reported for the CIMIS Station at Gerber South (#222).
Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

2016 Crop Evapotranspiration Tables: Colusa, Butte, Sutter, and American Sub-basins

Regional Water Management Plan Update
Evapotranspiration and Effective Precipitation - 2016
2017 Sacramento Valley Regional Water Management Plan Annual Update

	2016	April	May	June	July	August	September	October	Total Growing Season Etc	April	May	June	July	August	September	October	Effective Precip
	Precipitation	**0.27**	**0.65**	**0.03**	**0.00**	**0.12**	**0.01**	**2.25**		**0.27**	**0.65**	**0.03**	**0.00**	**0.12**	**0.01**	**2.25**	
	Grass Reference ETo	**5.63**	**6.53**	**7.71**	**8.41**	**5.45**	**5.33**	**2.89**									**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(AF)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover	4.80	5.48	6.57	6.97	4.42	4.47	1.65	2.86	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Almonds	Almonds	2.77	5.34	6.37	7.00	4.66	4.29	2.27	2.72	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Barley	Grain and Grain Hay	5.71	3.17	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Beans	Grain and Grain Hay	5.71	3.17	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Buckwheat	Grain and Grain Hay	5.71	3.17	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Cantelope	Melons, Squash, and Cucumbers	0.00	0.82	1.38	4.90	4.16	1.44	0.00	1.06	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Chestnuts	Almonds	2.77	5.34	6.37	7.00	4.66	4.29	2.27	2.72	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Cilantro	Small Vegetables	5.43	1.51	0.18	0.00	0.77	1.36	0.55	0.82	0.00	0.09	0.00	0.00	0.00	0.00	0.55	0.05
Corn	Corn and Grain Sorghum	1.30	2.11	6.52	7.89	4.08	0.00	0.00	1.82	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Cotton	Cotton	0.93	1.41	4.39	8.19	5.49	4.72	1.25	2.20	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Cover Crop	Pasture and Misc. Grasses	4.29	5.95	7.04	7.63	4.95	4.84	2.35	3.09	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Cucumbers	Melons, Squash, and Cucumbers	0.00	0.82	1.38	4.90	4.16	1.44	0.00	1.06	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Golf course	N/A								3.38	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Grain	Grain and Grain Hay	5.71	3.17	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Grapes	Grape Vines with 80% canopy	1.06	2.89	5.53	6.19	3.64	2.84	0.00	1.85	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Habitat	N/A								3.24	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Hay	Grain and Grain Hay	5.71	3.17	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Hops	Small Vegetables	5.54	1.56	0.19	0.15	1.07	1.40	1.23	0.93	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Idle	Idle	0.21	0.18	0.19	0.15	0.26	0.07	0.48	0.13	0.00	0.09	0.00	0.00	0.00	0.00	0.48	0.05
Kiwis	N/A								2.92	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Managed Marsh	N/A								2.97	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Melons	Melons, Squash, and Cucumbers	0.00	0.82	1.38	4.90	4.16	1.44	0.00	1.06	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Melons, Squash	Melons, Squash, and Cucumbers	0.00	0.82	1.38	4.90	4.16	1.44	0.00	1.06	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Milo	Corn and Grain Sorghum	1.30	2.11	6.52	7.89	4.08	0.00	0.00	1.82	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Misc. Deciduous	Misc. Deciduous	2.13	4.88	6.40	7.05	4.66	4.15	1.83	2.59	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Misc. field crops	Misc. field crops	1.30	2.09	6.67	7.51	2.17	0.00	0.00	1.64	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Mixed Truck	Small Vegetables	5.43	1.51	0.18	0.00	0.77	1.36	0.55	0.82	0.00	0.09	0.00	0.00	0.00	0.00	0.55	0.05
Oats	Grain and Grain Hay	5.71	3.17	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Olives	Avocado	2.13	4.88	6.40	7.05	4.66	4.15	1.83	2.59	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Onions	Onions and Garlic	4.66	4.48	1.08	0.00	0.00	0.00	0.00	0.85	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Pasture	Pasture and Misc. Grasses	4.29	5.95	7.04	7.63	4.95	4.84	2.35	3.09	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Peach	Peach, Nectarine and Apricots	2.03	5.01	6.62	7.32	4.78	4.33	1.82	2.66	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Pears	Apple, Pear, Cherry, Plum and Prune	2.21	5.16	6.63	7.42	4.80	4.41	1.73	2.70	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Pecans	Almonds	2.77	5.34	6.37	7.00	4.66	4.29	2.27	2.72	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Peppers	Tomatoes and Peppers	0.73	3.09	7.58	6.80	0.68	0.00	0.00	1.57	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Persimmons	Apple, Pear, Cherry, Plum and Prune	2.21	5.16	6.63	7.42	4.80	4.41	1.73	2.70	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Prunes	Apple, Pear, Cherry, Plum and Prune	2.21	5.16	6.63	7.42	4.80	4.41	1.73	2.70	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Pumpkins	Melons, Squash, and Cucumbers	0.00	0.82	1.38	4.90	4.16	1.44	0.00	1.06	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Rice	Rice	0.70	5.85	8.60	9.45	6.09	2.29	0.00	2.75	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Rice Straw Decomp	N/A								0.50	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Rye Grass	Grain and Grain Hay	5.71	3.17	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Safflowers	Safflower and Sunflower	4.86	6.89	6.73	0.92	0.00	0.00	0.00	1.62	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Squash	Melons, Squash, and Cucumbers	0.00	0.82	1.38	4.90	4.16	1.44	0.00	1.06	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Strawberries	Strawberries	1.30	2.09	6.67	7.51	2.17	0.00	0.00	1.64	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Sudan	Pasture and Misc. Grasses	4.29	5.95	7.04	7.63	4.95	4.84	2.35	3.09	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Sunflowers	Safflower and Sunflower	4.86	6.89	6.73	0.92	0.00	0.00	0.00	1.62	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Tomatoes	Tomatoes and Peppers	0.73	3.09	7.58	6.80	0.68	0.00	0.00	1.57	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.01
Vegetable Seed	Small Vegetables	5.43	1.51	0.18	0.00	0.77	1.36	0.55	0.82	0.00	0.09	0.00	0.00	0.00	0.00	0.55	0.05
Vegetables	Small Vegetables	5.43	1.51	0.18	0.00	0.77	1.36	0.55	0.82	0.00	0.09	0.00	0.00	0.00	0.00	0.55	0.05
Vetch	Pasture and Misc. Grasses	4.29	5.95	7.04	7.63	4.95	4.84	2.35	3.09	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10
Vineseed	Small Vegetables	5.54	1.56	0.19	0.15	1.07	1.40	1.23	0.93	0.00	0.09	0.00	0.00	0.00	0.00	1.05	0.10

Source: Kc values from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.

Notes:

Crop ET (ETc) was calculated as average ETo for CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250) and Verona (#235) x Kc based on ITRC Typical Year ETc for Zone 12 surface irrigation for water balances. Crop ET does not include water required for initial flooding, reflooding, or flow through on rice acres.

Precipitation is the 2016 average monthly precipitation reported for the CIMIS Stations at Davis (#6), Colusa (#32)/Williams (#250) and Verona (#235).

Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

Appendix G
2016 Sacramento River Settlement Contractor Water Measurement Plans and Programs

APPENDIX G

Sacramento River Settlement Contractor Water Measurement Plans and Programs

Water measurement plans and programs are presented for the following districts:

- Anderson-Cottonwood Irrigation District
- Glenn-Colusa Irrigation District
- Provident Irrigation District
- Princeton-Codora-Glenn Irrigation District
- Reclamation District No. 108
- Reclamation District No. 1004
- Meridian Farms Water Company
- Sutter Mutual Water Company
- Natomas Central Mutual Water Company

Anderson-Cottonwood Irrigation District

Anderson-Cottonwood Irrigation District Water Measurement Program

Prepared for

Anderson-Cottonwood Irrigation District

October 2016

CH2M HILL, Inc.
2525 Airpark Drive
Redding, CA 96001

MBK Engineers
455 University Ave., Suite 100
Sacramento, CA 95825

Contents

Acronyms and Abbreviations

ACID or District	Anderson-Cottonwood Irrigation District
cfs	cubic feet per second
O&M	operations and maintenance
Reclamation	Bureau of Reclamation
Regional Criteria	*Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*
SCADA	supervisory control and data acquisition

Anderson-Cottonwood Irrigation District Water Measurement Program

Purpose

This report describes measurement, pricing, and billing practices within Anderson-Cottonwood Irrigation District (ACID or District), and describes the District's plan to comply with the provisions of its Settlement Contract and the measurement requirements of the Central Valley Project Improvement Act and the *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors* (Regional Criteria) (Bureau of Reclamation [Reclamation], 2004).

Background

ACID diverts water by gravity from the right bank of the Sacramento River at Lake Redding, at River Mile 246.0R. The District also diverts water at the South Bonnyview Pumping Plant (Churn Creek System), which is located on the left bank of the Sacramento River at River Mile 240.5L. Gravity diversions at Lake Redding provide water to the Main Canal, which serves the majority of the District's service area. Diversions at the South Bonnyview Pumping Plant are pumped from the Sacramento River and serve the portion of the District east of the river. Diversions from the Sacramento River are measured at both locations.

A supervisory control and data acquisition (SCADA) system allows ACID to monitor diversions on a real-time basis from the Sacramento River to the Main Canal and to the Churn Creek System. The SCADA system also allows for real-time monitoring of water levels along the Main Canal at four locations: (1) the radial headgate at Highway 44, (2) the Anderson Creek Flume, (3) Locust/County Road and Crowley Gulch, and (4) Smith Road on the Churn Creek System.

The ACID provides water to approximately 800 customers for irrigation at approximately 950 individual field turnouts or farm-gates. The District is divided into four sub-regions, or areas, each with its own ditchtender. Ditchtenders are responsible for maintaining water levels and deliveries within their respective areas as well as starting, stopping, and recording deliveries to customers. Deliveries throughout the ACID are made on a rotation of once every 2 weeks to each customer. Turnouts are sized, and deliveries are based on the assumption that 5 cubic feet per second (cfs) will irrigate 1 acre in 1 hour.

Water users are required to apply for water in March prior to the beginning of the irrigation season. Water orders identify the assessor parcel number(s) and the acreage to be irrigated. The District charges for water annually on the basis of the number of acres ordered. The water charge includes an application fee that is payable in two installments; the first payment is due with the application in mid-March, and the second payment is due in mid-May. Payments are delinquent 30 days after they are due; penalties and interest are applied to delinquent payments in accordance with District policies. Copies of the Application and Agreement for 2015 Irrigation Season and the District Rules and Regulations are provided in Appendix A and Appendix B, respectively.

Current Measurement Practices

River Diversions

Diversions from the Sacramento River at the Lake Redding and the South Bonnyview Pumping Plant locations are measured by using meters installed and maintained by Reclamation. The meters provide both instantaneous flow rate and volumetric data that are transmitted via the SCADA system and remotely monitored daily (or more frequently) at the District office. Reclamation also manually reads and records the data at least monthly. Reclamation maintains and calibrates the meters in accordance with their standard operating procedures.

Lateral Measurement

ACID measures flows at the headgates of 17 of its major laterals. These flows are measured when the headgates are opened or changed throughout each 2-week rotation period. Head measurements are made manually, and flow rates are derived on the basis of size, type, and configuration of the headgate structure; the head or water levels in the canals; and rating tables applicable to the specific headgate or weir.

Turnout or Field-level Measurement

ACID measures deliveries to fields on the basis of the head or water levels in the delivery canals and headgate rating tables. Gate openings are set, and water levels are observed and recorded daily by District staff. Delivery durations are based on the assumption that a flow of 5 cfs will irrigate 1 acre per hour. This delivery duration applies to each 2-week rotation. For example, a 10 acre field, with a gate set to deliver 5 cfs would receive water delivery for 10 hours once every 2 weeks. Of the approximate 800 ACID customers, field sizes range from 1 to 606 acres, with an average size of about 10 acres. Delivery flow rates range from 2 to 40 cfs, with an average rate of approximately 5 cfs. Ratings for delivery gates are checked by ACID staff approximately every 4 years or as needed. Table 1 identifies the number and type of turnout measurement devices and the estimated level of volumetric accuracy for each device.

Table 1. Summary of Turnout Structures
Anderson-Cottonwood Irrigation District Proposed Water Measurement Program

Measurement Type	Number[a]	Estimated Accuracy[b]	Reading Frequency	Maintenance Frequency
Rated Gate	950	Less than ±12%	Daily or when changes are made	Annually or as needed

[a] The number of each type of device will be verified during the inspection and certification process.

[b] The estimated accuracy is based on information in the *Water Management Planner*, Chapter 9, Table 1 (Reclamation, 2011) and the District's best estimate of canal and turnout conditions.

The District maintains a database that includes the name of each customer or tenant, parcel number, contact information, total acreage, ordered acres for the current year, delivery flow rate, and the irrigation time or number of hours scheduled for each delivery. The actual hours of delivery are entered into the database from the records kept by the District's four ditchtenders. Although not currently tracked, the volume of water delivered at each turnout can be calculated from the hours of delivery and the flow rate recorded in the database.

Turnout Measurement Accuracy Verification

To address the measurement requirements of the Regional Criteria, ACID is formalizing its program to verify the accuracy of its existing measurement devices. The program includes the following activities:

- Inspection of delivery gates to confirm they are installed in accordance manufacturer specifications or industry-recognized standards and that they are properly maintained to achieve accurate flow measurement
- Evaluation of delivery canal water-level fluctuations
- Initial testing of existing ratings for approximately 10 percent of the District's turnouts
- Development of an ongoing operations and maintenance (O&M) program that will check approximately 10 percent of the delivery devices each year

In addition, ACID has retained professional services to establish the accuracy and procedures for use of portable water measurement devices currently in use at the District to verify flow measurements at locations downstream from lateral headgates. At locations within the laterals with a compressed over-pour weir, a weir stick designed and built by the Irrigation Training and Research Center at California Polytechnic State University in San Luis Obispo is used to verify in-lateral flows. At locations with a pipe or conduit but no weir, a global flow probe is used to verify in-lateral flows.

O&M procedures for gate ratings have been developed, including the verification of flows at specific gate openings by use of downstream portable measuring devices, where appropriate. Ratings tables assigned to specific turnouts were updated in spring 2016 based on field measurements.

Pricing and Billing

In addition to annual assessments charged to all irrigated lands within its boundaries, ACID charges customers for water service on the basis of the number of acres for which water is requested. Customers must apply for water by mid-March. The application for water service identifies the water charges for the year, as set by the District, and the payment schedule. A copy of the Application and Agreement for 2015 Irrigation Season is included in Appendix A.

As previously noted, records currently maintained by the District allow calculation of the volume delivered at each turnout. The existing database could be modified to develop the information to allow for a volumetric pricing structure to be implemented. However, any change to the current pricing structure will require action by the ACID Board of Directors in compliance with a statutorily compliant rate-change proposal process.

To date, a volumetric pricing structure has not been developed by the District. The *Policy for Water Deliveries* (ACID, 1997) defines the volume of water delivered to each turnout throughout the season. Available water is provided equitably among District customers based on the *Policy for Water Deliveries,* which also defines a specific volume of water to each customer during each delivery cycle. Volumetric pricing is currently under consideration by the ACID Board of Directors.

Finance Plan

The initial cost estimate to develop and implement turnout measurement accuracy verification and to modify the existing database to incorporate volumetric pricing is approximately $35,000. This estimate assumes that the District will perform the work. The cost estimate may be revised as the verification program is developed and refined. ACID proposes to develop and implement the program over a 3-year period. Table 2 identifies a schedule of tasks and the estimated annual program costs. To offset the impact of these added costs on ACID and its customers, the District intends to seek funding through grants that may be available from Reclamation or the California Department of Water Resources.

Understaffing during the drought years of 2014 and 2015 affected the initial proposed schedule of verification tasks, primarily by reducing the number of measurements conducted to verify ratings at individual turnouts. However, verification is ongoing and the District intends to verify ratings at approximately 100 turnouts per year. Measurements in 2014 and 2015 were completed at approximately 50 turnouts.

Table 2. Proposed Schedule of Verification Tasks
Anderson-Cottonwood Irrigation District Proposed Water Measurement Program

Task	2014	2015	2016	2017	2018
Develop O&M procedures for gate ratings (includes reviewing existing procedures)	X				
Conduct measurements to check and verify ratings at approximately 100 turnouts per year	X	X	X	X	X
Develop or adjust ratings tables assigned to specific turnouts based on measurements		X	X	X	X
Develop volumetric pricing policy			X	X	
Develop or modify database to incorporate volumetric pricing			X	X	
Initial Estimate of Annual Costs	$6,000	$6,000	$10,000	$7,000	$6,000

Additional Water Use Efficiency Improvements

The water use efficiency improvements discussed in this report have been developed to address specific requirements of the Central Valley Project Improvement Act and the Regional Criteria. ACID has identified the following additional improvements that would provide equal or greater benefits to overall water use efficiency within the District:

- Update the outdated existing SCADA system
- Expand the SCADA to include water-level monitoring at Laterals 21, 29, 35, 37, 41, and 46 and to include flow measurement in major laterals

These SCADA system improvements would allow the District to better manage its delivery system by monitoring and coordinating river diversions and canal operations within its areas, and it would reduce operational spills. Because of the costs associated with developing and implementing the turnout measurement program and ACID's limited resources, improvements to the SCADA system will depend on an outside funding source.

References

Anderson-Cottonwood Irrigation District (ACID). 1997. *Policy for Water Deliveries.* November 13.

Bureau of Reclamation (Reclamation). 2011. *Water Management Planner*.

Bureau of Reclamation (Reclamation). 2004. *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*.

Appendix A
Application and Agreement for 2015 Irrigation Season

Anderson-Cottonwood Irrigation District
2810 Silver Street Anderson, California 96007
Telephone: 530-365-7329 e-mail: acidwater@sbcglobal.net
www.andersoncottonwoodirrigationdistrict.org

APPLICATION AND AGREEMENT FOR 2015 WATER SERVICE

Payments for water service may be made in two installments.

First Installment (at least 50%)	**Due March 6, 2015**	*Delinquent after April 6, 2015*
Second Installment	**Due May 6, 2015**	*Delinquent after June 6, 2015*

If payments are not **received / postmarked** by the delinquent dates, a late penalty of 10% will be added to the amount due, and interest will be charged on the outstanding balance at the rate of 1.5% per month until paid. Irrigation deliveries will be withheld until the amount due, including any penalties and interest, is paid.

No water will be provided prior to payment.

Please complete this form and mail it (in its entirety) with your payment in the envelope provided.

APPLICATION WITH FIRST INSTALLMENT IS DUE BY FRIDAY, MARCH 6, 2015

ASSESSOR'S PARCEL NUMBER(S) OF PARCEL(S) BEING IRRIGATED ______________________________________

PHYSICAL ADDRESS OF PARCEL(S) BEING IRRIGATED ____

LANDOWNER INFORMATION

Name: ___________________________________

Mailing Address: __________________________________

Telephone No: ______________________________

Alternate Phone: ___________________________

Email: ____________________________________

TENANT / IRRIGATOR INFORMATION

Name: ____________________________________

Mailing Address: ___________________________________

Telephone No: _______________________________

Alternate Phone: _____________________________

Email: _____________________________________

As a condition for water service, the applicant and landowner agree to comply fully with the District's Rules and Regulations, policies, and with applicable state and Federal laws, orders, and regulations. The applicant and landowner agree that they assume full responsibility and liability for the use or misuse of water delivered to their property, including all damages to adjoining property due to failure to adequately control water delivered to their property. It is further agreed that the applicant's and landowner's signatures(s) hereon signifies that they have read and understand the District's Rules and Regulations and that they accept the terms and conditions for water service from the District. The District reserves the right to adjust the rates for water service if and when it is required based on district economic needs. The landowner further agrees that any charges for water used on his/her property by him/her or his/her tenant, but for which full payment is not received, may be added as an assessment on his property tax bill and hereby consents to that assessment.

Nothing contained in this application shall be construed as an assumption of liability on the part of the District, its Directors, officers, or employees for any damages occasioned through the improper construction, maintenance or use of District facilities, or the delivery or failure to deliver water, or the waste of water, or by permitting the flow of water, or turning water in any facility, or to any land.

Any dispute, claim or controversy arising out of or relating to this Application and Agreement or the breach, termination, enforcement, interpretation or validity thereof, including the determination of the scope or applicability of this agreement to arbitrate, shall be determined by arbitration in Redding, California before one arbitrator. The arbitration shall be administered by JAMS pursuant to its Comprehensive Arbitration Rules and Procedures. Judgment on the Award may be entered in any court having jurisdiction. This clause shall not preclude parties from seeking provisional remedies in aid of arbitration from a court of appropriate jurisdiction.

Landowner Signature ____________________________

Dated: _________________________, **2015**

Tenant / Irrigator Signature _________________________________

Dated:______________________________, **2015**

		ACRES	2015 CHARGE
Annual Application Fee			$ 115.00
Irrigated Acres	**$ 76.69** x	_______	+ $ ___________
Total Charge for 2015 Water Service*			= $ ___________

***1 Acre Minimum: $191.69**

Appendix B
Anderson-Cottonwood Irrigation District Rules and Regulations

ANDERSON-COTTONWOOD IRRIGATION DISTRICT

RULES AND REGULATIONS

Governing the Distribution and Use of Water

Adopted: March 26, 1918
Revised: June 3, 1952
January 16, 1986
March 16, 1993
March 11, 2004
February 1, 2012

RULES AND REGULATIONS

INTRODUCTION

The Anderson-Cottonwood Irrigation District is a government agency acting under and by virtue of Division 11 of the California Water Code. It is governed by a Board of Directors ("Board") that is elected by the voters of the District. The District operates for the sole benefit of the lands and the people situated within the District boundaries. The benefits people within the District derive from the District will be measured by the extent to which the people within the District and the District's employees and Board of Directors cooperate to make the District a success.

These rules and regulations are adopted pursuant to California Water Code Section 22257 to effect an orderly and equitable distribution of water within the District, and a procedure for the operation, maintenance, repair and replacement of District facilities.

The District office is located at 2810 Silver Street, Anderson, California, 96007. The regular meetings of the Board of Directors are on the second Thursday of each month, beginning at 6 p.m.

The records of the District are open to the public for inspection during office hours, subject to certain confidentiality limits. Landowners and water users may avail themselves of this source of information.

The rates and terms of payment for water for non-irrigation purposes shall be determined by the Board from time to time in instances where such use is permitted by Board order.

RULE 5. WATER SERVICE BILLINGS

Water users who choose to use the two-installment payment option may be mailed a reminder approximately 30 days prior to the due date.

RULE 6. UNPAID CHARGES AND REFUSAL OF SERVICE

All charges for water service remaining unpaid on December 31st of each year in which irrigation water was used will be subject to a lien being filed at the County Recorder's office against the land upon which the water was used.

As provided for by Sections 25806 and 25807 of the Water Code of the State of California, unpaid water charges and penalties may be included on the County property tax bill by the County Auditor in the following tax year.

The District reserves the right to refuse or to discontinue service to any customer who is in default in the payment of water charges, and to any land upon which water charges are delinquent, until such delinquent charges and penalties have been paid in full.

If the District finds it necessary to temporarily or permanently terminate irrigation service to any property for violation of any of the rules set forth herein, there will be no credit given for water not taken as a result of that termination.

RULE 7. CONTROL OF WORKS

No gate, takeout, siphon, or other structure or device shall be installed or placed in any facilities of the District except with the written consent of the General Manager and then only in the manner directed by him. No persons shall interfere with any facilities of the District without permission of the General Manger or his authorized representative.

repeated unauthorized taking of water may result in the termination of service to the irrigator for the remainder of that year. In the event of either temporary or permanent termination of service, no refunds of water service charges will be granted.

RULE 11. RECAPTURE OF WATER

All water introduced into the District by the District facilities remains District water and is subject to rediversion and reuse by the District for the benefit of its customers. All such water, whether drainage or seepage water, intercepted and put to beneficial use will be charged for at the rates established by the District.

RULE 12. WATER USE

Water must be used continuously by the irrigator throughout the period of delivery. If water is wasted, or inefficiently or improperly used, the General Manager may refuse further delivery of water until the cause of waste or inefficient or improper use is removed. The General Manager may also levy appropriate monetary penalties for waste or inefficient or improper use.

RULE 13. PRIVATE IRRIGATION FACILITIES

Before water is delivered to a private or non-District irrigation facility, the facility shall be in proper condition to receive and convey water efficiently. All such facilities must be kept free from weeds and other obstructions to flow. Failure to comply with this rule will be sufficient cause for refusal to deliver water or to suspend deliveries to such facilities.

Water occurring on land due to improper maintenance of private irrigation facilities will be charged to the owner of that land. Written notice will be sent to the landowner receiving the water advising of the need to correct the maintenance problem. If no response or action is taken by the landowner to correct the improperly maintained facility on his land, a charge and penalties may be levied against the land by the District.

RULE 17. DAMAGE TO DISTRICT FACILITIES

The cost of repair for any damage to District facilities caused by any person or by livestock may be charged to the responsible party including the owner of the livestock or the owner of the land.

RULE 18. NUISANCES

No tree or vine pruning, brush, weeds, grass, rubbish, swill, garbage, manure, or refuse, or dead animal matter from any barnyard, stable, dairy, or hog pen, or other material or substance that will become offensive to the senses or injurious to health or injuriously affect the quality of water, or obstruct the flow of water or result in the scattering of seeds or noxious weeds, plants, or grasses, shall be placed or dumped in any facility of the District or be placed or left so as to roll, slide, flow, or be washed or blown into any such facility. Any violation of this rule will subject the offender to prosecution. All employees of the District are especially urged to cooperate in its enforcement.

Installation of septic tanks, water closets or privies in a location which would result in pollution of the water in a facility of the District is a misdemeanor.

Unauthorized or unapproved drainage of imported water, including stormwater runoff, into District facilities is prohibited.

RULE 19. NON-LIABLITY FOR DAMAGES

Neither the District, its officers nor employees will be liable for any damage of any kind or nature resulting directly or indirectly from any facilities not owned by the District or the water flowing therein, or by reason of lack of capacity therein or for the negligent, wasteful, or other use or handling of water by users thereof.

All water furnished by the District flows through many miles of open ditches and is therefore subject to pollution, shortages, fluctuation in flow, and interruption in service. Ditchtenders are forbidden to make any agreements binding the District to serve an uninterrupted constant supply of water. All water furnished by the District will be on the basis of irrigation deliveries and every user putting the water to other uses does so at his own risk and by doing so

APPENDIX A

ANDERSON-COTTONWOOD IRRIGATION DISTRICT

POLICY FOR WATER DELIVERIES

(Revised November 13, 1997)

The purpose of this policy is to aid in better rotations. When a water user holds the water for an extended period of time, it results in extending the rotation.

It is the duty of the ditchtender to keep the water moving in a timely manner.

- The ditchtender may take the water when conditions warrant as determined by the ditchtender or directed to do so by the General Manager. Some of the conditions could be, but are not limited to:
  - Irrigator exceeding allotted time (see **Note**).
  - Irrigator is not in attendance.
- Any irrigator not taking water when his/her turn arrives may result in forfeiture to his/her irrigation right during that rotation.
- The irrigator shall release the water at the end of his/her allotted time. Taking water after the allotted time has expired may be considered an unauthorized taking of water which may result in the termination of service to the irrigator for the remainder of that irrigation season.
- It is the responsibility of the water user to have his/her system cleaned, repaired, sized, and ready to take and use the water in a timely manner.

Note: The District uses a rule of thumb that at a rate of five cubic feet per second, an acre of land can be irrigated in one hour.

Glenn-Colusa Irrigation District

Glenn-Colusa Irrigation District

SB X7-7 Water Measurement Compliance Program

Glenn-Colusa Irrigation District
Serving Our Lands and Environment Sustainably
Water Rights Established in 1883

December 2016 Update

Contents

Glenn-Colusa Irrigation District

SB X7-7 Water Measurement Compliance Program

Purpose

In accordance with California Water Code §10106.48(b), Article 2, §597.1(a), GCID is proposing to implement a program to comply with specified requirements within the Agricultural Water Measurement Regulation. This SB X7-7 Water Measurement Compliance Program (Program), which will become a component of the District's Agricultural Water Management Plan, describes how GCID will comply with the SB X7-7 water measurement requirements and adopted regulations, attached hereto as "Exhibit 4." This Program will provide the following pursuant to §597.4 (e):

1. Documentation as required to demonstrate compliance with §597, as outlined in section §597.3 and §597.4.
2. A description of best professional practices about, but not limited to, the (1) collection of water measurement data, (2) frequency of measurements, (3) method for determining irrigated acres, and (4) quality control and quality assurance procedures.
3. If a water measurement device measures flow rate, velocity or water elevation, and does not report the total volume of water delivered, the agricultural water supplier must document in its Agricultural Water Management Plan how it converted the measured value to volume. The protocols must follow best professional practices and include the following methods for determining volumetric deliveries:
    a. For devices that measure flow-rate, documentation shall describe protocols used to measure the duration of water delivery where volume is derived by the following formula: Volume = flow rate x duration of delivery.
    b. For devices that measure velocity only, the documentation shall describe protocols associated with the measurement of the cross-sectional area of flow and duration of water delivery, where volume is derived by the following formula: Volume = velocity x cross-section flow area x duration of delivery.

c. For devices that measure water elevation at the device (e.g. flow over a weir or differential elevation on either side of a device), the documentation shall describe protocols associated with the measurement of elevation that was used to derive flow rate at the device. The documentation will also describe the method or formula used to derive volume from the measured elevation value(s).

4. If an existing measurement device is determined to be out of compliance with §597.3, and the agricultural water supplier is unable to bring it into compliance before submitting its Agricultural Water Management Plan, the agricultural water supplier shall provide in its plan, a schedule, budget and finance plan for taking corrective action in three years or less.

Program Components

To comply with the SB X7-7 water measurement requirements and adopted regulations, the Program will include the following critical components:

- Proposed physical measurement alternatives and criteria.
- Proposed measurement protocols, customer billing, and reporting.
- Proposition 218 compliance to address new infrastructure costs and new rate methodologies incorporating in-part volumetric pricing.

Proposed Physical Measurement Alternatives and Criteria

The Program will employ water measurement using a combination of lateral level (upstream) turnout measurement to multiple customers, and measurement to individual customer turnouts referred to as farm-gates in §597.2(a)(8). In development of the Program, the District will develop a master plan overview of existing and proposed measurement facilities identifying the water delivery service area served by the lateral level (upstream) measurement turnouts and the service area served by individual turnouts. This master plan will also identify the measurement device at the lateral level (upstream) turnout measurement point (main canal metered laterals, main canal unmetered laterals, main canal lift pumps/pump ditches, pump recapture sites, and gravity recapture sites), or individual turnout measurement points (main canal and certain individual customer turnouts that serve individual fields). The information regarding the proposed metering methods and equipment necessary to comply with the volumetric pricing requirement, are further discussed in "Exhibit 3" which provides general, non-exclusive options for the types of devices that could be utilized to meet §597.3(a), §597.3(b)(1), and elements of §597.4 (e)(2).

A combination of lateral level (upstream) turnout measurement and individual turnout measurement is required because the options in §597.3(a) cannot be met at numerous farm-gate delivery points. In such circumstances, installation, measurement, operation, and monitoring of measurement devices at each downstream individual customer delivery point is not possible due to either one or both of the following conditions:

- GCID lacks legal access to the delivery points of individual customers or group of customers. Such cases shall be certified pursuant to §597.3(b)(2)(A).
- Small differentials in water levels from laterals to the fields, and large fluctuations in flow rate that result in poorly functioning devices. This determination shall be evaluated and certified by an engineer in accordance with §597.3(b)(2)(B).

GCID's water conveyance system presents a wide range of physical conditions that make planning for and complying with the SB X7-7 water measurement requirements challenging. In order to address these challenges, GCID will conduct a Pilot Project (See "Exhibit 1") by installing measurement devices at representative sites to identify effective metering solutions, infrastructure modification requirements, and refine costs. Site modification and construction requirements, and costing derived from the Pilot Project will provide important information to support funding requirements and the required Proposition 218 process. The Pilot Project is funded from the current GCID budget.

It is anticipated that the Pilot Project and subsequent Water Measurement Compliance Program will employ a combination of metering devices best suited to these various physical conditions. For lateral level (upstream) turnout measurement, the District will use a combination of measurement devices, which may include propeller meters, acoustic doppler meters, portable acoustic doppler meters, weirs with pressure transducers, Irrigation Training & Research Center of California Polytechnic State University San Luis Obispo (ITRC) calibrated metergates, and flumes:

A. Propeller meters with electronic flow rate and total quantity indicators will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(b)(1). The propeller meters measure velocity in pressurized pipes, which based on the cross-sectional area of the pipe is converted to an instantaneous flow rate. The totalizer on the device will report the total volume of water delivered by summing all of the previous measured instantaneous volumes to yield the total volume measured to date. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: Volume = flow rate x duration of delivery).

B. Acoustic doppler velocity meters with electronic flow rate indicator and totalizer will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(b)(1). The acoustic doppler meter averages velocity and cross-sectional area at the measurement site over a specified time interval, which yields an average flow rate for this specified time interval. The totalizer on the device will report the total volume of water delivered by taking this average flow over a period of time. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: Volume = flow rate x duration of delivery.)

C. Portable acoustic doppler meters will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(b)(1). The portable acoustic doppler meter averages velocity and cross-sectional area at the measurement site over a specified time interval, which yields an average flow rate for this specified time interval. The average flow rate multiplied by the accumulated time duration at a constant maintained flow will yield the total volume of water delivered during the period of constant flow. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: Volume = flow rate x duration of delivery).

D. Weirs with pressure transducer measurement devices will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(b)(1). Weirs with pressure transducer measurement devices measure water elevation. This data is used in conjunction with industry standard equations and/or methodologies specific to the type of weir utilized with the pressure transducer elevation readings to determine flow. The flow shall be either programmed into a data logging device for direct report of volume, or the data will be processed in spreadsheets to obtain volume. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: Volume = flow rate x duration of delivery.) Weir measurement devices, including rectangular or v-notch weir measurement devices, will be certified by an engineer to meet the requirements of §597.4(a).

E. ITRC calibrated metergates will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(b)(1). The ITRC calibrated metergates require measurement of the following parameters: the delivery gate opening, inlet water elevation at the delivery gate, and stilling well water elevation one-foot behind the delivery gate. The measurements will be collected manually with staff gauges, tape measure, and/or survey rod. The head differential from the water elevation measurements in conjunction with the delivery gate opening yields a corresponding empirical flow rate from the respective ITRC flow rating table. The resultant flow rate multiplied by the accumulated time duration at a constant maintained flow will yield the total volume of water delivered during the period of constant flow. The flow shall be either programmed into a data logging device for direct report of volume, or the data will be processed in spreadsheets to obtain volume. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: Volume = flow rate x duration of delivery.)

F. Flume measurement devices will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(b)(1). Flumes requires a water surface elevation measurement to be collected at the prescribed location set forth from the associated flume design with the industry standard WinFlume software. The measurements can be collected with the following methods: manually with a staff gauge, pressure transducer, or an ultrasonic measurement device. The flow shall be either programmed into a data logging device for direct report of volume, or the data will be processed in spreadsheets to obtain volume. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: Volume = flow rate x duration of delivery.) Flume measurement devices, including rectangular flumes or Replogle Flumes, will be certified by an engineer to meet the requirements of §597.4(a).

Similarly, for individual turnout, farm-gate, measurement, the District will use a combination of measurement devices, which may include propeller meters, acoustic doppler meters, portable acoustic doppler meters, weirs with pressure transducers, and ITRC calibrated metergates:

A. Propeller meters with electronic flow rate and total quantity indicators will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a).

B. Acoustic doppler meters with electronic flow rate indicator and totalizer will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a).

C. Portable acoustic doppler meters will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a).

D. Weir with pressure transducer measurement devices will be used on some existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a). Rectangular or v-notch weir measurement devices will be certified to meet the water measurement requirements of §597.3(a).

E. ITRC calibrated metergates will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a).

"Exhibit 2" presents the projected timeline for implementation of this Program, factoring in the Pilot Project process, number of metering sites, extraordinary fiscal demand in exceedance of standard operation and maintenance expenses, limited annual construction periods and physical conditions, including weather, during GCID's 6-week winter maintenance period available for the installation of the metering equipment.

Proposed Measurement Protocols, Customer Billing, and Reporting

Currently, GCID has an active and robust measurement program throughout the distribution system including main diversion points, laterals, sub-laterals, spill points, drain water recycling stations, etc. in order to effectuate good water management. Annually, the District completes a Water Measurement Report, which summarizes data on a monthly and yearly basis from all the water flow measurement points. This report is developed using a sophisticated and real-time Access database. The District has also made significant investments in Supervisory Control and Data Acquisition (SCADA), Water Information System (WIS) database, measurement reports, conjunctive use programs, conveyance improvements, and reuse facilities, all for the purpose of managing water supplies under a broad range of hydrology, delivery constraints, and ecosystem needs. This information is provided to the State Water Resources Control Board, Bureau of Reclamation, and Department of Water Resources.

A. Measurement Protocol

For this Program, the District will need to collect monthly measurement records, which will be used to develop billings to individual customers. Measurement records will be batched to the District's Water Information System to provide for a complete record of District deliveries, and then to the Water Accounting Program, which will be used to generate water user billings.

For lateral level (upstream) turnout and individual turnout measurement, the acreage and cropping pattern will be used to allocate and apportion flows to water users within a lateral or individual service area. Currently, the District generates an annual crop report that is included in the Water Measurement Report and also calculates the acreage of each crop within each service area. This information is obtained from water users during the water application process and then is confirmed by District personnel during mid-year field inspections.

B. Customer Billing

Currently, the District utilizes a customer accounting program that bills water users based on a per-acre land based assessment, a standby charge, and volumetric consumption rate based on the planted crop applied water use and evapotranspiration rate. The rates are reviewed on an annual basis and may be increased at the discretion of the Board of Directors, and as approved by landowners pursuant to a Proposition 218 rate setting process.

With a new billing structure required to comply with SB X7-7 water measurement requirements, the District will need to migrate to a new Water Accounting Program that will enable information to be downloaded from the Water Information System and to allow for lateral level and individual turnout measurement, and apportionment processes. Additionally, the District currently bills in five installments but, since in-part volumetric pricing will be required, the billing structure and collection process of the volumetric component may need to change to a monthly billing cycle.

C. Reporting

As required in §531.10(a) of the California Water Code, the District will submit an annual report to the Department that summarizes aggregated farm-gate delivery data on a monthly basis using best professional practices.

Proposition 218 Compliance to Address New Infrastructure Costs and New Rate Methodologies Incorporating In-Part Volumetric Pricing

After the Pilot Project has been completed and the District has selected the type of equipment that will be necessary to comply with SB X7-7 water measurement requirements, the District will undertake a public outreach effort that will include a series of public landowner and water user meetings to educate stakeholders on the costs and the water rate increases that will be necessary to comply with the new law. Through a series of meetings with its water users, the District will ultimately settle on one preferred rate structure, and in accordance with the requirements of California's Proposition 218, an Engineer's Report will be prepared by a registered Civil Engineering Firm. After the Engineer's Report is completed, the District will hold a public meeting to review the Engineer's Report and proposed rate structure. This meeting will trigger the start of a 45-day time period that will allow all landowners to participate in a mail ballot election on the proposed changes to the rate structure. At the end of the 45-day period, the District will hold a hearing to tally the mail ballot results and set the rates.

It is important to note that compliance with the SB X7-7 water measurement requirements will be based on the rate structure being approved by customers under Proposition 218 as required by Article XIIID of the California Constitution. Under Proposition 218, the District is not able to increase water rates or assessments to fund the Program without the approval of its landowners.

EXHIBIT 1: SB X7-7 NON-EXCLUSIVE MEASUREMENT DEVICE ALTERNATIVES PILOT PROJECT CAPITAL COST SUMMARY FOR WATER YEARS 2013-2016 TESTING

Site	Meter Manufacturer	Meter Type	Total Cost Per Site:
12-3-14R	Mace	Doppler Ultrasonic Area/Velocity Sensor	$ 8,850
Lateral 13-3	McCrometer Propeller	M1700 Digital Reverse Propeller Meter	$ 6,764
Lateral 19-1	Mace	Doppler Ultrasonic Area/Velocity Sensor	$ 7,045[2, 3]
Lateral 21-1	WinFlume/GCID	Rectangular Flume with Senix ToughSonic14	$ 76,009
Lateral 21-2	Mace	2x Doppler Ultrasonic Insert Velocity Sensors	$ 10,280
Lateral 21-4	WinFlume/GCID	Rectangular Flume with Mace EchoFlo	$ 78,449
Main Canal-49L	SonTek	IQ Pipe	$ 13,675
Lateral 26-2	SonTek	IQ Plus	$ 13,800
Juney Weir Lift Pump	Mace	Doppler Ultrasonic Insert Velocity Sensor	$ 12,463
Lateral 28-1-1L	Measurement Specialties & Briggs Mfg.	Pressure transducer and data logger with suppressed rectangular weir	$ 6,155
Lateral 29-2	SonTek	IQ Pipe	$ 12,035
Main Canal 91L	Mace	Doppler Ultrasonic Insert Velocity Sensor	$ 7,930
Lateral 35-1	Mace	Doppler Ultrasonic Area/Velocity Sensor	$ 10,220
Lateral 38-1	Mace	Doppler Ultrasonic Velocity Sensor	$ 4,613[2, 3]
Main Canal 192L	SonTek	IQ Pipe	$ 11,570[2, 3]
Lateral 54-1	McCrometer	Digital Reverse Propeller Meter M1736	$ 5,089
31 sites	ITRC Calibrated Metergate	15” ITRC Meter Gate	$ 4,308[1]
20 sites	ITRC Calibrated Metergate	18” ITRC Meter Gate	$ 4,906[1]
4 sites	ITRC Calibrated Metergate	24”ITRC Meter Gate	$ 5,274[1]
34 metergate sites	H2Otech	1x RemoteTracker Acoustic Doppler Velocimeter	$ 24,326[4]
Actual Total Cost of SB X7-7 Pilot Project			**$ 543,158**
***Simulated Total Cost* of SB X7-7 Pilot Project including device costs of relocated measurement devices**			**$ 562,037[3]**
***Simulated* Average Cost Per Site**			**$ 7,806[3]**

Please note:

I) [1] Total site cost is an average of multiple measurement device sites.
II) [2] Relocated measurement device.
III) [3] Simulated costs replicate the costs of the relocated measurement devices.
IV) [4] Portable device capable of collecting point measurements at multiple sites.

EXHIBIT 2: IMPLEMENTATION TIMELINE

Date	Action
December 2012	Complete SB X7-7 infrastructure planning and cost estimates
December 31, 2012	Complete SB X7-7 Water Measurement Compliance Program in preparation for submission to DWR pending USBR approval of Regional Water Management Plan
February 14, 2013	GCID Board of Directors review and consideration of the Regional Water Management Plan, and SB X7-7 Water Measurement Compliance Program
Phase I - Pilot Project	
March 2013 – December 2016	Conduct pilot program by installing various metering options at representative sites to assess construction requirements, confirm meter accuracy, and refine costs
March 2013 – December 2016	Operate Pilot Project metering site equipment to evaluate overall operation and accuracy
Phase II - Finalize Metering Program	
2017 – 2018	Information from the Pilot Project will be used to: - Identify actual metering solutions by site - Prepare a detailed budget and schedule for implementation
Phase III - Public Outreach and Water Rate Structure	
2019	Hold landowner/public meetings on Project cost
	Develop assessment and water rate structure alternatives and continue to gather feedback from GCID water users
Phase IV – Proposition 218 Process	
2020	Complete Engineering Report in accordance with Proposition 218 assessment and water rate requirements
	Hold landowner/public meetings on results of Engineering Report and proposed rate structure
	Begin 45-day mandatory Proposition 218 notice period
	Hold final Proposition 218 hearing, and set rates

Phase V – Installation of Metering Infrastructure	
Initialization subsequent to completion of Phase IV	Begin full-scale installation of metering infrastructure pending outcome of the Proposition 218 process It is anticipated that a maximum of 30 metering sites can be installed per year due to critical issues that impact design, construction, and installation of metering equipment, including: - Special conditions created by the presence of aquatic weed infestations - Year-round water service confines major construction activities to a 6-week period during January and February, and other limited periods when dry conditions allow - Weather conditions can limit construction activities during the winter months - Installation of metering infrastructure is dependent upon funding and successful completion of the Proposition 218 process

EXHIBIT 3: NON-EXCLUSIVE MEASUREMENT DEVICE ALTERNATIVES

Flow Condition	Measurement Device	Type of Device	Manufacturer Accuracy for New Device	SBX7-7 Accuracy Criteria	Volumetric Conversion Protocol per **§597.4 (e)(3)**	Frequency of Measurements per **§597.4 (e)(2)(2)**	Installation Criteria per **Best Professional Practices**	Collection of Water Measurement Data per **§597.4 (e)(2)(1)**
Open Channel	Measurement Specialties *730S*	Pressure transducer with stilling well	▪ ±0.1 Full Scale Output by Best-Fit Straight Line	As Applicable: New: Requires §597.3 (a)(2)(B); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Industry standard equation for head-discharge relationship: $V = \sum_{i=1}^{n} Q_i T_i$	5-15 minutes unless Best Professional Practices dictate otherwise	Install in a location with minimal turbulence and appropriate pressure measuring range	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek *IQ (Standard or Plus)*	Acoustic doppler current meter	▪ ±1% of measured velocity, ±0.5 cm/s (0.2 in/s) ▪ 0.1% of measured depth or ±0.003 m (0.01 ft) whichever is greater	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^{n} v_i A_i T_i$	5-15 minutes unless Best Professional Practices dictate otherwise	Install at least ten channel widths upstream and downstream of any flow disturbances (i.e. gates, curves, abrupt changes in elevation)	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek *SL 1500*	Acoustic doppler current meter	▪ ± 1% of measured velocity, ± 0.015 ft/s ▪ ±0.3cm (0.01 ft) of measured depth ±0.1%	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^{n} v_i A_i T_i$	5-15 minutes unless Best Professional Practices dictate otherwise	Install at least ten channel widths along a straight and uniform canal stretch with minimal turbulence	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek *SW*	Acoustic doppler current meter	▪ ±1% of measured velocity, ± 0.015 ft/s ▪ ±0.1% of measured depth, ±0.3 cm (0.01 ft)	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^{n} v_i A_i T_i$	5-15 minutes unless Best Professional Practices dictate otherwise	Straight and uniform canal stretch with minimal turbulence	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek *IQ Pipe*	Acoustic doppler current meter	▪ ±1% of measured velocity, ±0.5 cm/s (0.2 in/s) ▪ 0.1% of measured depth or ±0.003 m (0.01 ft) whichever is greater	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^{n} v_i A_i T_i$	5-15 minutes unless Best Professional Practices dictate otherwise	10 pipe diameters in either direction from an obstruction or flow diversion	Real-time remote acquisition and/or monthly physical connection with device storage for download
	WinFlume designed Flumes	Flumes with staff ultrasonic stage sensor, pressure transducer, or staff gauge	▪ <5% of measured flow, in accordance with specified design inputs for water elevation measurement	As Applicable: New: Satisfies §597.3 (a)(2)(B); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^{n} Q_i T_i$	5-15 minutes for electronic devices; planned flow changes for staff gauge	Install at least ten channel widths along a straight and uniform canal stretch with minimal turbulence	Real-time remote acquisition, monthly physical connection with device storage for download, or manual transcription

Flow Condition	Measurement Device	Type of Device	Manufacturer Accuracy for New Device	SBX7-7 Accuracy Criteria	Volumetric Conversion Protocol per **§597.4 (e)(3)**	Frequency of Measurements per **§597.4 (e)(2)(2)**	Installation Criteria per **Best Professional Practices**	Collection of Water Measurement Data per **§597.4 (e)(2)(1)**
Full Pipe	McCrometer *Mc Propeller M1700*	Propeller Open Flow meter	▪ ±2% of measured velocity with repeatability of ±0.25%	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $$V = \sum_{i=1}^{n} v_i A_i T_i$$	5-15 minutes unless Best Professional Practices determine otherwise	Positioning: 10 pipe diameters upstream	Real-time remote acquisition and/or monthly physical connection with device storage for download
	McCrometer *Bolt-On Saddle Flowmeter MO300 or M1400*	Propeller meter	▪ ±2% of measured velocity with repeatability of ±0.25%	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $$V = \sum_{i=1}^{n} v_i A_i T_i$$	5-15 minutes unless Best Professional Practices determine otherwise	Positioning: 10 pipe diameters upstream and two diameters downstream of the meter	Real-time remote acquisition and/or monthly physical connection with device storage for download
	Mace *Doppler Velocity Insert*	Doppler ultrasonic velocity sensor	▪ ±1% of measured velocity, up to 10 ft/s	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $$V = \sum_{i=1}^{n} v_i A_i T_i$$	5-15 minutes unless Best Professional Practices determine otherwise	Positioning is valve dependent: 6-15 pipe diameters upstream and 2-6 diameters downstream	Real-time remote acquisition and/or monthly physical connection with device storage for download
	H2Otech RemoteTracker	Acoustic doppler velocimeter	▪ ±4.6%	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $$V = \sum_{i=1}^{n} v_i A_i T_i$$	Collect measurements at planned flow changes	Positioning: Weir box at turnout discharge to ensure full pipe flow with bracket to position sensor at center of pipe	Measurements are relayed to a central database via a wide wireless area network (WWAN)
	ITRC calibrated metergate	Metergate	▪ ±5%	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $$V = \sum_{i=1}^{n} Q_i T_i$$	Collect measurements at planned flow changes	Install metergate assembly perpendicular to canal flow with a stilling well 12" behind the delivery gate	Measurements are manually collected, recorded, then transcribed into a database
	SonTek *IQ Pipe*	Acoustic doppler current meter	▪ ±0.1% of full scale pressure ▪ ±1% of measured velocity, ±0.5 cm/s (0.2 in/s) ▪ 0.1% of measured depth or ±0.003 m (0.01 ft) whichever is greater	As Applicable: New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $$V = \sum_{i=1}^{n} v_i A_i T_i$$	5-15 minutes unless Best Professional Practices determine otherwise	10 pipe diameters in either direction from an obstruction or flow diversion	Real-time remote acquisition and/or monthly physical connection with device storage for download

Please Note:

The Volumetric conversion protocol variables are defined below.

$$V = \sum_{i=0}^{n} v_i A_i \, T_i$$

V (Volume, ft^3)
Σ (summation sign)
n (final reported measurement for the year)
i (measurement number)
v_i (velocity, ft/s)
A_i (cross sectional area, ft^2)
T_i (sample time duration of measurement)

OR

$$V = \sum_{i=0}^{n} Q_i \, T_i$$

V (Volume, ft^3)
Σ (summation sign)
n (final reported measurement for the year)
i (measurement number)
Q_i (, ft/s)
T (sample time duration of measurement)

Essentially, these equations states that the volume of water measured over a sample time will be totalized with all previous measured volumes to yield the total volume measured thus far at that time in the year.

State of California
The Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Statewide Integrated Water Management
Water Use and Efficiency Branch

Agricultural Water Measurement

A regulation included under the authority of
Section 10608.48(i) (1) and(2) of the California Water Code

July 11, 2012

Edmund G. Brown Jr.
Governor
State of California

John Laird
Secretary for Natural Resources
The Natural Resources Agency

Mark W. Cowin
Director
Department of Water Resources

State of California
Office of Administrative Law

In re: **Department of Water Resources**	NOTICE OF APPROVAL OF REGULATORY ACTION
Regulatory Action:	Government Code Section 11349.3
Title 23, California Code of Regulations	OAL File No. 2012-0531-01 SR
Adopt sections: 597, 597.1, 597.2, 597.3, 597.4 **Amend sections:** **Repeal sections:**	

The Department of Water Resources proposed this action to adopt five sections and create a new article in title 23 of the California Code of Regulations for agricultural water measurement. The purpose of the regulatory action is to provide a range of options that agricultural water suppliers may use or implement to comply with the water measurement requirements in Water Code 10608.48(b)(1). These regulations implement amendments to the Water Code made in S.B. 7 (Stats. 2009, 7th Ex. Sess., ch. 4).

OAL approves this regulatory action pursuant to section 11349.3 of the Government Code. This regulatory action becomes effective on 7/11/2012.

Date: 7/11/2012

Richard L. Smith

Richard L. Smith
Senior Counsel

For: DEBRA M. CORNEZ
Director

Original: Mark Cowin
Copy: Kent Frame

California Code of Regulations
Title 23. Waters
Division 2. Department of Water Resources
Chapter 5.1. Water Conservation Act of 2009
Article 2. Agricultural Water Measurement

§597. Agricultural Water Measurement

Under the authority included under California Water Code §10608.48(i)(1), the Department of Water Resources (Department) is required to adopt regulations that provide for a range of options that agricultural water suppliers may use or implement to comply with the measurement requirements in paragraph (1) of subdivision (b) of §10608.48.

For reference, §10608.48(b) of the California Water Code states that:

> *Agricultural water suppliers shall implement all of the following critical efficient management practices:*
>
> *(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).*
>
> *(2) Adopt a pricing structure for water customers based at least in part on quantity delivered.*

For further reference, §531.10(a) of the California Water Code requires that:

> *(a) An agricultural water supplier shall submit an annual report to the department that summarizes aggregated farm-gate delivery data, on a monthly or bi-monthly basis, using best professional practices.*

Notes:

(1) Paragraphs (1) and (2) of §10608.48(b) specify agricultural water suppliers' reporting of aggregated farm-gate water delivery and adopting a volumetric water pricing structure as the purposes of water measurement. However, this article only addresses developing a range of options for water measurement.

(2) Agricultural water suppliers reporting agricultural water deliveries measured under this article shall use the "Agricultural Aggregated Farm – Gate Delivery Reporting Format for Article 2" (Rev. 6-20-12), developed for this article and hereby incorporated by reference.

(3) The Department shall report on the availability of new commercially available water measurement technologies and impediments to implementation of this article when reporting to the Legislature the status of adopted Agricultural Water Management Plans in plan submittal years 2012, 2015 and every five years thereafter as required by California Water Code §10845. The Department shall also report the findings to the California Water Commission.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 531.10, 10608.48 (b), 10608.48 (i), 10608.52 (b) and 10845 Water Code.

§597.1. Applicability

(a) An agricultural water supplier providing water to 25,000 irrigated acres or more, excluding acres that receive only recycled water, is subject to this article.

(b) A wholesale agricultural water supplier providing water to another agricultural water supplier (the receiving water supplier) for ultimate resale to customers is subject to this article at the location at which control of the water is transferred to the receiving water supplier. However, the wholesale agricultural water supplier is not required to measure the receiving agricultural water supplier's deliveries to its customers.

(c) A water supplier providing water to wildlife refuges or habitat lands where (1) the refuges or habitat lands are under a contractual relationship with the water supplier, and (2) the water supplier meets the irrigated acreage criteria of Water Code §10608.12(a), is subject to this article.

(d) An agricultural water supplier providing water to less than 10,000 irrigated acres, excluding acres that receive only recycled water, is not subject to this article.

(e) An agricultural water supplier providing water to 10,000 or more irrigated acres but less than 25,000 irrigated acres, excluding acres that receive only recycled water, is not subject to this article unless sufficient funding is provided specifically for that purpose, as stated under Water Code §10853.

(f) A canal authority or other entity that conveys or delivers water through facilities owned by a federal agency is not subject to this article.

(g) Pursuant to Water Code §10608.8(d), an agricultural water supplier "that is a party to the Quantification Settlement Agreement, as defined in subdivision (a) of Section 1 of Chapter 617 of the Statutes of 2002, during the period within which the Quantification Settlement Agreement remains in effect," is not subject to this article.

(h) Pursuant to Water Code §10608.12(a), the Department is not subject to this article.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 10608.12 (a), 10608.48 (d), 10608.48 (f), 10828, and 10853 Water Code.

§597.2. Definitions

(a) For purposes of this article, the terms used are defined in this section.

(1) "Accuracy" means the measured volume relative to the actual volume, expressed as a percent. The percent shall be calculated as 100 x (measured value – actual value) / actual value, where "measured value" is the value indicated by the device or determined through calculations using a measured value by the device, such as flow rate, combined with a duration of flow, and "actual value" is the value as determined through laboratory, design or field testing protocols using best professional practices.

(2) "Agricultural water supplier," as defined in Water Code §10608.12(a), means a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding acres that receive only recycled water. "Agricultural water supplier" includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells water for ultimate resale to customers. "Agricultural water supplier" does not include the Department.

(3) "Approved by an engineer" means a California-registered Professional Engineer has reviewed, signed and stamped the plans, design, testing, inspection, and/or documentation report for a measurement device as described in this article.

(4) "Best professional practices" means practices attaining to and maintaining accuracy of measurement and reporting devices and methods described in this article, such as operation and maintenance procedures and practices recommended by measurement device manufacturers, designers, and industry professionals.

(5) "Customer" means the purchaser of water from an agricultural water supplier who has a contractual arrangement with the agricultural water supplier for the service of conveying water to the customer delivery point.

(6) "Delivery point" means the location at which the agricultural water supplier transfers control of delivered water to a customer or group of customers. In most instances, the transfer of control occurs at the farm-gate, which is therefore, a delivery point.

(7) "Existing measurement device," means a measurement device that was installed in the field prior to the effective date of this article.

(8) "Farm-gate," as defined in Water Code §531(f), means the point at which water is delivered from the agricultural water supplier's distribution system to each of its customers.

(9) "Irrigated acres," for purposes of applicability of this article, is calculated as the average of the previous five-year acreage within the agricultural water supplier's service area that has received irrigation water from the agricultural water supplier.

(10) "Manufactured device" means a device that is manufactured by a commercial enterprise, often under exclusive legal rights of the manufacturer, for direct off-the-shelf purchase and installation. Such devices are capable of directly measuring flow rate, velocity, or accumulating the volume of water delivered, without the need for additional components that are built on-site or in-house.

(11) "Measurement device" means a device by which an agricultural water supplier determines the numeric value of flow rate, velocity or volume of the water passing a designated delivery point. A measurement device may be a manufactured device, on-site built device or in-house built device.

(12) "New or replacement measurement device" means a measurement device installed after the effective date of this article.

(13) "Recycled water" is defined in subdivision (n) of §13050 of the Water Code as water that, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur, and is therefore considered a valuable resource.

(14) "Type of device" means a measurement device that is manufactured or built to perform similar functions. For example, rectangular, v-notch, and broad crested weirs are one type of device. Similarly, all submerged orifice gates are considered one type of device.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 10608.12 (a), 10608.12 (m), 10608.48, and 10813 Water Code.

§597.3 Range of Options for Agricultural Water Measurement

An agricultural water supplier subject to this article shall measure surface water and groundwater that it delivers to its customers pursuant to the accuracy standards in this section. The supplier may choose any applicable single measurement option or combination of options listed in paragraphs (a) or (b) of this section. Measurement device accuracy and operation shall be certified, tested, inspected and/or analyzed as described in §597.4 of this article.

(a) Measurement Options at the Delivery Point or Farm-gate of a Single Customer

An agricultural water supplier shall measure water delivered at the delivery point or farm-gate of a single customer using one of the following measurement options. The stated numerical accuracy for each measurement option is for the volume delivered. If a device measures a value other than volume, for example, flow rate, velocity or water elevation, the accuracy certification must incorporate the measurements or calculations required to convert the measured value to volume as described in §597.4(e).

(1) An existing measurement device shall be certified to be accurate to within ±12% by volume.

and,

(2) A new or replacement measurement device shall be certified to be accurate to within:

(A) ±5% by volume in the laboratory if using a laboratory certification;

(B) ±10% by volume in the field if using a non-laboratory certification.

(b) Measurement Options at a Location Upstream of the Delivery Points or Farm-gates of Multiple Customers

(1) An agricultural water supplier may measure water delivered at a location upstream of the delivery points or farm-gates of multiple customers using one of the measurement options described in §597.3(a) if the downstream individual customer's delivery points meet either of the following conditions:

(A) The agricultural water supplier does not have legal access to the delivery points of individual customers or group of customers needed to install, measure, maintain, operate, and monitor a measurement device.

Or,

(B) An engineer determines that, due to small differentials in water level or large fluctuations in flow rate or velocity that occur during the delivery season at a single farm-gate, accuracy standards of measurement options in §597.3(a) cannot be met by installing a measurement device or devices (manufactured or on-site built or in-house built devices with or without additional components such as gauging rod, water level control structure at the farm-gate, etc.). If conditions change such that the accuracy standards of measurement options in §597.3(a) at the farm-gate can be met, an agricultural water supplier shall include in its Agricultural Water Management Plan, a schedule, budget and finance plan to demonstrate progress to measure water at the farm-gate in compliance with §597.3(a) of this article.

(2) An agricultural water supplier choosing an option under paragraph (b)(1) of this section shall provide the following current documentation in its Agricultural Water Management Plan(s) submitted pursuant to Water Code §10826:

(A) When applicable, to demonstrate lack of legal access at delivery points of individual customers or group of customers downstream of the point of measurement, the agricultural water supplier's legal counsel shall certify to the Department that it does not have legal access to measure water at customers delivery points and that it has sought and been denied access from its customers to measure water at those points.

(B) When applicable, the agricultural water supplier shall document the water measurement device unavailability and that the water level or flow conditions described in §597.3(b)(1)(B) exist at individual customer's delivery points downstream of the point of measurement as approved by an engineer.

(C) The agricultural water supplier shall document all of the following criteria about the methodology it uses to apportion the volume of water delivered to the individual downstream customers:

(i) How it accounts for differences in water use among the individual customers based on but not limited to the duration of water delivery to the individual customers, annual customer water use patterns, irrigated acreage, crops planted, and on-farm irrigation system,

and;

(ii) That it is sufficient for establishing a pricing structure based at least in part on the volume delivered,

and;

(iii) That it was approved by the agricultural water supplier's governing board or body.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 531.10, 10608.48 *(i)* (1), and 10826 Water Code.

§597.4 Accuracy Certification, Records Retention, Device Performance, and Reporting

(a) Initial Certification of Device Accuracy

The accuracy of an existing, new or replacement measurement device or type of device, as required in §597.3, shall be initially certified and documented as follows:

(1) For existing measurement devices, the device accuracy required in section 597.3(a) shall be initially certified and documented by either:

(A) Field-testing that is completed on a random and statistically representative sample of the existing measurement devices as described in §597.4(b)(1) and §597.4(b)(2). Field-testing shall be performed by individuals trained in the use of field-testing equipment, and documented in a report approved by an engineer.

Or,

(B) Field-inspections and analysis completed for every existing measurement device as described in §597.4(b)(3). Field-inspections and analysis shall be performed by trained individuals in the use of field inspection and analysis, and documented in a report approved by an engineer.

(2) For new or replacement measurement devices, the device accuracy required in sections 597.3 (a)(2) shall be initially certified and documented by either:

(A) Laboratory Certification prior to installation of a measurement device as documented by the manufacturer or an entity, institution or individual that tested the device following industry-established protocols such as the National Institute for Standards and Testing (NIST) traceability standards. Documentation shall include the manufacturer's literature or the results of laboratory testing of an individual device or type of device.

Or,

(B) Non-Laboratory Certification after the installation of a measurement device in the field, as documented by either:

(i) An affidavit approved by an engineer submitted to the agricultural water supplier of either (1) the design and installation of an individual device at a specified location, or (2) the standardized design and installation for a group of measurement devices for each type of device installed at specified locations.

Or,

(ii) A report submitted to the agricultural water supplier and approved by an engineer documenting the field-testing performed on the installed measurement device or type of device, by individuals trained in the use of field testing equipment.

(b) Protocols for Field-Testing and Field-Inspection and Analysis of Existing Devices

(1) Field-testing shall be performed for a sample of existing measurement devices according to manufacturer's recommendations or design specifications and following best professional practices. It is recommended that the sample size be no less than 10% of existing devices, with a minimum of 5, and not to exceed 100 individual devices for any particular device type. Alternatively, the supplier may develop its own sampling plan using an accepted statistical methodology.

(2) If during the field-testing of existing measurement devices, more than one quarter of the samples for any particular device type do not meet the criteria pursuant to §597.3(a), the agricultural water supplier shall provide in its Agricultural Water

Management Plan, a plan to test an additional 10% of its existing devices, with a minimum of 5, but not to exceed an additional 100 individual devices for the particular device type. This second round of field-testing and corrective actions shall be completed within three years of the initial field-testing.

(3) Field-inspections and analysis protocols shall be performed and the results shall be approved by an engineer for every existing measurement device to demonstrate that the design and installation standards used for the installation of existing measurement devices meet the accuracy standards of §597.3(a) and operation and maintenance protocols meet best professional practices.

(c) Records Retention

Records documenting compliance with the requirements in §597.3 and §597.4 shall be maintained by the agricultural water supplier for ten years or two Agricultural Water Management Plan cycles.

(d) Performance Requirements

(1) All measurement devices shall be correctly installed, maintained, operated, inspected, and monitored as described by the manufacturer, the laboratory or the registered Professional Engineer that has signed and stamped certification of the device, and pursuant to best professional practices.

(2) If an installed measurement device no longer meets the accuracy requirements of §597.3(a) based on either field-testing or field-inspections and analysis as defined in sections 597.4 (a) and (b) for either the initial accuracy certification or during operations and maintenance, then the agricultural water supplier shall take appropriate corrective action, including but not limited to, repair or replacement to achieve the requirements of this article.

(e) Reporting in Agricultural Water Management Plans

Agricultural water suppliers shall report the following information in their Agricultural Water Management Plan(s):

(1) Documentation as required to demonstrate compliance with §597.3 (b), as outlined in section §597.3(b)(2), and §597.4(b)(2).

(2) A description of best professional practices about, but not limited to, the (1) collection of water measurement data, (2) frequency of measurements, (3) method for determining irrigated acres, and (4) quality control and quality assurance procedures.

(3) If a water measurement device measures flow rate, velocity or water elevation, and does not report the total volume of water delivered, the agricultural water supplier must document in its Agricultural Water Management Plan how it converted the

measured value to volume. The protocols must follow best professional practices and include the following methods for determining volumetric deliveries:

(A) For devices that measure flow-rate, documentation shall describe protocols used to measure the duration of water delivery where volume is derived by the following formula: Volume = flow rate x duration of delivery.

(B) For devices that measure velocity only, the documentation shall describe protocols associated with the measurement of the cross-sectional area of flow and duration of water delivery, where volume is derived by the following formula: Volume = velocity x cross-section flow area x duration of delivery.

(C) For devices that measure water elevation at the device (e.g. flow over a weir or differential elevation on either side of a device), the documentation shall describe protocols associated with the measurement of elevation that was used to derive flow rate at the device. The documentation will also describe the method or formula used to derive volume from the measured elevation value(s).

(4) If an existing water measurement device is determined to be out of compliance with §597.3, and the agricultural water supplier is unable to bring it into compliance before submitting its Agricultural Water Management Plan in December 2012, the agricultural water supplier shall provide in its 2012 plan, a schedule, budget and finance plan for taking corrective action in three years or less.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 531.10, 10608.48 *(i)* (1), and 10826 Water Code.

Agricultural Aggregated Farm-Gate[1] Delivery Reporting Format for Article 2

Due annually beginning no later than July 31, 2013 from agricultural water suppliers subject to Title 23, Division 2, Chapter 5.1, Article 2 of the CCR - Agricultural Water Measurement

1. Water Supplier Information

Name:

Address:

Phone Number:

Fax:

Total Number of Farm-Gates:

Number of Measured Farm-Gates:

Service Area Acreage:

2. Contact information

Name:

Title:

Address:

Phone Number:

Fax:

E-mail:

Submittal date:

3. Aggregated Farm-Gate Delivery Data[2]: *(provide monthly or bimonthly data, acre-feet)*

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Monthly Deliveries													

	Jul-Aug	Sep-Oct	Nov-Dec	Jan-Feb	Mar-Apr	May-Jun	Total
Bimonthly Deliveries							

4. Explanations, Comments and Best Professional Practices[3]:

Note: An agricultural water supplier's total water use may be different from Aggregated Farm-Gate deliveries because measurement at these points may not account for other practices (such as groundwater recharge/conjunctive use, water transfers, wheeling to other agencies, urban use, etc).

1. "Farm-gate" means the point at which water is delivered from the agricultural water supplier's distribution system to each of its individual customers as specified in the Agricultural Water Measurement Regulation (Title 23, Division 2, Chapter 5.1, Article 2 of the CCR).
2. "Aggregated farm-gate delivery data" means information reflecting the total volume of water an agricultural water supplier provides to its customers and is calculated by totaling its deliveries to customers.
3. "Best Professional Practices" is defined in Title 23, Division 2, Chapter 5.1, Article 2 of the CCR, Section 597.2.

Provident Irrigation District

Provident Irrigation District Water Measurement Program

Prepared for

Provident Irrigation District

October 2016

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2525 Airpark Drive
Redding, CA 96001

455 University Ave., Suite 100
Sacramento, CA 95825

Contents

Acronyms and Abbreviations

O&M	operation and maintenance
PCGID	Princeton-Codora-Glenn Irrigation District
PID or District	Provident Irrigation District
Reclamation	Bureau of Reclamation
Regional Criteria	*Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*
RWMP	*Sacramento Valley Regional Water Management Plan*
SB-88	Senate Bill 88
SCADA	supervisory control and data acquisition

Provident Irrigation District
Water Measurement Program

Purpose

This report describes measurement, pricing, and billing practices within Provident Irrigation District (PID or District) and the District's plan to comply with the provisions of its Settlement Contract and the measurement requirements of the Central Valley Project Improvement Act and the *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors* (Regional Criteria) (Bureau of Reclamation [Reclamation], 2004).

Background

The District's contract with the Reclamation authorizes diversions from the Sacramento River at one location along the right (western) bank of the Sacramento River at River Mile (RM) 177.2R. In 2000, the District's diversion facilities were combined with those of Princeton-Codora-Glenn Irrigation District (PCGID), and a fish screen was installed. Currently, all diversions from the river are made at RM 177.2R. The District has state-issued water rights to divert water from the Sacramento River at this location outside of the season covered by the Settlement Contract and state-issued water rights to divert water from the Colusa Basin Drain. The District uses a system of canals, ditches, and drains to convey water diverted from the Sacramento River and the Colusa Basin Drain as well as other inflow and recirculated tailwater to its customers.

The District provides water for irrigation purposes to 111 customers at 218 individual field turnouts or farm gates by gravity. The PID manager also serves as the PCGID manager. The District employs a secretary/office manager, three full-time ditch tenders, and equipment operators. The ditch tenders are responsible for maintaining water levels throughout the District as well as starting and stopping deliveries to customers. Deliveries and changes are made by the ditch tenders on demand with 48-hour notice.

Water orders are due prior to the irrigation season, and the application for water must be accompanied with 25 percent payment for water. Remaining installments for water are due by the first of June, July, and August. Unpaid and delinquent water charges are subject to interest and penalties in accordance with District policies. Landowners are required to identify a "Designated Irrigator," which may be the landowner, a lessee, or other tenant. The Designated Irrigator is responsible for adhering to the District's Water Management and Conservation Policy and for any violations of this policy. A copy of the Designation of Responsible Party form is provided in Appendix A, and copies of the 2013 Water Order form and the 2013 water rates are provided in Appendix B. Appendix C includes the PID Rules and Regulations.

Current Measurement Practices

River Diversions

As previously discussed, the District diverts water from the Sacramento River at RM 177.2R through a facility jointly owned and operated with PCGID. Diversions from the river are measured by using meters installed and maintained by Reclamation. Water is diverted into a common pool, and additional meters measure the quantity of water flowing to PID and PCGID. All of the meters at this facility, those used to measure the diversions from the river and those used to measure the distribution of water between PID and PCGID, provide instantaneous flow rate and volumetric data. Maintenance and calibration of all meters are performed by Reclamation in accordance with their standard operating procedures. The District has a limited supervisory control and data acquisition (SCADA) program that allows it to remotely monitor its diversions from the river.

Lateral Measurement

The District employs three ditch tenders to operate the canals and laterals to maintain water levels to assure sufficient head for gravity deliveries. Water levels are monitored at headgates and at check structures at various locations along the larger canals. Water levels throughout the system are maintained in accordance with the ditch tenders' experience and knowledge of the system and the water requirements of the crops. Although the District has the ability to remotely monitor water levels at select locations via its SCADA system, water levels and flows are not typically recorded.

Turnout or Field-level Measurement

All deliveries to individual fields are made by gravity through 218 screw-gates. Deliveries are set on the basis of water orders, the ditch tenders' experience and knowledge of the system and its demands, and communication with individual customers. Currently, the District does not measure or record information regarding deliveries to fields. Table 1 identifies the number and type of turnout measurement devices along with an estimated level of volumetric accuracy for each device.

Table 1. Summary of Turnout Structures
Provident Irrigation District Water Measurement Program

Measurement Type	Number[a]	Estimated Accuracy[b]	Reading Frequency	Maintenance Frequency
Rated Gate	218	±12%	Daily or when changes are made	Annually or as needed

[a] The number of devices will be verified during the inspection and certification process.

[b] The estimated accuracy is based on information in Chapter 9, Table 1 of the *Water Management Planner* (Reclamation, 2011) and the District's best estimate of canal and turnout conditions.

Turnout Measurement Program

To address the measurement requirements of the Regional Criteria and to comply with the provisions of its Settlement Contract, the District intends to implement a turnout measurement program. The measurement program will include the following:

1. Evaluation of typical operational canal water-level fluctuations
2. Development and implementation of a system and methodology for monitoring changes in canal levels related to turnouts
3. Verification of number, type, and size of gates
4. Acquisition or development of ratings for screw-gates
5. Field verification of accuracy of screw-gate ratings and modification of ratings as appropriate
6. Development of a system for field recording delivery data
7. Development of a database for recording deliveries
8. Development of operation and maintenance (O&M) procedures to assure accurate measurement of deliveries

The District anticipates it will need to rely on outside consultants, hire additional personnel, and purchase an additional vehicle to develop and implement the measurement program. The initial estimate of the cost to develop and implement the measurement program is approximately $190,000 over the next 5 years. It is estimated that the ongoing annual costs to maintain the program will be approximately $25,000 per year once the program is fully implemented.

The District proposes to implement the measurement program in phases. The first phase will be to conduct steps 1 through 6 from the list above within one of the systems in the District. This phased approach will allow evaluation of measurement options and challenges on a limited scale before expanding the program throughout the District. The phased approach may help minimize the overall cost of the program. The program approach and associated costs will be reviewed and revised as the program is developed. Revisions and updates will be included in the annual updates to the *Sacramento Valley Regional Water Management Plan* (RWMP) (CH2M HILL, Inc., 2007).

Pricing and Billing

The District has two charges, an annual assessment applicable to all lands and a water charge applicable to lands that request water service. The charge for water service is based on the acreage to be planted. Because the only crop grown within the District is rice, all lands ordering irrigation water are charged the same price per acre. Water orders are due by mid-April, and payments for water charges are due in four installments by April 15, June 1, July 1, and August 1.

Any changes to the current pricing structure require action by the PID Board of Directors. Once the measurement program has been developed and implemented, the District will consider changes in its current pricing policy that will incorporate some level of volumetric pricing.

Finance Plan

As identified above, the costs to develop and implement the turnout measurement program are estimated to be approximately $190,000. As identified in the RWMP, the District intended to begin implementation of the turn-out measurement program in 2014. However, complications resulting from the extreme drought conditions in 2014 and 2015 including but not limited to reduced water supplies; increased expenses related to coordination with Reclamation and other SRSCs; reduced revenues; and new requirements by the State for measuring, recording, and reporting diversions pursuant to Senate Bill 88 (SB-88) resulted in the inability to implement the turnout measurement program as described. The District proposes to develop and implement the program over the next 5-year period as outlined in Table 2. Table 2 identifies a schedule of tasks and the estimated annual program costs. To offset the impact of these additional costs on the District and its customers, the District intends to seek funding through grants that may be available from Reclamation and the California Department of Water Resources. Funding availability may affect the timing of the implementation of the program.

Table 2. Proposed Schedule of Verification Tasks
Provident Irrigation District Water Measurement Program

Major Tasks	2017	2018	2019	2020	2021
Evaluate canal water level fluctuation	X	X			
Develop and implement system and methodology for monitoring changes in canal levels related to turnouts	X	X	X		
Obtain or develop ratings for screw-gate deliveries	X	X			
Conduct field verification or accuracy of screw-gate ratings and modify ratings as appropriate	X	X	X	X	X

Table 2. Proposed Schedule of Verification Tasks
Provident Irrigation District Water Measurement Program

Major Tasks	2017	2018	2019	2020	2021
Conduct measurements to check and verify ratings at approximately 10 to 20 percent of District turnouts each year	X	X	X	X	X
Develop system and methodology for field recording delivery data	X	X			
Develop O&M procedures to assure continued accuracy of turnout measurement devices		X	X		
Purchase and develop database to incorporate volumetric pricing			X	X	X
Develop and implement volumetric pricing policy				X	X
Initial Estimate of Annual Costs	$40,000	$40,000	$30,000	$55,000	$25,000

The estimated costs identified in Table 2 for the development and initial implementation of the proposed measurement program are based on the assumption that a significant amount of the work will be conducted by a third party, such as an outside engineer or consultant. However, implementation of the measurement program will result in additional duties for the District's existing staff. Reading and recording deliveries will require additional time and effort by ditch tenders to enter delivery data, and billing for water deliveries will result in additional work for office staff and the manager. The ongoing expense to maintain the measurement program, including the cost of an additional employee and vehicle, is estimated to be approximately $25,000 per year.

Additional Water Use Efficiency Improvements

This water management program has been prepared to address specific requirements of the Central Valley Project Improvement Act and the Regional Criteria. The District has identified the following additional improvements that may provide equal or greater benefits to overall water use efficiency within the District:

- Update the existing outdated SCADA system
- Expand the SCADA to include water-level monitoring at key locations

These SCADA system improvements would allow the District to better operate its delivery system by monitoring and coordinating river diversions and canal operations. Because of the costs associated with developing and implementing the turnout measurement program and the District's limited resources, improvements to the SCADA system will depend on outside funding sources.

References

Bureau of Reclamation (Reclamation). 2011. *Water Management Planner*.

Bureau of Reclamation (Reclamation). 2004. *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*.

CH2M HILL, Inc. 2007. *Sacramento Valley Regional Water Management Plan.*

Appendix A
Designation of Responsible Party Form

Provident Irrigation District

Water Management and Conservation Policy

Designation of Responsible Party

The "Designated Irrigator" listed below will be contacted in the event of any problems or violations of the Water Conservation Policy:

Designated Irrigator:

Name: ______________________________ Mobil Phone #: ______________________

Address: ______________________________

The person listed below accepts responsibility for any fines or violations related to the actions of the "Designated Irrigator" and desires all violation notices be sent to them.

Responsible Party for Violations: (Tenant Signature)

Name: ______________________________ Home Phone#: ______________________

Address: ______________________________ Mobil Phone# ______________________

UNPAID VIOLATIONS ARE THE RESPONSIBILITY OF THE LANDOWNER.

I hereby verify that I will agree to, and abide by the Provident Irrigation District Water Conservation Policy:

Tenant: ______________________________

Landowner: ______________________________

Appendix B
Water Order Form and Water Rates for 2013 Irrigation Season

Make separate application for lands under each tenant's lease
and for each and every separate farm.

PROVIDENT IRRIGATION DISTRICT
APPLICATION FOR WATER FOR THE 2013 WATER SEASON

The undersigned hereby applies for water to be used during this irrigation season to grow________________on_______________acres, subject to the rules and regulations as adopted by the Board of Directors of the District, which are hereby made part of this application, on land owned by ______________________________________ described as follows:____

____

____

2013 WATER RATE FOR RICE-$60.00/AC.
Minimum of 1/4 payment due with the application ($15.00/AC)

Accompanied herewith is payment in the sum of $___________being $_______per acre, which is ________of the estimated cost of water for that crop. I hereby agree to pay the further sum of $________per acre for said water on the first day of June, July, and August.

All water tolls and charges shall become delinquent fifteen days after the same become due and payable. If not paid prior to such delinquency, an interest charge of 1 1/2% per month shall be added. If delinquent water tolls and charges are not paid on or before the last Monday of December, an additional 10% penalty shall be added thereto and shall be and become part of such tolls and charges, in addition to the interest on delinquent payments.

The undersigned owner understands that unpaid District charges may be secured by a lien on his land, even if the services were provided for a tenant's or contract-holder's crop.

Dated_________________________ Owner_________________________________

Contract Holder_____________________________

Lessee__________________________________
Address:_________________________________

Appendix C
Provident Irrigation District
Rules and Regulations

PROVIDENT IRRIGATION DISTRICT
Rules for Distribution and Use of Water
Adopted July 9, 2002

The Board of Directors of Provident Irrigation District have adopted these Rules and Regulations under authority of the provisions of California Water Code Section 22257, that provides for a district to establish and distribute a set of equitable rules for the distribution and use of water.

Rule 1. Control of System

The maintenance, and operation of the canals, drains and works of the District shall be under the exclusive management and control of the District Manager, appointed by the Board of Directors and no other person, except his employees and assistants shall have any right to interfere with said canals, drains and works in any manner, except in case of an order from the Board of Directors.

Rule 2. Ditchtenders and Other Employees

The District Manager will employ such ditchtenders and other assistants as he may deem necessary for the proper operation of the system subject to the approval of the Board of Directors. Each ditchtender shall have charge of his respective Section, and shall be responsible to the District Manager. From the rulings and the action of the ditchtender an appeal may be made to the District Manager. From the action of the District Manager an appeal may be made to the Board of Directors at any meeting of such Board.

Rule 3. Distribution of Water

All waters shall be apportioned ratably to each landowner upon the basis of the ratio which the last assessment against his land for District purposes bears to the whole sum assessed upon the lands of the District, or in such other manner as is allowed by law, to such landowners making application therefor, and making payments of the tolls and charges fixed by the Board. Upon failure of any landowner to make application for water, the water that would otherwise be allotted to such landowner may be alloted by the District to other landowners who make application therefor.

Any landowner may make application for additional water over and above the amount to which he is entitled under his assessment and if such application cannot be granted for the full amount applied for, such water as may be available shall be pro-rated between such applications in proportion to their said assessments in the District.

Rule 4. Application for Water

At such time as may be ordered by resolution of the Board of Directors, each landowner or tenant shall file an application for water on a form provided by the District, setting forth the crops and acreage of each he is intending to irrigate. The application shall further contain the name of the owner of the land to be farmed, name of the tenant or tenants, acreage to be farmed within the District, amount and location of acreage for which the water is required and such other matters as the Board of Directors may desire. By making said application the applicant grants a right to the District for the irrigation season to control all ditches and laterals, and to install, maintain, control and regulate all meters, measuring devices, delivery gates or other structures in any ditch, canal or lateral necessary and on which the District does not otherwise have such rights, for the distribution, measurement and control of water, and to go upon the applicant's land for the purpose of measuring the area irrigated.

Any land that is farmed by a tenant is subject to the imposition of a claim by the District for any unpaid District rates, charges or assessments.

Rule 5. Delivery of Water

All orders for delivery or for shut-off of water must be made to the District's office by 2:00 p.m. on the day prior to the desired delivery or shut-off. The District will attempt to make delivery the same day, or by the next day for orders received after 2:00 p.m. The District's distribution system, however, is not designed to provide full service to every landowner simultaneously. Therefore, there may be times when water deliveries must be rotated, and that rotation will be imposed as equitably as possible by the District Manager. The District shall not be responsible for loss or damages incurred by reason of delays or interruptions in delivery of water service.

Water must be used continuously by the water user throughout the period of delivery, both day and night.

The District shall deliver no water unless proof of payment therefore required by these Rules and Regulations is made.

Rule 6. Measurements and Measuring Devices

The District shall be entitled to place such meters or other measuring devices, turnouts, gates, or other structures in the ditches, canals and laterals as it may consider necessary or proper.

Rule 7. Time for Fixing Rates of Tolls and Charges

The rates of tolls and charges for the use of water and other purposes may be fixed and determined annually by the Board of Directors. The rates of tolls and charges are payable at the District office.

If an applicant requests only a single irrigation, the entire amount of tolls and charges shall be paid before water is delivered. Should an applicant require a subsequent irrigation, the entire amount of tolls and charges for that subsequent irrigation shall be paid before water is delivered. Where more that one irrigation or continuous irrigation (such as for rice) during a season will be required, the applicant shall pay a minimum of one-fourth of the tolls and charges upon filing his application and before water delivery is commenced. The remainder of the tolls and charges shall be paid, one-fourth each, on or before the first day of June, July and August.

All water tolls and charges shall become delinquent fifteen days after the same are due and payable. If not paid prior to such delinquency, an interest charge of 1 ½% per month shall be added. If delinquent water tolls and charges are not fully paid on or before the last Monday of December, an additional 10% penalty shall be added thereto and shall be and become part of such tolls and charges, in addition to the interest on delinquent payments, and such penalty will also bear interest thereafter.

In addition to any other rights under law, the District may secure any unpaid tolls and charges in accordance with California Water Code Section 25806, that allows, in the District's discretion, for such charges to be added to the next assessment on the land, or to be secured by the filing of a certificate of lien in the office of the county recorder of any county. Landowners should understand that one or more of these processes could ultimately result in their loss of title to their land.

If any applicant for or user of water or the land upon which the water is to be used is fifteen or more days delinquent in the payment of any District tolls or charges, or any installments thereof, water delivery to such applicant or land shall be refused or discontinued until such tolls or charges or installments thereof, plus interest and penalties as provided for in these Rules and Regulations, are paid. If water service has commenced for the irrigation season, but is to be discontinued under the terms of this Rule, the landowner, and tenant, if any, who signed the application for water for the year, will first be afforded the right to a hearing before the District Manager or Board of Directors, as set forth in a written notice to be given to the landowner and tenant. Addition of delinquent water toll or tolls to the assessment against the lands using such water shall not be considered as payment thereof. The District's option to discontinue water service is in addition to all other rights of enforcing payment of District tolls and charges, and shall not be construed as limiting the rights of the District to otherwise enforce collection of its tolls and charges.

If at any time during an irrigation season, a landowner or water user has been more than thirty days delinquent in the payment of district tolls or charges, the District will require that one hundred percent of the following irrigation season's estimated water tolls and charges for the land on which the prior year's tolls or charges were delinquent be deposited at the time an application for water service is filed for that subsequent irrigation season.

Rule 8. District Owned Property

The lands owned or controlled by the District may be leased or rented under such terms and conditions as may be prescribed and ordered by the Board of Directors from time to time; provided however, that unless different rules, regulations and rates are fixed, then these rules, regulations and rates shall apply to water service to be delivered to such District-owned land.

Rule 9. Acreage Surveys

If the District finds it necessary to survey land for the purpose of determining the acreage planted and for which water was delivered, it will include all lands within the exterior boundaries of the area on which water has been allowed to stand, or use such other standards for measurement as are commonly used in the area in which the land is situated.

Rule 10. Abandoned Use of Water

Whenever the use of water is abandoned on any lands, such lands shall be required to pay the full installments of water tolls and charges due and payable at the time the District receives notice of such abandonment.

Rule 11. Condition of Ditches

Upon the application of a landowner or water user for the delivery of water, it shall be the duty of the District Manager to certify whether or not the applicant's ditches are in proper condition to receive water.

As provided in California Water Code Section 22257, all ditches must be kept free from weeds and other obstructions and shall be of sufficient capacity and properly constructed and maintained so as to carry water without danger of serious breaks or waste, and if not so unobstructed, constructed and maintained the District Manager may shut off delivery of water thereto. The District Manager will examine all ditches and may order them to be cleaned, repaired or reconstructed if necessary, before water is turned in. Refusal to comply with this rule will be sufficient cause for refusal to turn in water. Nothing herein shall be construed as an assumption of liability on the part of the District, its Directors, officers or employees for any damages occasioned through the improper construction, maintenance or use of any ditch or ditches or by reason of permitting the flow of water or turning water therein.

Rule 12. Waste of Water

Any landowner or water user wasting water either wilfully, carelessly, or on account of defective ditches will be refused the use of water until such conditions are remedied. Without limiting the foregoing, the District and its Board of Directors reserve the right to refuse or to limit delivery of water to any lands when it appears to the satisfaction of the Board of Directors that its proposed use, or method of use, will require such excessive quantities of water as will constitute waste or will damage adjacent land by seepage.

When it appears to the satisfaction of the Board of Directors that service of water to certain lands will probably result in seepage damage to adjacent lands the Board may require as a condition precedent to the delivery of water a written guarantee on the part of the landowner desiring service that he will protect the District and hold it free and harmless from liability for any such damage.

Rule 13. Shortage of Water

When, through lack of water, lack of ditch capacity, or for any other reason, it is not possible to deliver throughout the District or any portion thereof the full supply of water required by the water users, such supply as can be delivered will be equitably pro-rated until such time as delivery of a full supply can be given. A pro-rata delivery means a simultaneous flow available at a point nearest the District system for the use of each and every landowner or water user in as nearly an exact proportion as can be determined of the total amount available or that can be delivered, based on the individual's right to receive water as fixed by acreage, crop to be irrigated, ditch capacity, or otherwise. The method may be applied to all, or a part of the system.

Rule14. Use of Laterals and Distribution Ditches

No District owned or operated lateral shall be used as a distribution ditch to directly irrigate alfalfa, clover, corn or similar strip check grown crop.

Rule 15. Complaints

All complaints as to service, lack of water, or other unsatisfactory conditions should be made immediately, in writing, addressed to the District office.

Rule 16. Access to Land and Ditches

The District and its agents shall have free access at all times to all lands irrigated from the canal system and to all canals, laterals and ditches for the purpose of inspection, examination, measurements, surveys or other necessary purposes of the District, with the right of installation, maintenance, control and regulation of all meters or other measuring devices, gates, turnouts, or other structures necessary or proper for the measurement and distribution of water.

The District assumes no liability for damages to persons or property occasioned through defective ditches, laterals, meters or measuring devices.

Rule 17. Use of District Right-of-Way

No trees or crops shall be planted on any District right-of-way, and all such trees or crops growing therein shall belong absolutely to the District. The District Manager may, upon such terms and conditions as he deems appropriate, grant permission in writing for annual crops to be planted in a District right-of-way. Such plantings shall be entirely at the risk of the landowner or tenant planting such crops.

Rule 18. Obstructions on Right-of-Way

No fences or other obstructions shall be placed across, upon or along any canal bank or District right-of-way without the written permission of the Board of Directors, subject to such conditions as the Board deems appropriate. Any obstructions placed without permission as herein required shall be removed by the District and the expense of such removal shall be assessed against the landowner.

Rule 19. Drains

Before allowing water to drain or waste into the drains constructed by the District, all landowners and water users must construct, install and maintain all necessary structures so as to protect such drains from erosion and damage. Such work must be done to the satisfaction of the District Manager.

Each landowner shall construct and maintain adequate drainage facilities to prevent damage to adjacent land.

Rule 20. Gates, Structures and Main Canal

No opening shall be made or structures placed in or on any District right-of-way, nor shall anyone alter District facilities without the written permission of the District Manager. All such structures or alterations must be constructed according to requirements of the District, at the expense of the landowner or water user, must be maintained in a condition satisfactory to the District Manager and must not be changed without the written permission of the District Manager.

If a landowner or water user desires to have work done at his expense by the District, the District will prepare an estimate in advance if the landowner or water user requests it. The total cost of all work shall be paid within 30 days of completion of the project.

Rule 21. Damage to Laterals

Any person causing damage to or permitting livestock to cause damage to any District right of way or facilities shall be required to reimburse this District for all expense incurred in repairing the same.

Rule 22. Enforcement of Rules

Refusal to comply with the requirements, any violations of any of these Rules and Regulations, or any interference with the proper discharge of the duties of any person employed by the District, shall be considered sufficient cause for shutting off the water, and water will not again be furnished until in the opinion of the District Manager full compliance has been made with all requirements herein set forth.

Rule 23. Non-Liability of District

The District will not be liable for any damage of any kind or nature resulting directly or indirectly to any private ditch or the water flowing therein or by reason of lack of capacity therein, or for negligent, wasteful or other use or handling of water by the users thereof. The District's responsibility shall absolutely cease when the water leaves the District's facilities, and the District will not be liable for shortage of water, either temporary or permanent, failure to deliver such water, or for the quality thereof.

Rule 24. Presumption of Knowledge by Landowners

All landowners in the District shall be conclusively presumed to have knowledge of these Rules and Regulations, of the provisions of the California Irrigation District Law, and of all proceedings had, and all orders and decisions made and entered in the District's records, including those already appearing therein and those that may hereafter be entered therein; and all such landowners are bound by them.

Rule 25. Borrowing Equipment

Tools or equipment will not be loaned unless the borrower first secures a properly signed order for same at the District office.

Rule 26. Rebates

Refunds or rebates for water applied for but not used will only be considered in the discretion of the Board of Directors and none will be granted unless application therefore is made within the current year during which payment was made.

The foregoing Rules and Regulations were adopted July 9, 2002, superceding all former Rules and Regulations.

Princeton-Codora-Glenn Irrigation District

Princeton-Codora-Glenn Irrigation District Water Measurement Program

Prepared for

Princeton-Codora-Glenn Irrigation District

October 2016

CH2M HILL, Inc.
2525 Airpark Drive
Redding, CA 96001

455 University Ave., Suite 100
Sacramento, CA 95825

Contents

Acronyms and Abbreviations

O&M	operation and maintenance
PCGID or District	Princeton-Codora-Glenn Irrigation District
PID	Provident Irrigation District
Reclamation	Bureau of Reclamation
Regional Criteria	*Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*
RWMP	*Sacramento Valley Regional Water Management Plan*
SB-88	Senate Bill 88
SCADA	supervisory control and data acquisition

Princeton-Codora-Glenn Irrigation District Water Measurement Program

Purpose

This report describes measurement, pricing, and billing practices within Princeton-Codora-Glenn Irrigation District (PCGID or District) and the District's plan to comply with the provisions of its Settlement Contract and the measurement requirements of the Central Valley Project Improvement Act and the *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors* (Regional Criteria) (Bureau of Reclamation [Reclamation], 2004).

Background

The District's contract with Reclamation authorizes diversions from the Sacramento River at one location along the right (western) bank of the Sacramento River at River Mile (RM) 177.2R. In 2000, the District's diversion facilities were combined with those of Provident Irrigation District (PID), and a fish screen was installed. Currently all diversions from the river are made at RM 177.2R. The District has state-issued water rights to divert water from the Sacramento River at this location outside of the season covered by the Settlement Contract and state-issued water rights to divert water from the Colusa Basin Drain. The District uses a system of canals, ditches, and drains to convey water diverted from the Sacramento River, and the Colusa Basin Drain as well as other inflow and recirculated tailwater to its customers.

The District provides water for irrigation purposes to 97 customers at 312 individual field turnouts or farm gates by gravity. The PCGID manager also serves as the PID manager. The District employs a secretary/office manager, three full-time ditch tenders, and equipment operators. The ditch tenders are responsible for maintaining water levels throughout the District as well as starting and stopping deliveries to customers. Deliveries and changes are made by the ditch tenders on demand with 48-hour notice.

Water orders are due prior to the irrigation season, and the application for water must be accompanied with 25 percent payment for water. Remaining installments for water are due by the first of June, July, and August. Unpaid and delinquent water charges are subject to interest and penalties in accordance with District policies. Copies of the 2013 water order form and the 2013 water rates are provided in Appendix A; Appendix B includes the PCGID Rules and Regulations.

Current Measurement Practices

River Diversions

As previously discussed, the District diverts water from the Sacramento River at RM 177.2R through a facility jointly owned and operated with PID. Diversions from the Sacramento River are measured by using meters installed and maintained by Reclamation. Water is diverted into a common pool, and additional meters measure the quantity of water flowing to PCGID and PID. All of the meters at this facility, those used to measure the diversions from the river and those used to measure the distribution of water between PCGID and PID, provide instantaneous flow rate and volumetric data. Maintenance and calibration of all meters are performed by Reclamation in accordance with their standard operating procedures. The District has a limited supervisory control and data acquisition (SCADA) program that allows it to remotely monitor its diversions from the river.

Lateral Measurement

The District employs three ditch tenders to operate the canals and laterals to maintain water levels to assure sufficient head for gravity deliveries. Water levels are monitored at headgates and at check structures at various locations along the larger canals. Water levels throughout the system are maintained in accordance with the ditch tenders' experience and knowledge of the system and the water requirements of the crops. Although the District has the ability to remotely monitor water levels at select locations via its SCADA system, water levels and flows are not typically recorded.

Turnout or Field-level Measurement

All deliveries to individual fields are made by gravity through 312 screw-gates. Deliveries are set on the basis of water orders, the ditch tenders' experience and knowledge of the system and its demands, and communication with individual customers. Currently, the District does not measure or record information regarding deliveries to fields. Table 1 identifies the number and type of turnout measurement devices and the estimated accuracy of the devices.

Table 1. Summary of Turnout Structures
Princeton-Codora-Glenn Irrigation District Water Measurement Program

Measurement Type	Number[a]	Estimated Accuracy[b]	Reading Frequency	Maintenance Frequency
Rated Gate	312	±12%	Daily or when changes are made	Annually or as needed

[a] The number of devices will be verified during the inspection and certification process.

[b] The estimated accuracy is based on information contained in Chapter 9, Table 1 of the *Water Management Planner* (Reclamation, 2011) and the District's best estimate of canal and turnout conditions.

Turnout Measurement Program

To address the measurement requirements of the Regional Criteria and to comply with the provisions of its Settlement Contract, the District intends to implement a turnout measurement program, which will include the following:

1. Evaluation of typical operational canal water-level fluctuations
2. Development and implementation of a system and methodology for monitoring changes in canal levels related to turnouts
3. Verification of number, type, and size of gates
4. Acquisition of development of ratings for screw-gates
5. Field verification of accuracy of screw-gate ratings and modification of ratings as appropriate
6. Development of a system for field recording delivery data
7. Development of a database for recording deliveries
8. Development of operation and maintenance (O&M) procedures to assure accurate measurement of deliveries

The District anticipates it will need to rely on outside consultants, hire additional personnel, and purchase an additional vehicle to develop and implement the measurement program. The initial estimate of the cost to develop and implement the measurement program is approximately $190,000 over the next 5 years. It is estimated that the ongoing annual costs to maintain the program will be approximately $25,000 per year once the program is fully implemented.

The District proposes to implement the measurement program in phases. The first phase will be to conduct steps 1 through 6 from the list above within one of the systems in the District. This phased approach will allow evaluation of measurement options and challenges on a limited scale before expanding the program throughout the District. The phased approach may help minimize the overall cost of the program. The program approach and associated costs will be reviewed and revised as the program is developed. Revisions and updates will be included in the annual updates to the *Sacramento Valley Regional Water Management Plan* (RWMP) (CH2M HILL, Inc., 2007)

Pricing and Billing

The District has two charges: an annual assessment applicable to all lands and a water charge applicable to lands that request water service. The charge for water service is based on the acreage and crop to be planted. The price per acre for each crop is based on an assumed water need for the crop; that is, the water toll for high-water-use crops, such as rice, is much higher than low-water-use crops, such as wheat or safflower. Water orders are due by mid-March, and payments for water charges are due in four installments by April 1, June 1, July 1, and August 1.

Any changes to the current pricing structure require action by the PCGID Board of Directors. Once the measurement program has been developed and implemented, the District will consider changes in its current pricing policy that will incorporate some level of volumetric pricing.

Finance Plan

As identified above, the costs to develop and implement the turnout measurement program are estimated to be approximately $190,000. As identified in the RWMP, the District intended to begin implementation of the turn-out measurement program in 2014. However, complications resulting from the extreme drought conditions in 2014 and 2015 including but not limited to reduced water supplies; increased expenses related to coordination with Reclamation and other SRSCs; reduced revenues; and new requirements by the State for measuring, recording, and reporting diversions pursuant to Senate Bill 88 (SB-88) resulted in the inability to implement the turnout measurement program as described. The District proposes to develop and implement the program over the next 5-year period. Table 2 identifies a schedule of tasks and the estimated annual program costs. To offset the impact of these additional costs on the District and its customers, the District intends to seek funding through grants that may be available from Reclamation and the California Department of Water Resources. Funding availability may affect the timing of the implementation of the program.

Table 2. Proposed Schedule of Verification Tasks
Princeton-Codora-Glenn Irrigation District Water Measurement Program

Major Tasks	2017	2018	2019	2020	2021
Evaluate canal water level fluctuation	X	X			
Develop and implement system and methodology for monitoring changes in canal levels related to turnouts	X	X	X		
Obtain or develop ratings for screw-gate deliveries	X	X			
Conduct field verification or accuracy of screw-gate ratings and modify ratings as appropriate	X	X	X	X	X
Conduct measurements to check and verify ratings at approximately 10 to 20% of District turnouts each year	X	X	X	X	X
Develop system and methodology for field recording delivery data	X	X			

Table 2. Proposed Schedule of Verification Tasks
Princeton-Codora-Glenn Irrigation District Water Measurement Program

Major Tasks	2017	2018	2019	2020	2021
Develop O&M procedures to assure continued accuracy of turnout measurement devices		X	X		
Purchase and develop database to incorporate volumetric pricing			X	X	X
Develop and implement volumetric pricing policy				X	X
Initial Estimate of Annual Costs	$40,000	$40,000	$30,000	$55,000	$25,000

The estimated costs identified in Table 2 for the development and initial implementation of the proposed measurement program are based on the assumption that a significant amount of the work will be conducted by a third party such as an outside engineer or consultant. However, the implementation of the measurement program will result in additional duties for the District's existing staff. Reading and recording deliveries will require additional time and effort by ditch tenders to enter delivery data, and billing for water deliveries will result in additional work for office staff and the manager. The ongoing expense to maintain the measurement program, including the cost of an additional employee and vehicle, is estimated to be approximately $25,000 per year.

Additional Water Use Efficiency Improvements

The water management program has been prepared to address specific requirements of the Central Valley Project Improvement Act and the Regional Criteria. The District has identified the following additional improvements that may provide equal or greater benefits to overall water use efficiency within the District:

- Update the existing outdated SCADA system
- Expand the SCADA to include water-level monitoring at key locations

These SCADA system improvements would allow the District to better operate its delivery system by monitoring and coordinating river diversions and canal operations. Because of the costs associated with developing and implementing the turnout measurement program and the District's limited resources, improvements to the SCADA system will depend on outside funding sources.

Reference

Bureau of Reclamation (Reclamation). 2011. *Water Management Planner*.

Bureau of Reclamation (Reclamation). 2004. *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*.

CH2M HILL, Inc. 2007. *Sacramento Valley Regional Water Management Plan*.

Appendix A
Water Order Form and Water Rates for 2013 Irrigation Season

STANDARD WATER APPLICATION

Princeton-Codora-Glenn Irrigation Disrict
P O. Box 98, Princeton, CA 95970
530-439-2248

The undersigned hereby applies for the irrigation of the below farm crops under and subject to the By-Laws, Rules and Regulations of Tolls and charges adopted (which are by this reference made a part of the application) or to be adopted by the Board of Directors of the District, and hereby grants the right to the Princeton-Codora-Glenn Irrigation District to use all ditches and laterals on the below described premises & to install, maintain for distribution, measurement & control of water for irrigation purposes and said District and its officers or employees shall not be liable for damages to persons or property occasioned through such exercise of such right, or for the negligent, wasteful or other use or handling of the water by the user thereof. *It is the sole responsibility of the undersigned to insure that all necessary Reclamation Reform Act documents are on file with the District office prior to delivery of water to the below listed lands.*

Application Due: By 4:00 PM April 15, 2013

Landowner: ____________________

Address: ____________________

City: ____________ St. ________ Zip: ____________

Description of Parcels of Lands to be Irrigated

Parcel No.	Gate No.	Crop	Acreage	Tenant	Amt. Due
Totals					

Irrespective of whether landowner or tenant is to pay for water, unpaid charges may, at the District's discretion, be added to the assessment to be levied, or otherwise secured as provided by law.

Water is to be paid by: Landowner _______ Tenant ________ Phone # of Irrigator:____________

This application must be signed by the landowner or his lawful agent, as authorized, in writing, on forms available at the District office. ***Payment for the 1st installment must accompany this application.***

Landowner: ____________________ Date: ____________

2013 Water Toll Schedule

CROP	2013 WATER TOLLS
ALFALFA	$ 7.19 PER ACRE PER IRRIGATION
BEANS	$ 7.19 PER ACRE PER IRRIGATION
CORN (FIELD)	$ 7.19 PER ACRE PER IRRIGATION
CORN (MILO)	$ 8.75 PER ACRE PER IRRIGATION
COTTON	$ 7.19 PER ACRE PER IRRIGATION
ORCHARD (FLOOD)	$ 10.32 PER ACRE PER IRRIGATION
ORCHARD (FURROW)	$ 9.69 PER ACRE PER IRRIGATION
ORCHARD (SPRINKLER)	$ 8.82 PER ACRE PER IRRIGATION
ONIONS	$ 8.99 PER ACRE PER IRRIGATION
PASTURE	$ 8.99 PER ACRE PER IRRIGATION
RICE	$ 110.00 PER ACRE PER YEAR
SAFFLOWER	$ 8.99 PER ACRE PER IRRIGATION
SUGARBEETS	$ 8.99 PER ACRE PER IRRIGATION
SUNFLOWERS	$ 8.99 PER ACRE PER IRRIGATION
TOMATOES (FURROW)	$ 8.99 PER ACRE PER IRRIGATION
TOMATOES (SPRINKLER)	$ 8.99 PER ACRE PER IRRIGATION
VINESEEDS (FURROW)	$ 8.99 PER ACRE PER IRRIGATION
VINESEEDS (SPRINKLER)	$ 8.99 PER ACRE PER IRRIGATION
WHEAT	$ 8.75 PER ACRE PER IRRIGATION
ONE IRRIGATION	$ 12.82 PER ACRE PER IRRIGATION
OTHER CROPS	$ 8.82 PER ACRE PER IRRIGATION

PAYMENT SCHEDULE:

RICE	*1st Installment Due With Application Remainder due in 3 additional installments (June, July, and September)*
ALL OTHER CROPS	FIRST IRRIGATION PAYMENT DUE WITH APPLICATION. ALL OTHER PAYMENTS DUE 10TH OF MONTH FOLLOWING IRRIGATION.
REFUNDS	Refunds or rebates for water applied for but not used will be considered by the Board of Directors at the next regular meeting following application therefore. Applications for refunds or rebates must be made in the year payment is made.

Appendix B
Princeton-Codora-Glenn Irrigation District Rules and Regulations

PRINCETON-CODORA-GLENN IRRIGATION DISTRICT
Rules for Distribution and Use of Water
Adopted: July 10, 2002

The Board of Directors of Princeton-Codora-Glenn Irrigation District have adopted these Rules and Regulations under authority of the provisions of California Water Code Section 22257, that provides for a district to establish and distribute a set of equitable rules for the distribution and use of water.

Rule 1. Control of System

The maintenance, and operation of the canals, drains and works of the District shall be under the exclusive management and control of the District Manager, appointed by the Board of Directors and no other person, except his employees and assistants shall have any right to interfere with said canals, drains and works in any manner, except in case of an order from the Board of Directors.

Rule 2. Ditchtenders and Other Employees

The District Manager will employ such ditchtenders and other assistants as he may deem necessary for the proper operation of the system subject to the approval of the Board of Directors. Each ditchtender shall have charge of his respective Section, and shall be responsible to the District Manager. From the rulings and the action of the ditchtender an appeal may be made to the District Manager. From the action of the District Manager an appeal may be made to the Board of Directors at any meeting of such Board.

Rule 3. Distribution of Water

All waters shall be apportioned ratably to each landowner upon the basis of the ratio which the last assessment against his land for District purposes bears to the whole sum assessed upon the lands of the District, or in such other manner as is allowed by law, to such landowners making application therefor, and making payments of the tolls and charges fixed by the Board. Upon failure of any landowner to make application for water, the water that would otherwise be allotted to such landowner may be allotted by the District to other landowners who make application therefor.

Any landowner may make application for additional water over and above the amount to which he is entitled under his assessment and if such application cannot be granted for the full amount applied for, such water as may be available shall be pro-rated between such applications in proportion to their said assessments in the District.

Rule 4. Application for Water

At such time as may be ordered by resolution of the Board of Directors, each landowner or tenant shall file an application for water on a form provided by the District, setting forth the crops and acreage of each he is intending to irrigate. The application shall further contain the name of the owner of the land to be farmed, name of the tenant or tenants, acreage to be farmed within the District, amount and location of acreage for which the water is required and such other matters as the Board of Directors may desire. By making said application the applicant grants a right to the District for the irrigation season to control all ditches and laterals, and to install, maintain, control and regulate all meters, measuring devices, delivery gates or other structures in any ditch, canal or lateral necessary and on which the District does not otherwise have such rights, for the distribution, measurement and control of water, and to go upon the applicant's land for the purpose of measuring the area irrigated.

Any land that is farmed by a tenant is subject to the imposition of a claim by the District for any unpaid District rates, charges or assessments.

Rule 5. Delivery of Water

All orders for delivery or for shut-off of water must be made to the District's office by 2:00 p.m. on the day prior to the desired delivery or shut-off. The District will attempt to make delivery the same day, or by the next day for orders received after 2:00 p.m. The District's distribution system, however, is not designed to provide full service to every landowner simultaneously. Therefore, there may be times when water deliveries must be rotated, and that rotation will be imposed as equitably as possible by the District Manager. The District shall not be responsible for loss or damages incurred by reason of delays or interruptions in delivery of water service.

Water must be used continuously by the water user throughout the period of delivery, both day and night.

The District shall deliver no water unless proof of payment therefore required by these Rules and Regulations is made.

Rule 6. Measurements and Measuring Devices

The District shall be entitled to place such meters or other measuring devices, turnouts, gates, or other structures in the ditches, canals and laterals as it may consider necessary or proper.

Rule 7. Time for Fixing Rates of Tolls and Charges

The rates of tolls and charges for the use of water and other purposes may be fixed and determined annually by the Board of Directors. The rates of tolls and charges are payable at the District office.

If an applicant requests only a single irrigation, the entire amount of tolls and charges shall be paid before water is delivered. Should an applicant require a subsequent irrigation, the entire amount of tolls and charges for that subsequent irrigation shall be paid before water is delivered. Where more that one irrigation or a continuous irrigation (such as for rice) during a season will be required, the applicant shall pay a minimum of one-fourth of the tolls and charges upon filing his application and before water delivery is commenced. The remainder of the tolls and charges shall be paid, one-fourth each, on or before the first day of June, July and August.

All water tolls and charges shall become delinquent fifteen days after the same are due and payable. If not paid prior to such delinquency, an interest charge of 1 ½% per month shall be added. If delinquent water tolls and charges are not fully paid on or before the last Monday of December, an additional 10% penalty shall be added thereto and shall be and become part of such tolls and charges, in addition to the interest on delinquent payments, and such penalty will also bear interest thereafter.

In addition to any other rights under law, the District may secure any unpaid tolls and charges in accordance with California Water Code Section 25806, that allows, in the District's discretion, for such charges to be added to the next assessment on the land, or to be secured by the filing of a certificate of lien in the office of the county recorder of any county. Landowners should understand that one or more of these processes could ultimately result in their loss of title to their land.

If any applicant for or user of water or the land upon which the water is to be used is fifteen or more days delinquent in the payment of any District tolls or charges, or any installments thereof, water delivery to such applicant or land shall be refused or discontinued until such tolls or charges or installments thereof, plus interest and penalties as provided for in these Rules and Regulations, are paid. If water service has commenced for the irrigation season, but is to be discontinued under the terms of this Rule, the landowner, and tenant, if any, who signed the application for water for the year, will first be afforded the right to a hearing before the District Manager or Board of Directors, as set forth in a written notice to be given to the landowner and tenant. Addition of delinquent water toll or tolls to the assessment against the lands using such water shall not be considered as payment thereof. The District's option to discontinue water service is in addition to all other rights of enforcing payment of District tolls and charges, and shall not be construed as limiting the rights of the District to otherwise enforce collection of its tolls and charges.

If at any time during an irrigation season, a landowner or water user has been more than thirty days delinquent in the payment of district tolls or charges, the District will require that one hundred percent of the following irrigation season's estimated water tolls and charges for the land on which the prior year's tolls or charges were delinquent be deposited at the time an application for water service is filed for that subsequent irrigation season.

Rule 8. District Owned Property

The lands owned or controlled by the District may be leased or rented under such terms and conditions as may be prescribed and ordered by the Board of Directors from time to time;

provided however, that unless different rules, regulations and rates are fixed, then these rules, regulations and rates shall apply to water service to be delivered to such District-owned land.

Rule 9. Acreage Surveys

If the District finds it necessary to survey land for the purpose of determining the acreage planted and for which water was delivered, it will include all lands within the exterior boundaries of the area on which water has been allowed to stand, or use such other standards for measurement as are commonly used in the area in which the land is situated.

Rule 10. Abandoned Use of Water

Whenever the use of water is abandoned on any lands, such lands shall be required to pay the full installments of water tolls and charges due and payable at the time the District receives notice of such abandonment.

Rule 11. Condition of Ditches

Upon the application of a landowner or water user for the delivery of water, it shall be the duty of the District Manager to certify whether or not the applicant's ditches are in proper condition to receive water.

As provided in California Water Code Section 22257, all ditches must be kept free from weeds and other obstructions and shall be of sufficient capacity and properly constructed and maintained so as to carry water without danger of serious breaks or waste, and if not so unobstructed, constructed and maintained the District Manager may shut off delivery of water thereto. The District Manager will examine all ditches and may order them to be cleaned, repaired or reconstructed if necessary, before water is turned in. Refusal to comply with this rule will be sufficient cause for refusal to turn in water. Nothing herein shall be construed as an assumption of liability on the part of the District, its Directors, officers or employees for any damages occasioned through the improper construction, maintenance or use of any ditch or ditches or by reason of permitting the flow of water or turning water therein.

Rule 12. Waste of Water

Any landowner or water user wasting water either wilfully, carelessly, or on account of defective ditches will be refused the use of water until such conditions are remedied. Without limiting the foregoing, the District and its Board of Directors reserve the right to refuse or to limit delivery of water to any lands when it appears to the satisfaction of the Board of Directors that its proposed use, or method of use, will require such excessive quantities of water as will constitute waste or will damage adjacent land by seepage.

When it appears to the satisfaction of the Board of Directors that service of water to certain lands will probably result in seepage damage to adjacent lands the Board may require as a condition precedent to the delivery of water a written guarantee on the part of the landowner desiring service that he will protect the District and hold it free and harmless from liability for any such damage.

Rule 13. Shortage of Water

When, through lack of water, lack of ditch capacity, or for any other reason, it is not possible to deliver throughout the District or any portion thereof the full supply of water required by the water users, such supply as can be delivered will be equitably pro-rated until such time as delivery of a full supply can be given. A pro-rata delivery means a simultaneous flow available at a point nearest the District system for the use of each and every landowner or water user in as nearly an exact proportion as can be determined of the total amount available or that can be delivered, based on the individual's right to receive water as fixed by acreage, crop to be irrigated, ditch capacity, or otherwise. The method may be applied to all, or a part of the system.

Rule14. Use of Laterals and Distribution Ditches

No District owned or operated lateral shall be used as a distribution ditch to directly irrigate alfalfa, clover, corn or similar strip check grown crop.

Rule 15. Complaints

All complaints as to service, lack of water, or other unsatisfactory conditions should be made immediately, in writing, addressed to the District office.

Rule 16. Access to Land and Ditches

The District and its agents shall have free access at all times to all lands irrigated from the canal system and to all canals, laterals and ditches for the purpose of inspection, examination, measurements, surveys or other necessary purposes of the District, with the right of installation, maintenance, control and regulation of all meters or other measuring devices, gates, turnouts, or other structures necessary or proper for the measurement and distribution of water.

The District assumes no liability for damages to persons or property occasioned through defective ditches, laterals, meters or measuring devices.

Rule 17. Use of District Right-of-Way

No trees or crops shall be planted on any District right-of-way, and all such trees or crops growing therein shall belong absolutely to the District. The District Manager may, upon such terms and conditions as he deems appropriate, grant permission in writing for annual crops to be planted in a District right-of-way. Such plantings shall be entirely at the risk of the landowner or tenant planting such crops.

Rule 18. Obstructions on Right-of-Way

No fences or other obstructions shall be placed across, upon or along any canal bank or District right-of-way without the written permission of the Board of Directors, subject to such conditions as the Board deems appropriate. Any obstructions placed without permission as herein required shall be removed by the District and the expense of such removal shall be assessed against the landowner.

Rule 19. Drains

Before allowing water to drain or waste into the drains constructed by the District, all landowners and water users must construct, install and maintain all necessary structures so as to protect such drains from erosion and damage. Such work must be done to the satisfaction of the District Manager.

Each landowner shall construct and maintain adequate drainage facilities to prevent damage to adjacent land.

Rule 20. Gates, Structures and Main Canal

No opening shall be made or structures placed in or on any District right-of-way, nor shall anyone alter District facilities without the written permission of the District Manager. All such structures or alterations must be constructed according to requirements of the District, at the expense of the landowner or water user, must be maintained in a condition satisfactory to the District Manager and must not be changed without the written permission of the District Manager.

If a landowner or water user desires to have work done at his expense by the District, the District will prepare an estimate in advance if the landowner or water user requests it. The total cost of all work shall be paid within 30 days of completion of the project.

Rule 21. Damage to Laterals

Any person causing damage to or permitting livestock to cause damage to any District right of way or facilities shall be required to reimburse this District for all expense incurred in repairing the same.

Rule 22. Enforcement of Rules

Refusal to comply with the requirements, any violations of any of these Rules and Regulations, or any interference with the proper discharge of the duties of any person employed by the District, shall be considered sufficient cause for shutting off the water, and water will not again be furnished until in the opinion of the District Manager full compliance has been made with all requirements herein set forth.

Rule 23. Non-Liability of District

The District will not be liable for any damage of any kind or nature resulting directly or indirectly to any private ditch or the water flowing therein or by reason of lack of capacity therein, or for negligent, wasteful or other use or handling of water by the users thereof. The District's responsibility shall absolutely cease when the water leaves the District's facilities, and the District will not be liable for shortage of water, either temporary or permanent, failure to deliver such water, or for the quality thereof.

Rule 24. Presumption of Knowledge by Landowners

All landowners in the District shall be conclusively presumed to have knowledge of these Rules and Regulations, of the provisions of the California Irrigation District Law, and of all proceedings had, and all orders and decisions made and entered in the District's records, including those already appearing therein and those that may hereafter be entered therein; and all such landowners are bound by them.

Rule 25. Borrowing Equipment

Tools or equipment will not be loaned unless the borrower first secures a properly signed order for same at the District office.

Rule 26. Rebates

Refunds or rebates for water applied for but not used will only be considered in the discretion of the Board of Directors and none will be granted unless application therefore is made within the current year during which payment was made.

The foregoing Rules and Regulations were adopted July 10, 2002, superceding all former Rules and Regulations.

Reclamation District No. 108

Reclamation District No. 108

SBx7-7 Water Measurement Compliance Program

Prepared By:

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916/456-4400
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October 2016

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Reclamation District No. 108

SBx7-7 Water Measurement Compliance Program

PURPOSE

This SBx7-7 Water Measurement Compliance Program (Program) has been developed and implemented by Reclamation District No. 108 (RD 108 or District) to comply with, the requirements of Water Code Section 10608.48 (WC §10608.48) and the Agricultural Water Measurement Regulation, CCR §597. The Program has become a component of the District's Agricultural Water Management Plan. Specifically, the Program outlines how the Company has addressed the Efficient Water Management Practices (EWMPs) identified in WC §10608.48.

WC §10608.48(a) states that agricultural water suppliers *"shall implement efficient water management practices pursuant to subdivisions (b) and (c)."* Subdivision (b) identifies the following two *"critical efficient water management practices:*

(1) Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) Section 531.10 and to implement paragraph (2).

(2) Adopt a pricing structure for water customers based at least in part on quantity delivered."

Subdivision (c) identifies several "additional" EWMPs that are to be implemented by agricultural water suppliers *"if the measures are locally cost effective and technically feasible."* Both the Critical and Additional EWMPs are discussed below.

CRITICAL EFFICIENT WATER MANAGEMENT PRACTICES

California Code of Regulations (CCR) §597, approved on July 11, 2012, defines how agriculture suppliers comply with WC § 10608.48(b)(1). The District currently measures its deliveries to all customers and believes it is in compliance with the provisions of Section 10608.48(b)(1) and the measurement accuracy provisions of CCR §597. The District's water delivery measurements and certification are described below.

A. Water Delivery Measurement

The District invested time and money to perform significant pilot projects to determine how measurement compliance could be achieved in the District. Three measurement methods, an orifice gate, a weir box, and the RemoteTracker (a portable velocity sensor). The results of the studies were clear. The use of a velocity measurement device provided consistently accurate measurements that would meet the State regulation. This RemoteTracker reduced the impacts from the challenging low head and extreme high flow conditions. As a result, RD 108 proceeded with implementation of turnout measurement using the RemoteTracker system, a wirelessly controlled acoustic Doppler velocity sensor. To fund the measurement program, RD 108 held an election in accordance with Proposition 218 to approve a special assessment under which the landowners paid the costs to implement the measurement program.

In order to implement the measurement program, the District modified all 600 field turnouts and pump discharges to provide turnout measurement that meets the accuracy standards required by the State regulation. This included the addition of a concrete weir box on all field turnouts and either a weir box, or if not possible, installation of a flow meter on each lift pump. In order to accomplish this, the District hired additional staff to help assemble an installation crew. The general box installation included removing any existing end of turnout structure, excavating the location for the new box to be placed, cutting the end of pipe as necessary, removing sediment from pipe, placing base rock foundation for the new box, grouting the box to the end of pipe, placing boards in box up to field elevation and backfilling around the box. Each box was then equipped with a properly located bracket to position the portable measurement device. Approximately $650,000 was spent on the boxes, meters, and equipment. Labor costs associated with the program were an additional $180,000.

District watermen use these portable acoustic Doppler flow meters to take point measurements whenever the flow through the field turnout is changed. This information is then transferred via Bluetooth to a ruggedized tablet PC in the operator's vehicle and used to calculate the volume of water delivered over time. The information is automatically transferred through wireless technology to a server in the District office where quality control, monthly reporting and billing is performed. Finally, the district has developed a tool that allows all landowners to access this data in real time to help them manage their water usage. The costs for the hardware, software, general engineering, and general legal were approximately $485,000.

The capital improvements and data management processes were completed prior to the 2016 irrigation season as the regulation requires and the measurement program has been fully implemented during the 2016 season. The approximant total cost implement the measurement program is $1,315,000 to date.

B. Accuracy Certification

RD 108 performed field verification of the device with five comparison measurements between the RemoteTracker and an USGS mid-section method measurement performed with a SonTek ADV. The results indicated that the RemoteTracker measurement methodology compared very well with the standard mid-section open channel methodology. In addition, the acoustic doppler sensor was lab tested and certified at the California State University Chico Agricultural Teaching and Research Center (CSUC ATRC) in July of 2012. Seven measurements obtained from the RemoteTracker were compared to measurements taken with a 10" magnetic flow meter manufactured by Water Specialties. The measurements compared very well with the magnetic meter and showed that the RemoteTracker can meet the accuracy requirements of the regulation. As required under CCR §594.4, the results of the certification program are enclosed as Exhibit 1, the RemoteTracker Volumetric Accuracy

Certification further describes the results from the laboratory testing that support compliance with regulations.

C. Pricing Structure

The District worked with landowners and water users through a series of meetings to develop a new rate structure during 2015. During 2015 the District was also able to gather data at all of the completed measurement locations. This data was combined with billing proposals to help the water users and District arrive at a water rate structure proposal for a Prop 218 election that was approved by the voters prior to the 2016 irrigation season. The District's Board considered and adopted pricing policy based in part on the measured volume delivered to customers in accordance with Water Code Section 10608.48(b)(2). The pricing consists of three equal revenue components: 1) a fixed acreage charge, 2) a crop based estimated volume charge and 3) an actual measured volumetric charge. The District required water deliveries to collect $3,000,000 total in revenue, so each of these components was designed to collect $1,000,000 each. The acreage component is a rate equal to the $1,000,000 divided by the irrigated acreage. The crop based volumetric approach weights each farmed acre by the applied water necessary for that crop and then proportions the $1,000,000 based on that weighted water use, and the last component is a per acre foot rate required to collect $1,000,000 based on the District's average annual farm turnout deliveries. Attached as Exhibit 2 is the District's Prop 218 memorandum, Report Detailing the Cost of Service that was distributed to the landowners which describes the rates in greater detail.

ADDITIONAL EFFICIENT WATER MANAGEMENT PRACTICES

In addition to the critical EWMPs discussed above, Water Code § 10608.48(c) identifies additional EWMPs which are to be implemented if the measures are locally cost effective and technically feasible. These additional EWMPs are referred to in DWR's AWMP Guidebook as Conditional EWMPs.

The District has evaluated many of the Conditional EWMPs as part of the 2007 RWMP and its updates through addressing the targeted benefits (TBs) and quantifiable objective (QOs). The District may further address Conditional EWMPs at a future date.

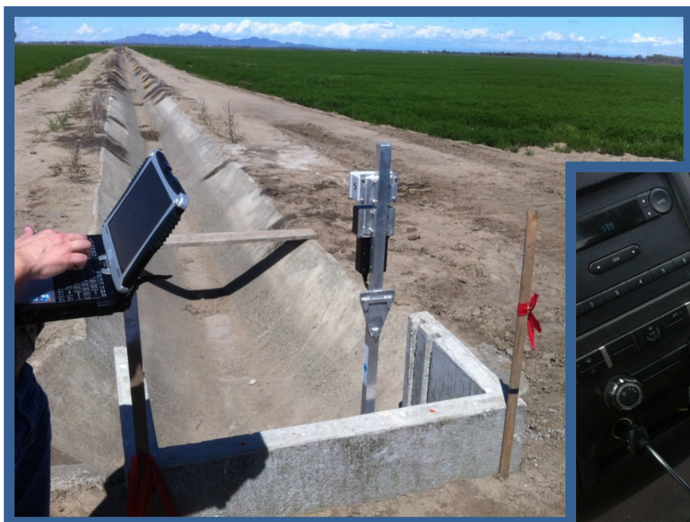
EXHIBIT 1

REMOTETRACKER VOLUMETRIC ACCURACY CERTIFICATION

Reclamation District No. 108

RemoteTracker Volumetric Accuracy Certification

Colusa and Yolo Counties, California



Prepared by

DAVIDS ENGINEERING, INC

October 2012

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Abbreviations

%	Percent
AF	acre-feet
Avg	Average
CCR	California Code of Regulations
cfs	cubic feet per second
DEL	Delivery
DWR	California Department of Water Resources
ft	feet/foot
ft/s	feet per second
gpm	gallons per minute
GT	Gate
Max	Maximum
Min	Minimum

RD 108	Reclamation District No. 108
RT	RemoteTracker
Std Dev	Standard Deviation
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey
WMM	Water Measurement Manual
WR	Weir
WWVS	Wireless Water Velocity Sensor

List of Figures

A-1.0 Introduction and Summary

This document (1) provides an overview of the RemoteTracker system (Section A-2.0), (2) presents results of initial laboratory and field testing (Section A-3.0) and (3) develops a volumetric accuracy analysis to support compliance of RemoteTracker system with California Code of Regulations Title 23 Division 2 Chapter 5.1 Article 2 Section 597 (CCR 23 §597) (Section A-4.0). Based on the analysis in Section A.3, the expected accuracy in volumetric measurements performed with the RemoteTracker system is ±4.6 percent. Because the RemoteTracker system utilizes a laboratory certified acoustic doppler velocimeter manufactured by SonTek to measure water velocity, the ±5 percent by volume laboratory certification option presented in CCR 23 §597.3(a)(2)(B) applies. Thus, the demonstrated accuracy of the RemoteTracker complies with the ±5 percent by laboratory certification standard. Documentation of the protocols associated with the measurement of the cross-section flow area and duration of delivery, as required by §597.4(e)(3)(B), is presented in Section A-4.0.

A-2.0 RemoteTracker System Overview

The RemoteTracker is an integrated turnout flow measurement, data management and volumetric accounting system developed by H2oTech[1] specifically for agricultural water suppliers in response to CCR 23 §597. The RemoteTracker system is comprised of (1) a wirelessly controlled water velocity sensor, (2) a ruggedized tablet PC in the operator's vehicle and (3) a database running on a file server connected to the internet. The user interface on the tablet PC enables operators to view real time flow data from the wirelessly controlled water velocity sensor via a Bluetooth radio connection while adjusting flows at the turnout gate. Data is automatically transferred over a wireless wide area network (WWAN) to a centralized file server at the District headquarters where it is automatically loaded into a custom database application. The database performs quality control and quality assurance procedures on the data and then develops daily volumes for each customer delivery point (turnout or delivery) within the District.

The wireless water velocity sensor (WWVS) is held in place at a precise location at the pipe outlet by an aluminum or stainless steel mounting bracket. The user interface, shown in Figure A-1, was designed with simplicity and ease of use in mind. If 'Auto Locate' is selected, the program automatically populates the three site identification pull-downs at the top of the screen. If the operator needs to select a different site, the pull-downs can be manually changed. The site selection hierarchy is a three digit abbreviation of 'Operator Route' (i.e. ride, beat or division) on the left, a three digit abbreviation of 'Canal' in the middle and site name on the right. The most recently measured flow, and any pending orders are shown on the 'Home' tab. Many useful reports, including (1) Delivery History, (2) Pending Orders, (3) Fulfilled Orders and (4) Canal Management are available on the 'Reports' tab. These reports can be sorted at any spatial or temporal scale. The data sharing and management framework allows water order and delivery data collected by any operator to be automatically available for viewing by other operators or management staff in a matter of minutes.

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[1] H2oTech is a company based in Chico, California that focuses on the development of innovative technologies to solve water management challenges.

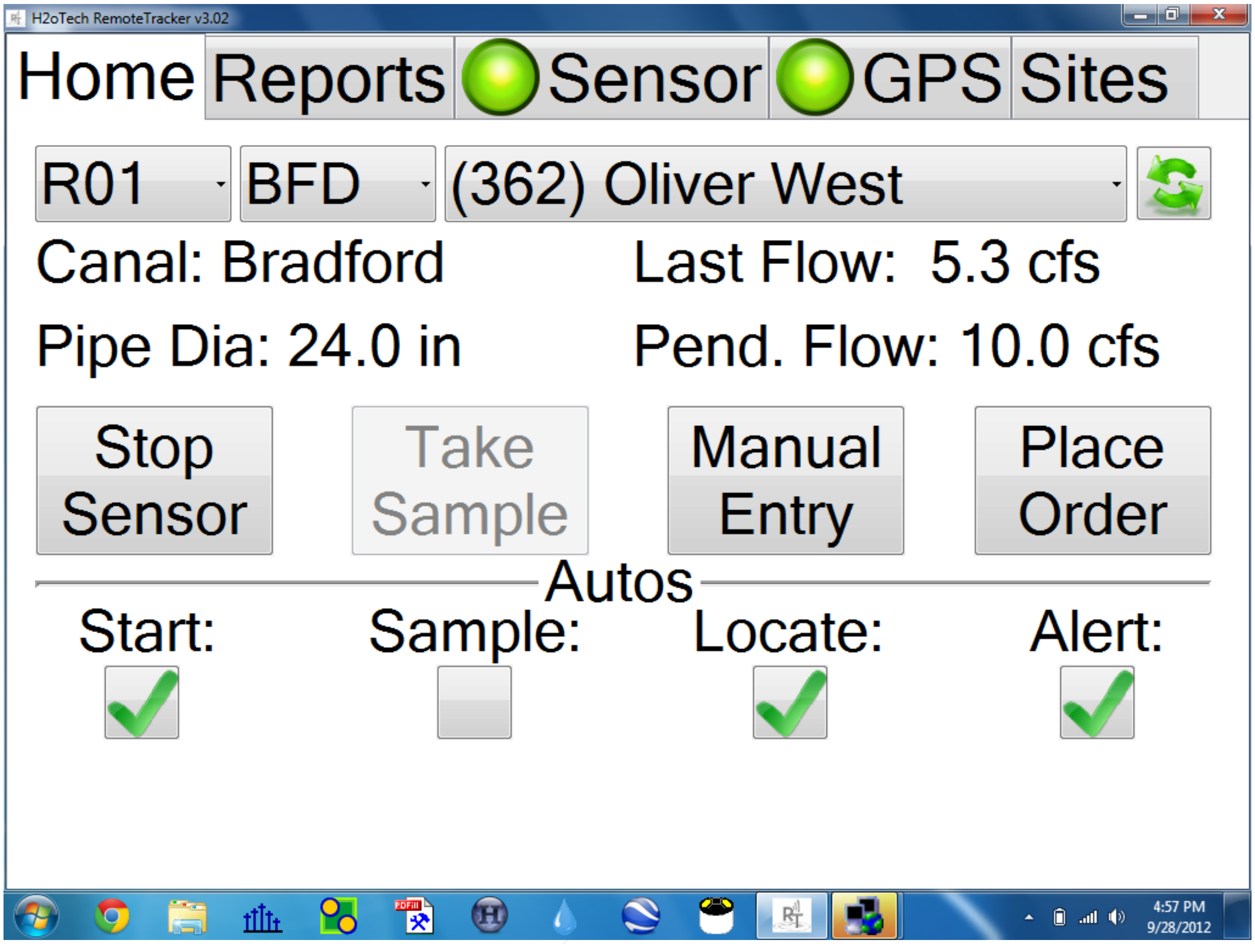
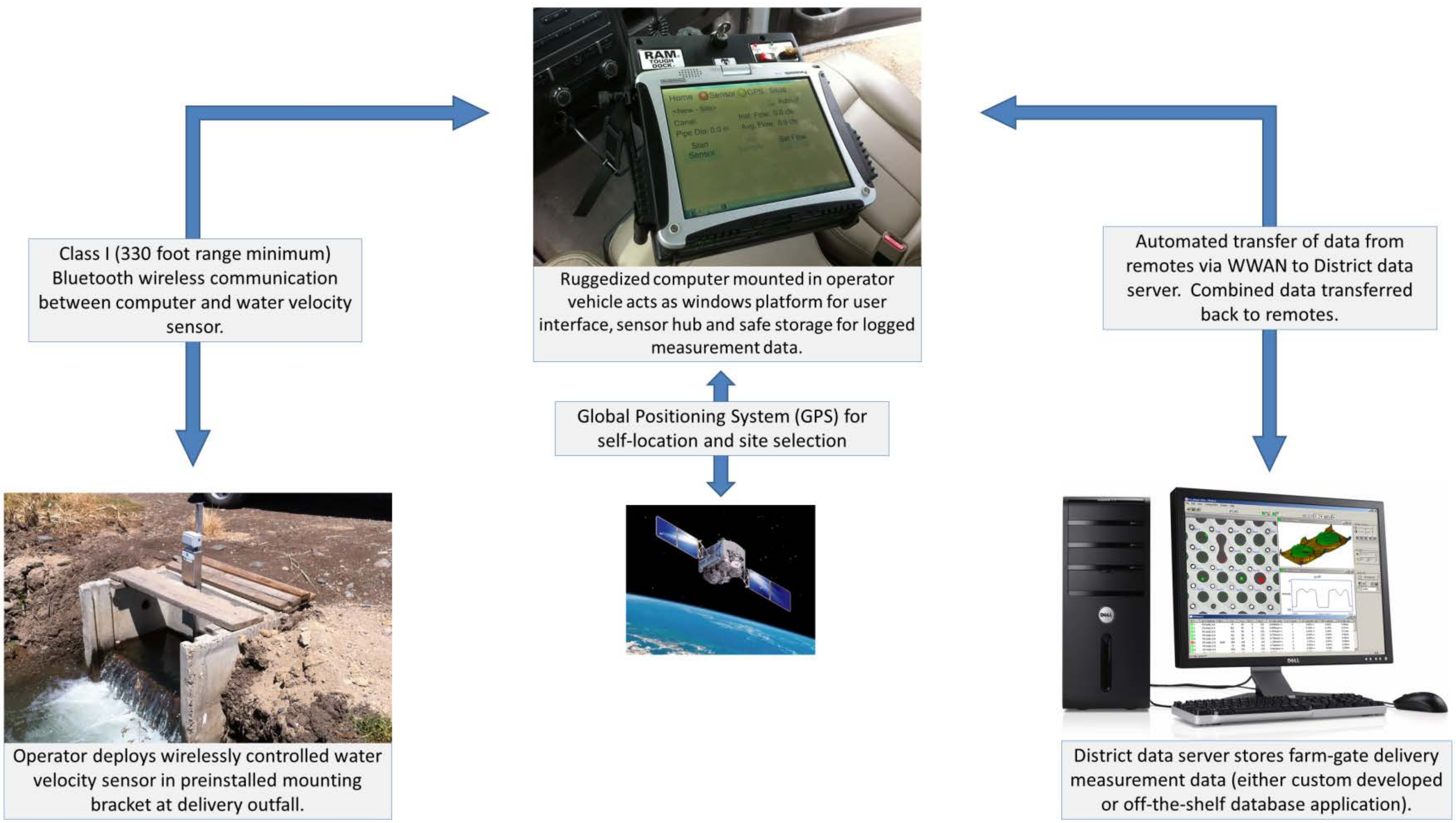


Figure A-1. RemoteTracker User Interface - Home Tab Shown

The basic components of the RemoteTracker system are illustrated in Figure A-2. Water velocity is collected by a portable acoustic Doppler velocimeter deployed during measurement by hanging it on brackets permanently installed at each turnout. The brackets are precisely positioned such that the sample volume is at the center of the pipe. Data is transmitted via a class 1 Bluetooth radio to a ruggedized tablet PC where it is processed, displayed and stored. Data is then transferred via a WWAN to a file server at the District headquarters. Data from each operator is aggregated with an automated database procedure and then returned to each operator via WWAN, thereby ensuring that delivery and order data is shared and accessible throughout the entire District.

RemoteTracker* Principles of Operation Diagram



* Patent Pending

Figure A-2. RemoteTracker Principles of Operation Overview

The key to pipe flow measurement using the RemoteTracker is the consistent relationship between a single velocity measurement at the center of the pipe and the average pipe flow velocity shown in Figure A-3 derived from 146 measurements of center and mean pipe velocity. Based on this relationship, with the pipe diameter and cross sectional area known, the single point velocity can be accurately and reliably correlated with mean pipe velocity (flow rate).

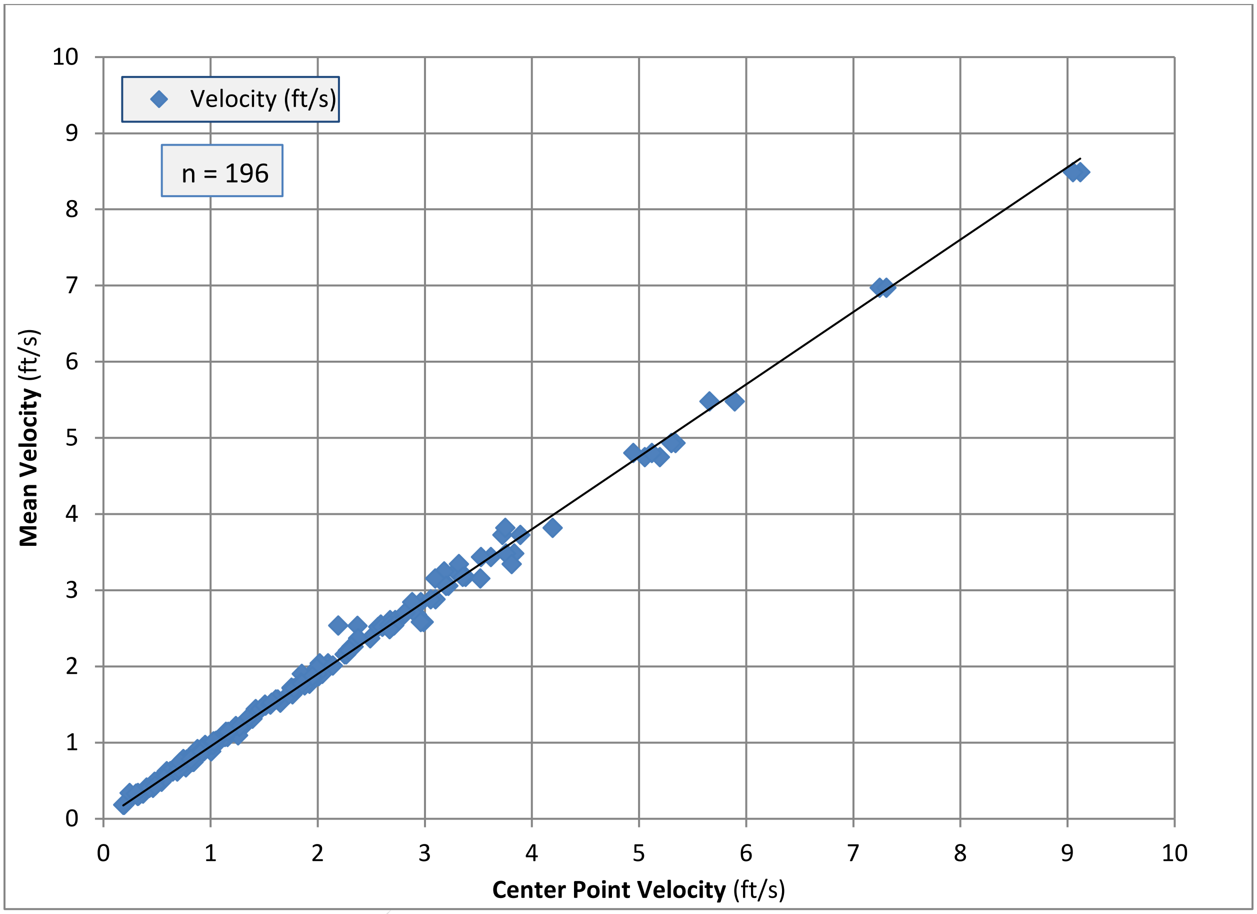


Figure A-3. Relationship between Average and Center Point Pipe Flow Velocity

As with weir and orifice gate measurement, full pipe flow is required for the RemoteTracker to measure correctly. Therefore, a weir box is needed at each turnout to ensure full pipe flow as well as to accommodate the mounting bracket to hold the wireless water velocity sensor so that the sample volume is at the center of the pipe.

The RemoteTracker system can also be integrated with existing or new data management systems at the District office for report generation, accounting and billing. This capability can be added later to provide additional efficiencies in water billing and accounting procedures.

A-3.0 Initial Testing Results

A-3.1 Laboratory Testing

Additional testing was performed at the California State University Chico Agricultural Teaching and Research Center (CSUC ATRC) in July of 2012. Flow data obtained from the RemoteTracker was compared to measurements taken with a 10-inch diameter magnetic flow meter manufactured by Water Specialties. Figure A-4 shows the Water Specialties Magnetic meter with an Endress & Hauser Transit-Time Meter installed just upstream as an additional check. The 3 foot wide by 3 foot deep concrete flume was modified to simulate a typical delivery configuration by forcing all the flow through a 20 foot length of 18 inch HDPE smooth interior wall pipe submerged in the concrete flume. The RemoteTracker wireless water velocity sensor was installed at the pipe outfall using a temporarily constructed headwall with a mounting bracket as shown in Figure A-5.

Figure A-4. Water Specialties Magnetic Flow Meter at CSUC ATRC

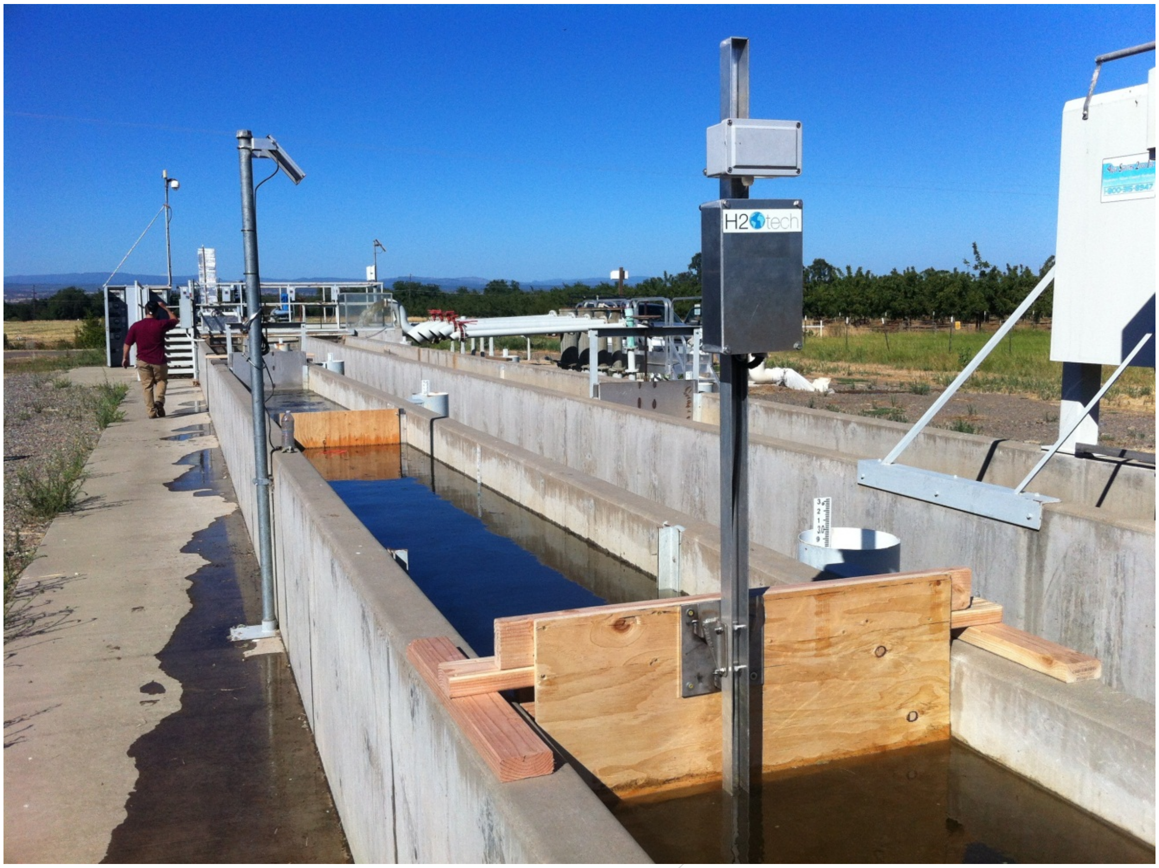


Figure A-5. RemoteTracker Wireless Water Velocity Sensor Installed at CSUC ATRC

Seven comparison measurements were made between the RemoteTracker and magnetic meter ranging from 0.5 cfs to just over 3.0 cfs (the maximum pump capacity). The percent difference between the two measurements averaged roughly -2.6 percent with a range of -10.2 to 2.8 percent indicating that the RemoteTracker measurement methodology compares very well with the magnetic meter. Note that the -10.2 percent difference occurred at the lowest flow rate of approximately 0.5 cfs and represents an absolute flow rate difference of just 0.05 cfs between the two measurement methods. The results of the comparison measurements are presented in Figure A-6 where the blue bars represent flow rates obtained with a magnetic meter, the red bars represent flow rates obtained with the RemoteTracker and the green triangles represent the percent difference between the two (secondary vertical axis).

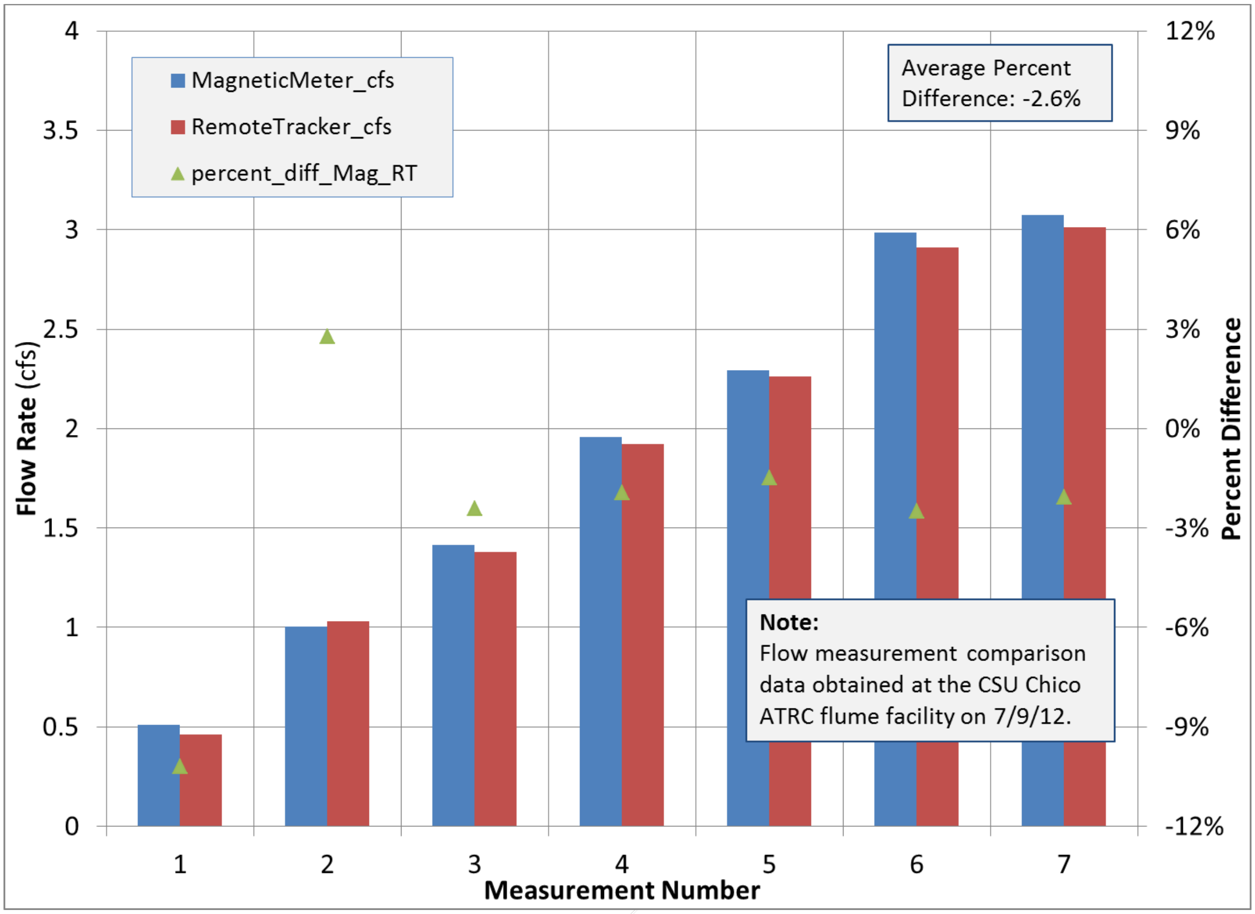


Figure A-6. RemoteTracker and CSUC ATRC Magmeter Comparisons

A-3.2 Field Testing

Five comparison measurements between the RemoteTracker and USGS mid-section method measurements with a SonTek ADV were performed at two turnouts in two irrigation districts (one turnout in each District) in Northern California during the 2011 irrigation season. The turnouts were selected because the delivery spilled into a field ditch (or head ditch) rather than a field, so both a RemoteTracker and a USGS mid-section method measurement (Rantz 1982) could be taken and compared. Figure A-7 shows the cross section report for one of the measurements in a typical earthen head ditch, in this case with a maximum depth of 2.5 feet, top width of 14 feet and bottom width of 5 feet. Typically, velocity measurements were performed at 0.5 foot intervals with velocities averaged over a 40 second period.

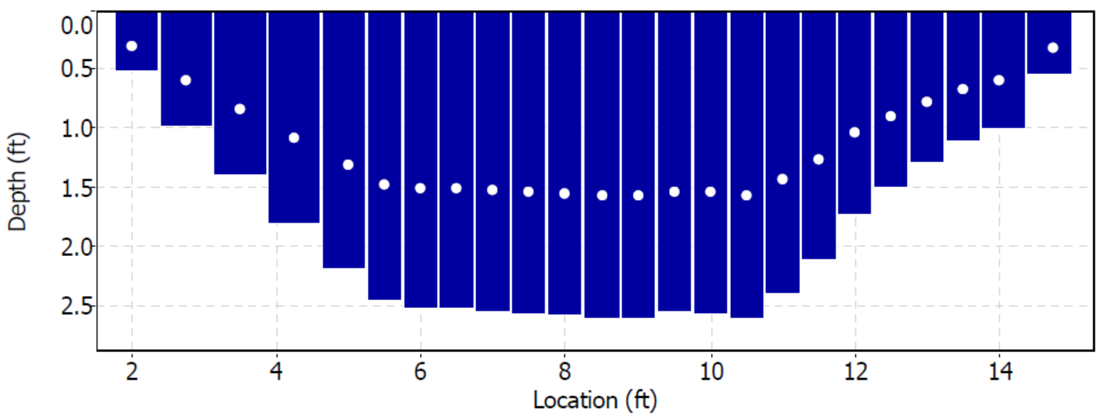


Figure A-7. SonTek ADV Cross Section for Canal Verification Measurement

The percent difference between the RemoteTracker and the USGS mid-section method averaged roughly 0.9 percent with a range of -0.8 to 3.4 percent, indicating that the RemoteTracker measurement methodology compares very well with the standard mid-section open channel methodology. The results of the comparison measurements are presented below in Figure A-8 where the blue bars represent flow rates obtained with a SonTek ADV in an open channel downstream of the turnout, the red bars represent flow rates obtained with the RemoteTracker and the green triangles represent the percent difference between the two (secondary vertical axis).

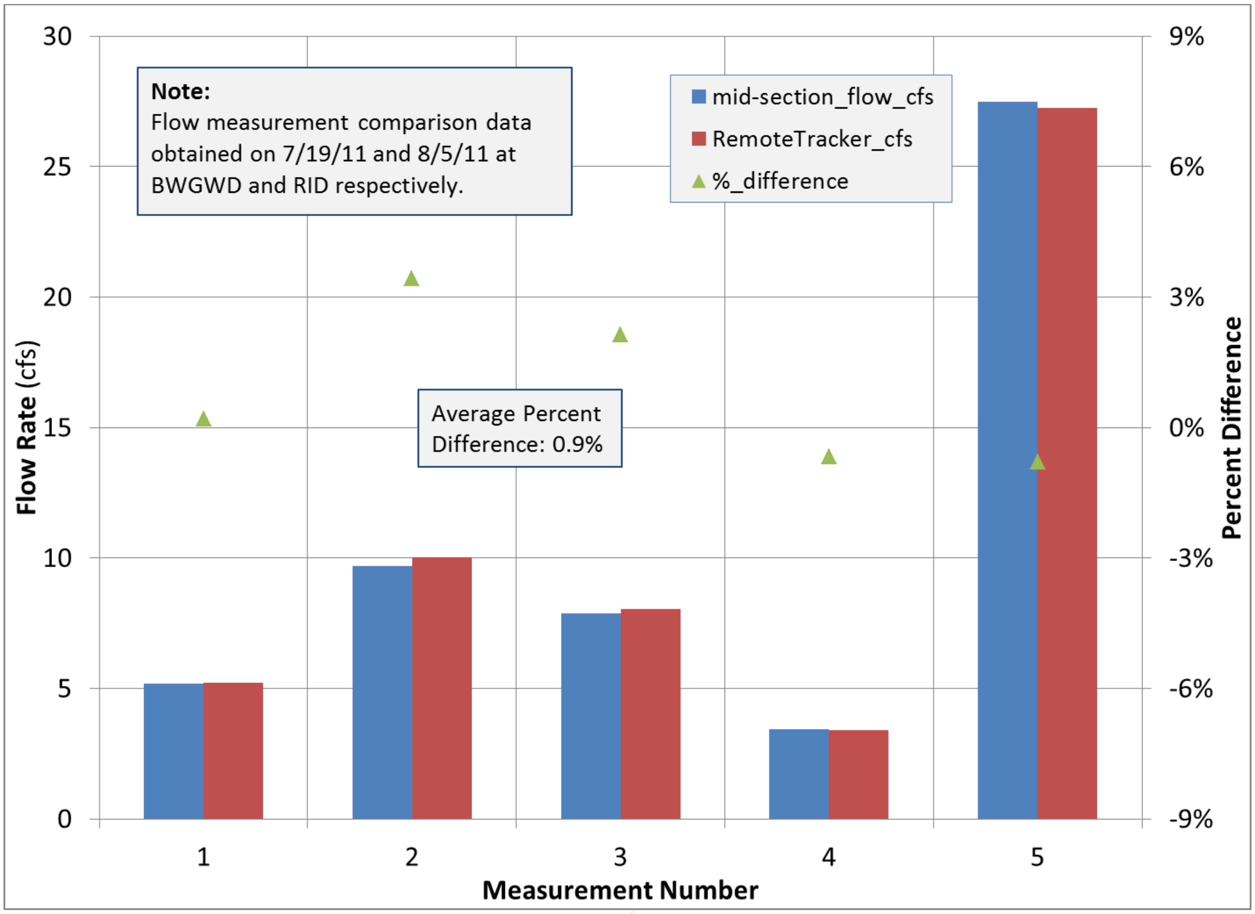


Figure A-8. RemoteTracker and Mid-Section method Comparisons

A-4.0 Volumetric Conversion (CCR 23 §597.4 (e) (3))

Accuracy requirements established by CCR 23 §597 apply to delivery volume and not instantaneous flow rate or velocity. CCR 23 §597.4(e)(3)(B) states, "For devices that measure velocity only, the documentation shall describe protocols associated with the measurement of the cross-sectional area of flow and duration of water delivery…". This document provides descriptions of the protocols associated with the measurement of (1) average velocity, (2) cross-sectional area of flow and (3) duration of delivery, in addition to the corresponding accuracies associated with each measurement.

Because the RemoteTracker WWVS measures water velocity only, Equation A-1 suggested in CCR 23 597.4(e)(3)(B) is used to calculate volume.

$$\forall = V * A * \Delta t \qquad \textbf{(Equation A-1)}$$

Where the variables are defined as:

- $\forall$: Volume
- V: Average Velocity
- A: Cross-Section Flow Area
- Δt: Duration of Delivery

This relative accuracy analysis assumes:

- 3 cubic foot per second (cfs) maintenance delivery
- A 24 inch inner diameter delivery pipe
- Normal distribution of measurement errors

A 3 cfs delivery was selected because it represents the lower range of agricultural water delivery rates and accuracy is harder to achieve at low flows. A 24 inch pipe is the average turnout pipe size within most agricultural districts. These assumptions lead to the listed variables having the values presented below.

- V_{RT} = RemoteTracker Velocity Measurement = 1.00 ft/s
- $V_{Avg}*$ = Average Velocity of the pipe at the time of the RemoteTracker spot measurement = 0.95 ft/s (determined by correlation with measured velocity; see Figure A-3)
- D = Pipe Diameter = 2.00 ft
- A = Cross-Section Flow Area = 3.14 ft^2

Based on the following analysis, the expected accuracy in volumetric measurements performed with the RemoteTracker system is ±4.6 percent.

A-4.1 Volumetric Accuracy Analysis Overview

Volumetric accuracy of water deliveries consists of the accuracies in each of the following three components:

- Average Velocity (V_{Avg})
- Cross-Section Flow Area (A)
- Duration of Delivery (Δt)

The total absolute accuracy is found using the following equation;

$$\sigma_{\forall} = \pm\sqrt{\left(\frac{\partial\forall}{\partial V_{Avg}}\sigma_{V_{Avg}}\right)^2 + \left(\frac{\partial\forall}{\partial A}\sigma_A\right)^2 + \left(\frac{\partial\forall}{\partial\Delta t}\sigma_{\Delta t}\right)^2} \qquad \textbf{(Equation A-2)}$$

Where the variables are defined as:

- ∀: Volume
- V_{Avg}: Average Velocity
- Δt: Duration of Delivery
- σ: Absolute Accuracy (expressed in the units of the term in question)
- U: Relative Accuracy (expressed as a percentage)

The total relative accuracy is:

$$U_{\forall} = \frac{\sigma_{\forall}}{\forall} = \pm\frac{1}{\forall}\sqrt{\left(\frac{\partial\forall}{\partial V_{Avg}}\sigma_{V_{Avg}}\right)^2 + \left(\frac{\partial\forall}{\partial A}\sigma_A\right)^2 + \left(\frac{\partial\forall}{\partial\Delta t}\sigma_{\Delta t}\right)^2} \qquad \textbf{(Equation A-3)}$$

$$U_{\forall} = \pm\sqrt{\frac{1}{\forall^2}\left(\left(\frac{\partial\forall}{\partial V_{Avg}}\sigma_{V_{Avg}}\right)^2 + \left(\frac{\partial\forall}{\partial A}\sigma_A\right)^2 + \left(\frac{\partial\forall}{\partial\Delta t}\sigma_{\Delta t}\right)^2\right)}$$

Where the partial derivatives are:

$$\frac{\partial\forall}{\partial V_{Avg}} = A\Delta t\ ,\ \frac{\partial\forall}{\partial A} = V_{Avg}\Delta t\ ,\ \frac{\partial\forall}{\Delta t} = V_{Avg}A$$

Substituting in the solutions to the partial derivatives:

$$U_{\forall} = \pm\sqrt{\frac{1}{\forall^2}\left(\left(A\Delta t\sigma_{V_{Avg}}\right)^2 + \left(V_{Avg}\Delta t\sigma_A\right)^2 + \left(V_{Avg}A\sigma_{\Delta t}\right)^2\right)}$$

$$U_\forall = \pm\sqrt{\left(\frac{A\Delta t\sigma_{V_{Avg}}}{\forall}\right)^2 + \left(\frac{V_{Avg}\Delta t\sigma_A}{\forall}\right)^2 + \left(\frac{V_{Avg}A\sigma_{\Delta t}}{\forall}\right)^2}$$

$$U_\forall = \pm\sqrt{\left(\frac{\sigma_{V_{Avg}}}{V_{Avg}}\right)^2 + \left(\frac{\sigma_A}{A}\right)^2 + \left(\frac{\sigma_{\Delta t}}{\Delta t}\right)^2}$$

This becomes:

$$U_\forall = \pm\sqrt{\left(U_{V_{Avg}}\right)^2 + (U_A)^2 + (U_{\Delta t})^2} \qquad \textbf{(Equation A-4)}$$

Based on Equation A-4, the relative accuracies of Average Velocity, Cross-Section Flow Area, and Duration of Delivery are required. The following sections detail their determination.

A-4.2 Relative Accuracy in Velocity

The following bullet points provide protocols for the collection of water velocity data.

- The RemoteTracker WWVS will be deployed in the delivery pipe outfall so that the sample volume is located in the center of the delivery pipe
- Water velocities will be collected with the RemoteTracker WWVS at:
    - The start of all delivery events
    - After any changes in delivery events
- Shutoffs will be recorded on the RemoteTracker user interface with the “Record Shutoff” button at the time the gate is closed

The accuracies in average velocity consist of three parts:

1. $\sigma_{V_{RT}}$: Accuracy of RemoteTracker velocity measurements
2. $\sigma_{V_{Avg*}}$: Accuracy due to the process of correlating RemoteTracker velocity measured at the pipe center and the average velocity of the pipe at the time of the RemoteTracker spot measurement[2]
3. $\sigma_{\Delta V_T}$: Accuracy due to the difference between the average velocity at the time of the RemoteTracker spot measurement and the actual average velocity for the duration of the delivery (i.e. change in velocity over time)

The average velocity relative accuracy is:

[2] Average velocity at the time of the RemoteTracker spot measurement represents a snapshot of the average water velocity in a delivery pipe at the time of the RemoteTracker measurement.

$$U_{V_{Avg}} = \pm \frac{\sigma_{V_{Avg}}}{V_{Avg}}$$ **(Equation A-5)**

Where the variables are defined as:

- V_{Avg}: Average Velocity
- $U_{V_{Avg}}$: Relative Velocity Accuracy
- $\sigma_{V_{Avg}}$: Absolute Velocity Accuracy

The average velocity of the entire irrigation event is the summation of the average velocity at the time of observation and the average change in velocity throughout the remainder of the event due to water level fluctuations.

$$V_{Avg} = V_{Avg} * + \Delta V_T$$ **(Equation A-6)**

Where the variables are defined as:

- V_{Avg}: Average Velocity
- V_{Avg} $*$: Average Velocity at the time of the RemoteTracker spot measurement
- ΔV_T: Average Change in Velocity over time

Therefore:

$$\sigma_{V_{Avg}} = \pm\sqrt{\left(\frac{\partial V_{Avg}}{\partial V_{AvgO}} \sigma_{V_{AvgO}}\right)^2 + \left(\frac{\partial V_{Avg}}{\partial \Delta V_T} \sigma_{\Delta V_T}\right)^2}$$ **(Equation A-7)**

Where the partial derivatives are:

$$\frac{\partial V_{Avg}}{\partial V_{Avg^*}} = 1,\ \frac{\partial V_{Avg}}{\partial \Delta V_T} = 1$$

Substituting in the solutions to the partial derivatives:

$$\sigma_{V_{Avg}} = \pm\sqrt{\left(\sigma_{V_{Avg^*}}\right)^2 + \left(\sigma_{\Delta V_T}\right)^2}$$ **(Equation A-8)**

The following subsections present (1) the accuracy of the RemoteTracker velocity measurements, (2) the accuracy of the average velocity at the time of the RemoteTracker spot measurements ($\sigma_{V_{Avg}*}$) and (3) the accuracy in the change in average velocity over time ($\sigma_{\Delta V_T}$).

A-4.2.1 Accuracy of RemoteTracker Velocity Measurement

The RemoteTracker system uses a SonTek ADV for water velocity measurements. The SonTek ADV technical specifications sheet lists a velocity measurement error of 0.01 or 1.0% (SonTek 2006). Therefore, $\sigma_{V_{RT}}$ is equal to 0.010 ft/s, or 1.0% of 1.00 ft/s (V_D).

A-4.2.2 Accuracy of the Average Velocity at the Time of the RemoteTracker Spot Measurement

The average velocity is computed as the product of the velocity measured by the RemoteTracker and the coefficient correlating the RemoteTracker velocity measurement to the average velocity at the time of the RemoteTracker spot measurement.

$$V_{Avg} *= CV_{RT}$$ **(Equation A-9)**

Where the variables are defined as:

- $V_{Avg} *$: Average velocity at the time of the RemoteTracker spot measurement
- C: Coefficient correlating the RemoteTracker velocity measurement to the average velocity at the time of the RemoteTracker spot measurement, which is equal to 0.95 (see Figure A-3)
- V_{RT}: RemoteTracker velocity measurement

Therefore:

$$\sigma_{V_{Avg^*}} = \pm\sqrt{\left(\frac{\partial V_{Avg^*}}{\partial C}\sigma_C\right)^2 + \left(\frac{\partial V_{Avg^*}}{\partial V_{RT}}\sigma_{V_{RT}}\right)^2}$$ **(Equation A-10)**

Where the partial derivatives are:

$$\frac{\partial V_{Avg} *}{\partial C} = V_{RT}, \frac{\partial V_{Avg} *}{\partial V_{RT}} = C$$

Substituting in the solutions to the partial derivatives:

$$\sigma_{V_{Avg^*}} = \pm\sqrt{(V_{RT}\sigma_C)^2 + \left(C\sigma_{V_{RT}}\right)^2}$$ **(Equation A-11)**

Based on water velocity data collected, the average error introduced by converting the RemoteTracker velocity measurement to the average velocity at the time of the RemoteTracker spot measurement (σ_C) is 0.014 or 1.4%.

Inserting the determined values into Equation A-11:

$$\sigma_{V_{Avg^*}} = \pm\sqrt{(1.0 * 0.014)^2 + (0.95 * 0.010)^2} = \pm\, 0.017\ ft/s$$

A-4.2.3 Accuracy of the Change in Velocity over Time

A Microsoft Access database was developed to assess the accuracy in the change in velocity over time. Based on the orifice equation, the change in velocity through an orifice is solely a function of changes in head (or difference between upstream and downstream water level). Only water level data from the typical irrigation season (i.e. May through August) was used. It was assumed that measurements of velocity were performed every three days.

The difference between the head observed every three days and the actual average of the 15 minute data during the three day period was computed for each 15 minute record and then averaged over the observation period. Equation A-14 was then used to calculate the change in velocity over time (ΔV_T) for each three day period. The initial head (h_i) was assumed to be 0.5 feet to simulate a low head delivery. A low head was chosen because water level fluctuations impact the velocity of low head deliveries more significantly than high head deliveries.

Rearranging Equation A-6:

$$\Delta V_T = V_{Avg} - V_{Avg}\,*$$

From the orifice equation:

$$V = C(2gh)^{0.5}$$ **(Equation A-12)**

Where the variables are defined as:

- V: Velocity
- C: Discharge Coefficient
- g: gravitational constant
- h: Head

Orifice gates in most agricultural water districts operate under submerged conditions (i.e. not free flow conditions). As upstream canal water levels fluctuate, the flow through the orifice would theoretically vary as a function of the changes in canal water level to the one-half power. However, since the orifice gates are submerged, the hydraulically connected downstream water level also varies together with the upstream canal water level. This provides a damping effect on the overall change in velocity due to upstream water level fluctuations. The California Polytechnic State University at San Luis Obispo Irrigation

Training and Research Center (ITRC) suggest using a power of 0.38 in the orifice equation to simulate the damping effect of submergence for a range of downstream channel conditions (Burt and Geer 2012).

$$V = C(2gh)^{0.38} \qquad \textbf{(Equation A-13)}$$

Substituting values:

$$\Delta V_T = C(2gh_{avg})^{0.38} - C(2gh_O)^{0.38}$$

Where the variables are defined as:

- h_{avg}: Average Head
- h_O: Observed Head

Factoring:

$$\Delta V_T = C(2g)^{0.38}\left((h_{avg})^{0.38} - (h_O)^{0.38}\right)$$

Substituting values:

$$\Delta V_T = C(2g)^{0.38}\left((h_i + \Delta h_{avg})^{0.38} - (h_i)^{0.38}\right) \qquad \textbf{(Equation A-14)}$$

Where the variables are defined as:

- h_i= Initial head at time of observation
- Δh_{avg}= average change in head

Since the volumetric reporting requirements apply to a monthly or bi-monthly basis (California Water Code §531.10(a)), the change in velocity over time was then averaged on a monthly time step. The average of the absolute values of each of the average monthly changes in velocity over time was taken across all nine sites. Largely due to the fact that water level fluctuations are normally distributed, the results of the hydraulic database model suggest that the average change in velocity over time due to water level fluctuation is:

$$\sigma_{\Delta V_T} = \pm\, 0.033\ ft/s$$

Based on the evaluation of continuous upstream and downstream water level data from 14 irrigation events in RD 108 with an average duration of five days, the average change in velocity over time was determined to be ±1.0 percent. In the context of this analysis, the accuracy in the change in velocity over time would be:

$$\sigma_{\Delta V_T} = \pm 1.0\% \; or \pm 0.010 \; ft/s$$

Therefore, utilizing the value of ±0.033 ft/s for the volumetric accuracy analysis is a conservative assumption.

Inserting the calculated values into Equation A-8, the average velocity accuracy is:

$$\sigma_{V_{Avg}} = \pm\sqrt{(0.017)^2 + (0.033)^2} = 0.037 \; ft/s$$

The relative accuracy of the average velocity is:

$$\boxed{U_{V_{Avg}} = \pm \frac{\sigma_{V_{Avg}}}{V_{Avg}} = \pm \frac{0.037 \; ft/s}{0.95 \; ft/s} = \pm \, 0.039 \; or \; 3.9\%}$$

A-4.3 Relative Accuracy in Cross-Section Flow Area

The following bullet points provide protocols for the collection of cross-section flow area data.

- The cross-section flow area will be calculated by measuring the inner diameter of the delivery pipe at the location of the water velocity measurement and using Equation A-16 to calculated area from inner diameter
- Inner pipe diameters will be measured with best professional practices when the pipe is dry

The accuracy in the inner pipe diameter measurement is assumed to be 0.02 feet (or 1/4 inch). The relative accuracy due to area is:

$$U_A = \pm \frac{\sigma_A}{A}$$ **(Equation A-15)**

The correlation between diameter and area is:

$$A = \frac{\pi \mathrm{D}^2}{4}$$ **(Equation A-16)**

Where the variables are defined as:

- A: Cross-Section Flow Area
- π: Pi
- D: Inner Diameter

The accuracy is:

$$\sigma_A = \pm\sqrt{\left(\frac{\partial A}{\partial D}\sigma_D\right)^2}$$ **(Equation A-17)**

Where the partial derivative is equal to:

$$\frac{\partial A}{\partial D} = \frac{2\pi D}{4} = \frac{\pi D}{2}$$

The assumed pipe is 2.00 feet (24 inch) in diameter, giving an area of 3.142 ft^2

$$\sigma_A = \pm\sqrt{\left(\frac{\partial A}{\partial D}\sigma_D\right)^2} = \sqrt{\left(\frac{\pi D}{2}0.02\right)^2} = \sqrt{\left(\frac{\pi 2}{2}0.02\right)^2} = \pm\, 0.063\ ft$$

The relative accuracy in the cross-section flow area is:

$$\boxed{U_A = \pm\frac{\sigma_A}{A} = \pm\frac{0.063\ ft}{3.142\ ft} = \pm\, 0.020\ or\ 2.0\%}$$

A-4.4 Relative Accuracy in Duration of Delivery

The following bullet points provide protocols for the collection of duration of delivery data.

- The start time for delivery will be the date and time recorded in the RemoteTracker system when a velocity measurement is taken at the start of a delivery
- The stop time for delivery will be the date and time recorded in the RemoteTracker system when either:
  - "Record Shutoff" is pressed after a gate is closed at the end of a delivery or
  - A new velocity measurement is taken after a change in delivery flow rate is made

A conservative value for the duration of an irrigation event is assumed to be a period of 24 hours. The possible accuracy in duration measurement is considered to be 15 minutes for the startup and 15 minutes for the shutoff (or 0.25 hours for both). Realistically, the actual accuracy in duration is much smaller when using the RemoteTracker system since the operator is recording water velocity data on site when gate position changes are made. The relative accuracy due to duration of delivery is:

$$U_{\Delta t} = \pm\frac{\sigma_{\Delta t}}{\Delta t}$$ **(Equation A-18)**

Where:

$$\Delta t = Et - St$$ **(Equation A-19)**

Where the variables are defined as:

- Δt: Duration of Delivery
- St: Start Time
- Et: End Time

The accuracy of the Duration of Delivery is:

$$\sigma_{\Delta t} = \pm\sqrt{\left(\frac{\partial \Delta t}{\partial St}\sigma_{St}\right)^2 + \left(\frac{\partial \Delta t}{\partial Et}\sigma_{Et}\right)^2} \qquad \textbf{(Equation A-20)}$$

Where the partial derivatives are equal to:

$$\frac{\partial \Delta t}{\partial St} = 1, \ \frac{\partial \Delta t}{\partial Et} = 1$$

$$\sigma_{\Delta t} = \pm\sqrt{(\sigma_{St})^2 + (\sigma_{Et})^2} = \sqrt{(.25)^2 + (0.25)^2} = 0.35\ hrs$$

The relative accuracy in the duration of delivery is:

$$\boxed{U_{\Delta t} = \pm\frac{\sigma_{\Delta t}}{\Delta t} = \pm\frac{0.35}{24} = \pm\,0.015\ or\ 1.5\%}$$

A-4.5 Relative Accuracy in Volume

As previously stated this relative accuracy assumes a 3 cfs maintenance delivery in a 24” pipe. Inserting the calculated accuracy value for each component, the relative accuracy is as follows:

$$U_{\forall} = \pm\sqrt{\left(U_{V_{Avg}}\right)^2 + (U_A)^2 + (U_{\Delta t})^2} \qquad \textbf{(Equation A-21)}$$

Inserting all calculated accuracy values the relative accuracy in volumetric measurements is:

$$U_{\forall} = \pm\sqrt{(.039)^2 + (.020)^2 + (.015)^2}$$

$$\boxed{U_{\forall} = \pm\,0.046\ or\ \pm\,4.6\%}$$

Based on the foregoing analysis and the resulting ±4.6% accuracy in delivery volume determined for the RemoteTracker, the RemoteTracker complies with the ±5.0% accuracy standard in CCR 23 §597 for laboratory testing.

EXHIBIT 2

REPORT DETAILING THE COST OF SERVICE

RECLAMATION DISTRICT NO. 108

REPORT DETAILING THE COST OF SERVICE

BACKGROUND

Reclamation District No. 108 (RD108) was formed in 1870 under the general Reclamation District Law of 1868 for the purpose of constructing levees to provide flood protection to over 100,000 acres of farmland along the west side of the Sacramento River from north of Colusa to Knights Landing. In the early 1900s, RD108 was consolidated to approximately 58,000 acres to provide irrigation water service, flood control, and drainage for lands within its service area. In 1917, RD108 began construction of major irrigation distribution system facilities for delivery of water from the Sacramento River to approximately 48,000 acres.

RD108 obtains its water supply from the Sacramento River under its riparian water rights and licenses for appropriation of surface waters. This water supply is supplemented when necessary from groundwater, using the District's wells and privately owned wells and by diversion of water from the Colusa Basin Drain under the District's appropriative license. RD108's appropriative water rights for diversion from the Sacramento River have priority dates of 1917 and 1919. RD108's appropriative water right for diversion from the Colusa Basin Drain has a priority date of 1947.

In 1964, RD108 entered into a negotiated settlement agreement with the U.S. Bureau of Reclamation (USBR), quantifying the amount of water RD108 could divert from the Sacramento River. The resulting negotiated agreement recognized RD108's annual entitlement of Base Supply of 199,000 acre-feet per year (ac-ft/yr) of flows from the Sacramento River and also provided for a 54,500 ac-ft/yr allocation of Central Valley Project supply (Project Supply). In 1974, the District reduced its Project Supply allocation to 33,000 ac-ft/yr with the expectation that conservation efforts including canal lining and recirculation of drainage water would reduce diversion requirements. The subsequent contract entitlement was thus for a total of 232,000 ac-ft/yr. The contract stipulated maximum diversions of Base and Project Supply for the months of April through October and remained in effect until March 31, 2006, at which time it was extended for an additional 40 years.

Rice is the predominant crop grown within RD 108's service area. Other key crops include tomatoes, alfalfa, vineseed, wheat, and corn.

ACCOUNTING BASIS

RD108 irrigation services are accounted for within a single irrigation fund. RD108 uses the accrual basis of accounting and, as such, revenues are recognized when earned and expenses are recorded when the liability is incurred, regardless of the timing of cash flows. Capital assets are depreciated over the useful life of the asset.

COST OF WATER SERVICE

For purposes of complying with the mandates of Article XIII D of the California Constitution, it is imperative that the amount of a charge (such as the water rates) not exceed the cost of service. The cost of service is determined by preparing a budget with all revenues and expenses necessary to operate RD108 (including a budget reserve), but without including the revenues generated from annual water rates. Then, using an estimate of the number of acres that will be irrigated, associated water duties, and volumes of water delivered, water rates necessary to balance the budget can be calculated.

As shown on the attached Table 1 the Irrigation Budget for 2016 is projected to result in a net loss. RD108's 2016 Irrigation Budget demonstrates that its water rates will not exceed the cost of service and, in fact, every property in RD108 receiving water will be charged slightly less than the cost of service.

Avoided Cost of Service for Lift Pumps

Some RD108 customers receive water via lift pumps that are operated by the Water User to lift water from the RD108 conveyance channel to the field to be irrigated. As a result, RD108 avoids additional costs that would otherwise be required to construct and operate District pumping facilities to lift the water from the canal for each Water User. In order to account for this avoided cost of service that would otherwise be incurred, RD108 reduces the charge for water delivered by the estimated avoided pumping costs. This cost is estimated to be approximately $0.30 per acre-foot per foot of lift.

PROPORTIONALITY OF WATER RATES TO SERVICE PROVIDED

Charges subject to Article XIII D must also be proportional to the service provided. Historically, RD108 has charged its landowners who receive water for rice irrigation a per-acre water rate. For other crops, a per-acre water rate is charged for the first irrigation, followed by a lesser per-acre water rate for each subsequent irrigation. For non-rice crops, this approach results in higher rates on fields with crops using more irrigation applications, which results in rates reasonably proportional to the amount of water applied. As described previously, Water Users who pump water using lift pumps are charged lesser rates in proportion to the avoided cost to RD108 of pumping the water. For non-rice crops, all charges are calculated based on the number of irrigations provided. Due to the fact that RD108's field turnouts have not historically been metered, this method is reasonable for estimating Water User's water use.

In 2015, RD108 authorized Davids Engineering to evaluate potential rate structures and estimated applied water duties for irrigation by crop[1] with the goal of developing a water rate based in part on the actual volume of water delivered to individual field turnouts, as required under California Senate Bill x7-7 (SBx7-7), also known as the Water Measurement Program, and the Water Conservation Act of 2009. The evaluation included evaluation of a three-part rate structure that includes two fixed (per acre) components of the water rate and a volumetric (per acre-foot) component of the water rate.

PROPOSED WATER RATES

Three-Part Rate Structure

For 2016, it is proposed that the three-part rate structure evaluated be implemented, including two fixed rate components and a volumetric rate component, as described above. The first fixed component of the rate includes an equal charge per acre irrigated applicable to all crops. The second fixed component of the rate includes a per-acre charge that varies based on the estimated applied water duty for each crop.

[1] A table of estimated applied water duties by crop is provided as Exhibit 1.

The volumetric component of the rate includes a charge based on the actual quantity of water delivered, as measured by RD108.

A large part of RD108's annual expenses are related to the fixed costs of operating and maintaining the water system infrastructure and are not directly dependent upon the amount of water actually delivered to irrigated parcels within RD108. As such, it is desirable for RD108 to implement the proposed rate structure, including the volumetric component of the rate, in 2016. The proposed rate structure provides benefits to RD108, as compared to a wholly fixed or wholly volumetric rate structure. A portion of charges based on the number of acres irrigated using RD108 water, promotes revenue stability to RD108 across years and allows RD108 to proceed with delivery measurement at field turnouts and to implement associated volumetric charges as required by SBx7-7 without solely charging based on the amount delivered. Basing a portion of charges based on the actual volume of water delivered to field turnouts encourages conservation of limited water supplies and provides equitability among Water Users growing a particular crop with different amounts of applied water per acre.

For the proposed rate update, RD108 has determined that, on average, one third of the cost of service is to be recovered through each of the three components of the rate, with adjustments based on lift pump costs incurred by RD108 Water Users, applied to the second fixed rate component (per-acre charge based on crop grown and corresponding estimated applied water duty) and the volumetric rate component (per acre-foot charge based on actual measured delivery volume) as appropriate. This division of fixed and volumetric rate components is expected to result in a desirable blend of the benefits described above.

2016 Water Rates

It is proposed that for 2016 and subsequent years, unless otherwise modified by the RD108 Trustees, the three-part rate structure will be applied. All rates represent proposed maximum water rates that could be charged and may be reduced at any time at the discretion of the RD108 Board of Trustees.

Proposed rates have been calculated based on the projected cost of service for 2016, minus any revenues from other sources. Estimated irrigation water rate changes for 2016 by crop are summarized in Exhibit 2. Increased water rates reflect a combination of increased cost of service and changes resulting from transition for RD108's current rate structure to the proposed three-part rate structure, which includes a rate component based on the volume of water delivered. Due to the change in rate structure, the rate of increase for individual crops varies. In general water rates for crops with the least number of irrigations increase by the greatest percentage due to the inclusion of the fixed component applied to all crops based on the acreage irrigated. Conversely, water rates for crops with the greatest number of irrigations tend to decrease.

A sample rate sheet describing water rate components by crop for 2016 is provided in Exhibit 3. Example rate calculations for individual fields are provided in Exhibit 4.

Payment Collection Schedule

Under the three-part rate structure, payment will be due in three installments, with the exception of deliveries for rice straw decomposition, as described below. The acreage-based fixed rate component will be due prior to delivering water to the field at the beginning of the irrigation season. The crop-based estimated applied water fixed rate component will be due by August 1 of the year during which the crop is grown. The volumetric rate component based on the actual volume of water delivered will be due by December 1 of the year during which the crop is grown.

For rice straw decomposition (decomp) and the second crop for double-cropped fields, the acreage-based fixed rate component will be waived, as it will have been paid for the preceding crop. The estimated applied water fixed rate component will be due prior to reflood for decomp or prior to the first irrigation of the second crop for double-cropped fields. The volumetric rate component based on the actual volume of water delivered for decomp and second crops will be due prior to the first irrigation of the field in the following year or by April 1, whichever comes first.

CONCLUSION

The proposed three-part rate structure ensures that RD108's water rates do not exceed the cost of service, are reasonably proportional to the service provided, equitably distributed among Water Users, and compliant with the requirements of the California Water Code established with the adoption of SBx7-7.

Table 1. RD108 2016 Irrigation Budget.

INCOME	
Water Sales/Irrigation	$ 3,000,000.00
Water Sales/Fair Ranch	$ 29,800.00
Water Sales/Rice Straw Decomposition	$ 200,000.00
Water Transfer	$ -
Earned Interest	$ 4,500.00
Outside Drainage Charge	$ 2,779.00
Miscellaneous Operating	$ -
TOTAL INCOME	$ 3,237,079.00
EXPENSES	
USBR Water Charges	$ 922,615.00
Office Supplies	$ 80.00
Power & Energy	$ 850,000.00
System Facilities	$ 1,644,402.00
Water Transfer	$ -
Water Conservation Program	$ -
Miscellaneous Non-Operating	$ -
TOTAL EXPENSES	$ 3,417,097.00
NET INCOME/LOSS	$ (180,018.00)

EXHIBIT 1. ESTIMATED APPLIED WATER DUTIES (DELIVERIES) BY IRRIGATED LAND USE[2].

Crop	Estimated Applied Water Duty (acre-feet per acre)	Comments
Alfalfa	4.50	
Beans	2.50	
Canola	2.20	
Carrots	2.50	
Clover	4.50	
Conservation	2.50	
Cotton	3.30	
Corn	2.50	
Garlic	1.50	
Grain	2.00	Barley, Buckwheat, Milo, Oats, Wheat
Market Veg	2.50	
Melons	1.60	
Onions	1.50	
Orchard, Young	1.60	3 years or younger
Orchard, Mature	3.00	4 years or older
Pasture	3.00	
Pumpkins	1.60	
Rice	5.50	Medium, Short, Sweet
Rice - Wild	5.00	
Safflower	2.20	
Soybeans	2.50	
Sudan Grass	3.00	
Sugar Beets	3.50	
Sunflowers	2.20	
Tomatoes	2.30	
Vetch	2.50	
Vine Seeds	1.60	
Idle Lands	0.00	
Decomp, 1 Flood	1.00	Rice straw decomposition with one-time flood
Decomp, Maint.	2.00	Rice straw decomposition with maintenance flow
Fall Only, 1 Flood	1.00	One-time fall flood (no summer crop)
Fall Only, Maint.	2.00	Fall flood with maintenance (no summer crop)

[2] For double-cropping, duties will be estimated as the sum of duties for individual crops grown.

EXHIBIT 2. ESTIMATED WATER RATE CHANGES FOR 2016 BY CROP.[3,4]

Crop	Budgeted Acres	Estimated Average Irrigations	Estimated Applied Water Duty (ac-ft/ac)	Average Historical Water Rate ($/ac)	Proposed Water Rate ($/ac)	Total Change ($/ac)	Percent Change
Alfalfa	1,850	4.9	4.5	$54.86	$65.86	$11.00	20%
Beans	300	5.6	2.5	$61.58	$46.66	-$14.92	-24%
Corn	500	5.0	2.5	$55.70	$46.66	-$9.04	-16%
Grain	2,400	1.2	2.0	$18.53	$41.86	$23.33	126%
Melons	260	4.4	1.6	$49.93	$38.02	-$11.91	-24%
Orchard, Young	670	3.8	1.6	$44.27	$38.02	-$6.25	-14%
Orchard, Mature	1,700	3.8	3.0	$44.27	$51.46	$7.19	16%
Pasture	160	4.3	3.0	$48.16	$51.46	$3.30	7%
Rice	31,830	NA	5.5	$68.20	$75.46	$7.26	11%
Safflower	840	1.3	2.2	$20.02	$43.78	$23.76	119%
Sudan Grass	40	2.4	3.0	$30.07	$51.46	$21.39	71%
Sunflowers	1,410	1.6	2.2	$22.88	$43.78	$20.90	91%
Tomatoes	3,930	6.7	2.3	$71.44	$44.74	-$26.70	-37%
Vine Seeds	870	4.4	1.6	$49.93	$38.02	-$11.91	-24%
Decomp, 1 Flood	7,000	NA	1.0	$17.57	$9.60	-$7.97	-45%
Decomp, Maint.	4,500	NA	2.0	$23.93	$19.20	-$4.73	-20%
Fall Only, 1 Flood	200	NA	1.0	$17.57	$32.26	$14.69	84%
Fall Only, Maint.	110	NA	2.0	$23.93	$41.86	$17.93	75%

[3] Average historical and proposed water rates by crop are based on gravity deliveries and do not reflect reductions in water rates to be applied based on RD108 avoided costs for pump deliveries. Proposed water rates are based on the estimated applied water duty and will vary somewhat from field to field based on actual usage. Total acres includes 47,070 summer and 12,120 fall irrigated acres. Other totals are calculated as area-weighted averages based on budgeted acreages.

[4] Historically, fields have been billed for water purely on a volumetric basis in some cases. For these fields, the average historical water rate and change in water rate will vary from the values shown depending on the amount of water applied.

EXHIBIT 3. SAMPLE 2016 RATE SHEET.

RECLAMATION DISTRICT NO. 108 - 2016 RATE STRUCTURE

This sheet shows how water rates are distributed between a Crop Specific Fixed Rate Component ($/Acre), which is comprised of an Acreage Rate Component and an Est. AW Rate Component (see Exhibit X), and a Lift Specific Volumetric Rate Component ($/AF) (see Exhibit Y).

Exhibit X - 2016 CROP SPECIFIC FIXED RATE COMPONENT

Installment ->	*First*	*Second*			
Payment Due ->	*Prior to First*	*by August 1st*			
Crop	Acreage Rate Component ($/Acre)	Est AW Duty (AF/Acre)	Est. AW Volumetric Rate Component ($/AF)	Est. AW Rate Component ($/Acre)	Total Fixed Rate Component * ($/Acre)
ALFALFA	$22.66	4.50	$4.80	$21.60	$44.26
BEANS	$22.66	2.50	$4.80	$12.00	$34.66
CANOLA	$22.66	2.20	$4.80	$10.56	$33.22
CARROTS	$22.66	2.50	$4.80	$12.00	$34.66
CLOVER	$22.66	4.50	$4.80	$21.60	$44.26
CONSERVATION	$22.66	2.50	$4.80	$12.00	$34.66
COTTON	$22.66	3.30	$4.80	$15.84	$38.50
CORN	$22.66	2.50	$4.80	$12.00	$34.66
GARLIC	$22.66	1.50	$4.80	$7.20	$29.86
GRAIN	$22.66	2.00	$4.80	$9.60	$32.26
MARKET VEG	$22.66	2.50	$4.80	$12.00	$34.66
MELONS	$22.66	1.60	$4.80	$7.68	$30.34
ONIONS	$22.66	1.50	$4.80	$7.20	$29.86
ORCHARD, YOUNG	$22.66	1.60	$4.80	$7.68	$30.34
ORCHARD, MATURE	$22.66	3.00	$4.80	$14.40	$37.06
PASTURE	$22.66	3.00	$4.80	$14.40	$37.06
PUMPKINS	$22.66	1.60	$4.80	$7.68	$30.34
RICE	$22.66	5.50	$4.80	$26.40	$49.06
RICE - WILD	$22.66	5.00	$4.80	$24.00	$46.66
SAFFLOWER	$22.66	2.20	$4.80	$10.56	$33.22
SOYBEANS	$22.66	2.50	$4.80	$12.00	$34.66
SUDAN GRASS	$22.66	4.90	$4.80	$23.52	$46.18
SUGAR BEETS	$22.66	3.50	$4.80	$16.80	$39.46
SUNFLOWERS	$22.66	2.20	$4.80	$10.56	$33.22
TOMATOES	$22.66	2.30	$4.80	$11.04	$33.70
VETCH	$22.66	2.50	$4.80	$12.00	$34.66
VINE SEEDS	$22.66	1.60	$4.80	$7.68	$30.34
DECOMP, 1 FLOOD	$0.00	1.00	$4.80	$4.80	$4.80
DECOMP, MAINT.	$0.00	2.00	$4.80	$9.60	$9.60
FALL ONLY, 1 FLOOD	$22.66	1.00	$4.80	$4.80	$27.46
FALL ONLY, MAINT.	$22.66	2.00	$4.80	$9.60	$32.26

** Note: Total Fixed Rate Component = Acreage Rate Component + Est. AW Rate Component*

Exhibit Y - 2016 LIFT SPECIFIC NET VOLUMETRIC RATE COMPONENT

Installment ->	*Third*		
Payment Due ->	*by December 1st*		
Amount of Lift (Ft)	Volumetric Rate Component ($/AF)	Lift Credit ($/AF)	Net Volumetric Rate Component ** ($/AF)
0	$4.80	$0.00	$4.80
2	$4.80	$0.60	$4.20
3	$4.80	$0.90	$3.90
4	$4.80	$1.20	$3.60
5	$4.80	$1.50	$3.30
6	$4.80	$1.80	$3.00
7	$4.80	$2.10	$2.70
8	$4.80	$2.40	$2.40
9	$4.80	$2.70	$2.10
10	$4.80	$3.00	$1.80
11	$4.80	$3.30	$1.50
12	$4.80	$3.60	$1.20
13	$4.80	$3.90	$0.90
14	$4.80	$4.20	$0.60
15	$4.80	$4.50	$0.30
16	$4.80	$4.80	$0.00
17	$4.80	$5.10	-$0.30
18	$4.80	$5.40	-$0.60

*** Note: Net Volumetric Rate Component = Volumetric Rate Component - Lift Credit*

Abbreviations: AF: Acre-foot; FT: Foot; Est. AW: Estimated Applied Water

Notes:

1. **Grain** includes Barley, Buckwheat, Milo, Oats, and
2. **Rice** includes Short, Medium, and Sweet.

the following year will be considered on a field-by-field basis.

For summer crops, payments for water charges will be made in three installments:

First Installment (Acreage Charge) = Acreage Rate Component * Acres Planted (due Prior to First Delivery)
Second Installment (Est AW Charge) = Est. AW Rate Component * Acres Planted (due by August 1st)
Third Installment (Volumetric Charge) = Volumetric Rate Component * Measured AW (due by December 1st)

For rice straw decomposition and second (double) crops, payments for water charges will be made in two installments:

First Installment (Est AW Charge) = Est. AW Rate Component * Acres Planted (due Prior to First Delivery)
Second Installment (Volumetric Charge) = Volumetric Rate Component * Measured AW (due Prior to First Delivery of following year)

EXHIBIT 4. EXAMPLE WATER RATE CALCULATIONS.

RECLAMATION DISTRICT NO. 108 - 2016 RATE STRUCTURE

This sheet shows two sample water rate and water charge calculations.
See Exhibits X and Y for Details on Rates.

For summer crops, payments for water charges will be made in three installments:
First Installment (Acreage Charge) = Acreage Rate Component * Acres Planted (due Prior to First Delivery)
Second Installment (Est AW Charge) = Est. AW Rate Component * Acres Planted (due by August 1st)
Third Installment (Volumetric Charge) = Volumetric Rate Component * Measured AW (due by December 1st)
For rice straw decomposition and second (double) crops, payments for water charges will be made in two installments:
First Installment (Est AW Charge) = Est. AW Rate Component * Acres Planted (due Prior to First Delivery)
Second Installment (Volumetric Charge) = Volumetric Rate Component * Measured AW (due April 1 of following year)

Example Calculations

Given:
Crop: **Rice**
Acres: **100**
Amount of Lift: (FT) **5**

Installment	Description	Value	Notes
First	Acreage Rate Component ($/AC)	$22.66	Acreage Rate Component for Rice
	Acreage Charge ($)	$2,266.00	Acreage Charge ($): 22.66/Acre * 100 acres = $2266
Second	Est. AW Rate Component($/AC)	$26.40	Est. AW Rate Component for Rice
	Est. AW Charge ($)	$2,640.00	Est. AW Charge ($): 26.4/Acre * 100 acres = $2640
Third	Volume Applied (AF)	620	Volume of water delivered (AF)
	Net Volumetric Rate Component ($/AF)	$3.30	Net Volumetric Rate Component for 5 FT of Lift
	Volumetric Charge ($)	$2,046.00	Volumetric Charge ($): 3.3/AF * 620 AF = $2046
	Total Charge (All Installments) ->	**$6,952.00**	
	Total Charge Per Acre ->	**$69.52**	

Given:
Crop: **Tomatoes**
Acres: **50**
Amount of Lift: (FT) **0**

Installment	Description	Value	Notes
First	Acreage Rate Component ($/AC)	$22.66	Acreage Rate Component for Tomatoes
	Acreage Charge ($)	$1,133.00	Acreage Charge ($): 22.66/Acre * 50 acres = $1133
Second	Est. AW Rate Component ($/AC)	$11.04	Est. AW Rate Component for Tomatoes
	Est. AW Charge ($)	$552.00	Est. AW Charge ($): 11.04/Acre * 50 acres = $552
Third	Volume Applied (AF)	153	Volume of water delivered (AF)
	Net Volumetric Rate Component ($/AF)	$4.80	Net Volumetric Rate Component for 0 FT of Lift
	Volumetric Charge ($)	$734.40	Volumetric Charge ($): 4.8/AF * 153 AF = $734.4
	Total Charge (All Installments) ->	**$2,419.40**	
	Total Charge Per Acre ->	**$48.39**	

Reclamation District No. 1004

Reclamation District 1004
Water Measurement Program

Prepared for

Reclamation District 1004

October 2016

CH2M HILL, Inc.
2525 Airpark Drive
Redding, CA 96001

455 University Ave., Suite 100
Sacramento, CA 95825

Contents

Acronyms and Abbreviations

RD 1004 or District	Reclamation District 1004
Reclamation	Bureau of Reclamation
Regional Criteria	*Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*

Reclamation District 1004
Water Measurement Program

Purpose

This report describes measurement, pricing, and billing practices within Reclamation District 1004 (RD 1004 or District) in accordance with the provisions of its Settlement Contract and the measurement requirements of the Central Valley Project Improvement Act and the *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors* (Regional Criteria) (Bureau of Reclamation [Reclamation], 2004).

Background

As identified in the *Sacramento River Basinwide Water Management Plan* (California Department of Water Resources, 2003), water measurement is considered to be a fully implemented water conservation measure within RD 1004. The District's diversions from the Sacramento River and Butte Creek are measured. Flows in canals and laterals are also measured at intermediate points, such as road culverts. Meters have been installed on most of the lift pumps that comprise the District's recirculation system. In addition, flowmeters were installed on all RD 1004 customer turnouts, and volumetric pricing has been in place since 1994.

Current Measurement Practices

Table 1 summarizes the District's measurement devices.

Table 1. Summary of Measurement Devices
Reclamation District 1004 Water Measurement Program

Measurement Type	Number	Estimated Accuracy[a]	Reading Frequency	Maintenance Frequency
Sacramento River Diversions				
Propeller meters	5	±4%	Biweekly by District; monthly by Reclamation	Annually or as needed
Sontek Flowmeters	4	±4%		Annually or as needed
Butte Creek Diversions				
Mace Flowmeters	4	±3%	Biweekly	Annually or as needed
Canal/Laterals				
Mace Flowmeters	4	±3%	Biweekly	Annually or as needed
Recirculation Pumps				
Mace Flowmeters	4	±3%	Biweekly	Annually or as needed
Customer Delivery/Turnouts				
Propeller meters	127	±4%	Approximately every 2 days	Annually or as needed

[a] Estimated accuracy is based on manufacturer information for devices properly installed and maintained.

River Diversions

The District's diversions from the Sacramento River are measured by using flowmeters installed and maintained by Reclamation. The flowmeters provide instantaneous flow rate and volumetric data. The flowmeters are read and data recorded at least monthly by Reclamation. Maintenance and calibration of the flowmeters are performed by Reclamation in accordance with their standard operating procedures.

Diversions from Butte Creek are measured by using flowmeters installed and maintained by the District. The flowmeters are read and data recorded at least monthly by the District. Maintenance and calibration of the flowmeters are performed by the District in accordance with the manufactures' specifications and recommendations.

Lateral Measurement

Flows in canals and laterals are measured at intermediate points, such as road culverts, by using flowmeters equipped with totalizers. Meters have also been installed on most of the lift pumps that comprise the District's recirculation system. The flowmeters are read and data recorded at least monthly by the District. Maintenance and calibration of the flowmeters are performed by the District in accordance with the manufactures' specifications and recommendations.

Turnout or Field-level Measurement

Flowmeters have been installed on all RD 1004 customer turnouts since 1994. The flowmeters are read and cleaned, and data are recorded approximately every 2 days while deliveries are being made. District staff compile the data and bill customers for the volume of water delivered. District staff maintain and calibrate the flowmeters in accordance with the manufactures' specifications and recommendations.

Pricing and Billing

The District's customers are subject to two charges each year: a standby charge and a water charge. The standby charge is a per-acre charge and applicable to all lands within District boundaries. Those who order water are also charged for the volume of water delivered. Water users or customers apply for water in March prior to the beginning of the irrigation season. Water orders identify the field acreage and crop to be irrigated. Copies of the 2013 water order and a sample bill are provided in Appendix A, and the District Rules and Regulations are provided in Appendix B

References

Bureau of Reclamation (Reclamation). 2004. *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*.

California Department of Water Resources. 2003. *Sacramento River Basinwide Water Management Plan*. January.

Appendix A
Sample Bill

08/05/2013

Reclamation District No. 1004
317 4th Street
Colusa, CA 95932

Water Use Statement

Barale Ranch
P. O. Box 935
Alamo, Ca
94507

Meter Reading Date: *07/31/2013*

Field #	Beginning Meter Reading	Current Meter Reading	Y-T-D Adjustments	Total Acre Feet Used	Water Charges	Water Deposits	Deposit Balance or (Amount Owed)
160	0	198	0	198	$2,227.50	$1,032.37	($1,195.13)
161	0	0	0	0	$0.00	$565.41	$565.41
162	0	0	0	0	$0.00	$880.47	$880.47
			Total Balance:	198	$2,227.50	$2,478.25	$250.75

Appendix B
Reclamation District 1004
Rules and Regulations

RULE 27 – DISTRICT CANALS AND FACILITIES ARE NOT FOR RECREATION OR OTHER UNAUTHORIZED USES

The District's canals/laterals and facilities shall be used solely for the purposes of conveying water for use on land, and for conveying drainage water away from the land. The use of District canals/laterals for recreation or other unauthorized purposes is prohibited.

Landowners and water users are urged to prevent the use of District canals/ laterals and their banks, as well as any pumping structures and bridges, for recreation, swimming, play or other unauthorized purposes. These areas present hazards, as the water may be cold, swift and deep. Turbulence in and around culverts and pumping facilities also present Eminent danger.

RULE 28 – COMPLAINTS

All complaints regarding service, lack of water or other unsatisfactory conditions shall be communicated by the landowner or water user directly to the District Manager. It will be the responsibility of the Manager to bring the matter before the Board of Trustees at the next regular board meeting. Decisions may be appealed to the district board at a regular meeting after appropriate opportunity has been provided the Manager to respond.

RULE 29 – AMENDMENT AND OTHER CHANGES

These Rules and Regulations are subject to amendment, modification, repeal or other variation at any time or from time to time at the discretion of the Board of Trustees.

29A. Amendment: In accordance with District rules #4 and #6, customers may not commence taking water until their paperwork is complete, the deposits have been paid and the District has received proper notification and confirmation. These requirements will insure water orders can be filled, diversions match supply and there is no disruption with existing deliveries. Water users north of the California Levee are required to notify the district manager a minimum of twenty-four hours and water users south of the California Levee are required to notify district manager a minimum of forty-eight hours in advance of water demands and curtailments.Water users commencing service prior to the completion of the required paperwork, payment of the water deposit and authorization from the district manager will be subject to the turnout (s) being chained and a $300.00 fine per occurrence.

RULES AND REGULATIONS

GOVERNING THE USE
AND
DISTRIBUTION OF WATER
IN
RECLAMATION DISTRICT NO. 1004
AND FIXING CHARGES PURSUANT TO
SECTION 50911 OF THE CALIFORNIA WATER CODE

Preamble

These Rules and Regulations have been adopted by the Board of Trustees under the authority of the California Water Code, and are part of the law governing this District, and itís landowners and water users. These Rules and Regulations have been adopted to ensure the orderly, efficient, and equitable distribution, use, and conservation of the District's water resources.

Revision Date

~~June 21st~~, 2013

RECLAMATION DISTRICT NO. 1004

DISTRICT EMPLOYEES

Cameron Kelly Boyd	General Manager
Barbara J. Sachs	Office Manager/Sec. to Board of Trustee's
Wayne Montz	Meter Specialist
Steve Crawshaw	Operations Assistant

AFTER HOUR EMERGENCIES

General Manager (530) 682–0050

DISTRICT OFFICE	DISTRICT SHOP
317 4th Street	7625 Gridley–Colusa Hwy
Colusa, CA 95932	Colusa, CA 95932
Phone: (530) 458–7459	Phone/Fax: (530) 458–4220
Fax: (530) 458–4276	

or charge, when due, or interference with the performance of the duties of any official or employee of the District shall be sufficient cause for shutting off the water from any such offender. Except in cases of emergencies, the Manager will attempt to notify the irrigator in person, by telephone, or in writing prior to shutting off the water supply together with advice as to the violation requiring that termination. Water will not again be furnished until, in the opinion of the Manager, full compliance has been made with all of the requirements hereof.

RULE 26 – NON LIABILITY OF DISTRICT

a. Private laterals. The District will not be liable for any damage of any kind or nature resulting directly or indirectly from any private lateral, or the water flowing therein, or by reason of lack of capacity therein, or for negligent, wasteful or other use or handling of water by the water user therefrom.

b. Deliver of water. Most of the water furnished by the District is pumped, flows, through miles of open ditches, and is subject to pollution, shortages, fluctuation in flow, and interruption in service. District employees shall not and are not authorized to make any agreements binding the District to serve an uninterrupted, constant supply of water, or guaranteeing a certain quality of water. All water furnished by the District will be on the basis of irrigation deliveries; water users putting District water to other uses do so at their own risk and assume all liability for, and agree to hold the District and its Trustees, officers, agents and employees free and harmless from, liability and damages that may occur as a result of defective water quality, water shortages, fluctuation in flow and interruptions in service. The District sells water as a commodity only and not as a guaranteed service. The District will not be liable for defective quality of water, shortage of water, either temporary or permanent, or failure to deliver water.

c. Pumping. Pumping by water users of District water, when permitted by the District Manager, is done at the userís risk, and the District assumes no liability for damages to pumping equipment or other damages resulting from turbulent water, shortage or excess of water, or other causes, including fluctuations in the amount or level of water. It shall be the duty of the landowner or the water user to provide appropriate devices to protect pumps from damage.

users or their agents will not be permitted from the District easement or rights–of–way areas without prior approval of the District Manager.

Plantings and natural growth of vegetation in District easement and rights–of–way, including conveyance and drainage ditches and ditch banks must be maintained. Prior consideration should be given to the future growth of this vegetation, planted or natural, to insure safe unobstructed passage of vehicles and equipment. Encroachment of any plantings and/or natural vegetation within this area may be subject to damage from the cleaning and/or maintenance. Reasonable allowance for vegetative growth in these areas will minimize potential damage or loss of wanted cover from maintenance. It is the responsibility of the landowners or their agents to maintain clear unobstructed passage.

RULE 23 – ABATEMENT OF NUISANCE

No tree or vine trimmings, brush, weeds, grass, tulles, rubbish, swill, garbage, manure, refuse, dead animals, or animal matter from any barnyard, stable, dairy or hog pen, or other materials or substances that will become offensive to the senses or injurious to health or obstruct the flow of water, or result in the scattering of seeds of noxious weeds, plants, or grasses shall be placed or dumped in any canal or drain belonging to the District, or be placed or left so as to roll, slide, flow or be washed or blown into any such canal or drain. Any violation of this rule will subject the offender to prosecution. Also, the offender will be responsible for all costs incurred by the District to rectify the violation. All employees of the District shall promptly report any violation of this rule and the water users of the District are urged to cooperate in its enforcement.

RULE 24 – WATER DELIVERED IN MAIN CANAL

The District will operate the pumping plant or plants of the District and will deliver the water there from to the main canal of the District known as Drumheller Slough and all existing District laterals, from whence it will be required to be diverted or pumped by each irrigator at his own expense; and it is understood that the District shall be required to deliver water for irrigation into said main canal and all existing laterals only, and the charges paid by the respective irrigators for water is for the service of the District in delivering said water into said main canal.

RULE 25 – ENFORCEMENT OF RULES

Failure or refusal of any landowner or water user or their servants or employees to comply with the requirements of any of these Rules and Regulations or violation of any of the provisions hereof or failure to pay any water toll

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ery. District personnel will make every reasonable effort to advise landowners of any observed deficiencies in sufficient time to make necessary repairs. Landowners and or tenants should take note during the season and make repairs of all needed field hardware also including drain pipes and weir boxes in addition to continuous seasonal surveying and repair to perimeter roads that boarder delivery and drainage laterals reducing unnecessary water losses. Refusal to comply therewith will be sufficient cause for refusal to turn water on or continue to provide water deliveries.

RULE 19 – BUILDING DIVERTING GATES AND WEIRS

No openings shall be made or structures placed in any district conveyance or drainage canal until an application in writing has been made to the Board, and permission granted therefore, and without the special permission of the District Manager. All structures in must be maintained in a condition satisfactory to the Manager, and must not be removed or altered without the permission of the Manager.

RULE 20 – RESPONSIBILITY OF THE DISTRICT

The District will not be liable for any damage resulting, directly or indirectly, from the water flowing in or from any private ditch nor for any damage resulting from the flooding of land or other property, by water from fields that are being irrigated. District responsibility will cease absolutely when the water is delivered from the canals or laterals of the District.

RULE 21 – LIABILITY OF IRRIGATORS

Every Water User and landowner shall be jointly and severally responsible to the District for all damage to District works by his neglect, carelessness, or malicious acts, and upon his failure to repair such damage after notification by the Manager or duly authorized assistant thereof, such repairs will be made at his expense by the District.

RULE 22 – ENCROACHMENTS

No encroachments shall be permitted upon District lands, easements or rights–of–way, including conveyance, drain ditches and ditch banks, by installation of any structure or alteration of the District lands, easements or rights–of–way (excluding, in the case of District owned lands, alterations made pursuant to a lease) except upon application to the District for a permit authorizing such installation or other alteration. No construction, permanent or temporary of any nature on District easements or rights–of–way, including conveyance and drainage ditches and ditch banks will be permitted without prior approval of the District Manager and written authorization from the Board of Trustees. Material needed for coffer dams or other projects by the water

RULE 15 – ACCESS TO LAND

The Manager, his assistants and all other servants, agents and employees of the District shall have free access at all times to all canals, ditches, laterals, pipes and meters and, to the extent needed to properly manage District operations or enforce these regulations, to the lands irrigated from same for the purpose of inspection, examination, measurements, surveys, control of water or other necessary purposes of the District, with the right of installation, maintenance, control and regulation of all meters or other measuring devices, gates and turnouts necessary for the proper measurement and distribution of water.

RULE 16 – CONTROL OF REGULATING STRUCTURES

Except in cases of actual emergency or to prevent imminent danger of damage to property or when specifically authorized by the Manager, no person other than the Manager or his assistants shall be authorized or permitted to turn water on or off or to change or interfere with the Districtís head gates or delivery gates or the irrigation systems or with any measuring devices of the irrigation systems. All violations are subject to prosecution under Section 592 of the Penal Code of California.

RULE 17 – CONDITION OF PRIVATE DITCHES

Upon application of a landowner for the delivery of water, it shall be the duty of the District Manager to certify whether or not the applicantsí ditches are in proper condition to receive water. All private ditches shall be properly constructed and maintained so as to carry water without danger of serious breaks or undue seepage. The Manager is required to examine all such ditches and may order them to be cleaned, repaired or reconstructed, as he deems necessary, before water will be turned into them. Refusal to comply therewith will be sufficient cause for refusal to turn on water. Nothing herein shall be construed as an assumption of liability on the part of the District, its Trustees, officers, or employees for any damage occasioned by improper construction, maintenance or use of any private ditch or ditches or other facilities or by reason of permitting the flow of water or the turning of water therein.

RULE 18 – DELIVERY GATES OR TURNOUTS

All delivery gates, turnouts and weirs are under the control of the District. The Districtís employees alone are allowed to open the Districtís delivery gates, and they alone have full authority to close the same as soon as the requisite amount of water for each irrigator has been discharged. Said gates and turnouts may be supplied with locks, the keys to be under control of the Manager. All landowner delivery hardware, including but not limited to, screw gates, weirs and piping are to be in satisfactory condition prior to water deliv-

RULE 1 – CONTROL OF SYSTEM

The operation of the distribution system and irrigation works owned or operated by Reclamation District No. 1004 shall be under the exclusive management and control of the Manager of the District. No other person shall have control of the distribution system and works, except for duly appointed assistants of the Manager or when specifically authorized by resolution of the Board of Trustees of the District.

RULE 2 – EMPLOYEES

Subject to the approval of the Board of Trustees, the Manager shall employee such assistants as may be necessary for the proper operation and maintenance of the District. Employees shall be guided by these Rules and Regulations and by such technical and other instructions and advice as may be given by the District's professional staff for the purpose of carrying out the policies of the Board of Trustees and providing efficient and economical service.

It is the specific duty of each employee to maintain cordial relations with all landowners and water users in the District. Every water user is entitled to equitable, courteous and prompt service. Every employee is charged with the duty and responsibility of cooperating with the water users and the Board in a sincere effort to render as satisfactory service as can be reasonably attained. Every water user has a right to such service, and every employee of the District is enjoined to maintain and execute this policy.

RULE 3 – DISTRIBUTION OF WATER

The District will deliver water into the various irrigation canals, laterals and drains as shown on the map of district facilities approved by the Board of Trustees at such levels as are feasible and practical with the facilities existing at the time these Rules and Regulations are made effective and such other facilities as may thereafter be added by resolution of the Board of Trustees. Except as hereinafter provided in case of a shortage of water or in case of noncompliance with these Rules and Regulations, water will be delivered into the irrigation canals and laterals in sufficient quantity to meet the reasonable needs of all qualified irrigators. The District does not and cannot guarantee water quality, nor the time or quantity of delivery. THIS WATER IS NOT POTABLE AND MUST BE PURIFIED FOR DOMESTIC USE. The District recommends that the water not be used for domestic purposes.

A water user may have temporary circumstances needing a very limited quantity of water not effectively being taken through the current metered points of delivery. The District manager will evaluate this special need of water on a case–by–case basis with water only being available during the irrigation season, as it is available, and to be used within the District boundaries. The approved quantity of water will be charged a flat fee determined by the District manager. No pump with larger than a three inch intake is to be used. A separate fee will be levied for each District numbered property receiving this water for a period of time not to exceed the current irrigation season. All required paperwork and the full amount of the fee will be submitted to the District office for approval prior to the take of water. The water user is to call the District Manager arranging the time water will begin being taken and similarly, when the take will end. At any time during the irrigation season the District Manager may curtail the taking of water with no refund. Any expense for the movement of the needed water from the point of origin to the point of use is at the sole cost of the party requesting the water. The District purveys water from many sources and may contain varying amounts of foreign matter such as chemicals, insecticides, herbicides and fertilizers. Therefore, the District is not to be used as a potable source of water and should be tested if used on any sensitive vegetation.

RULE 4 – APPLICATIONS FOR WATER

Prior to delivery of water from the irrigation works of the District to anyTract of land each season, an application for water shall be filed with the District Office Manager or authorized assistant on a form provided by the District. All applications shall be signed by and shall show the name(s) and address(es) of the party(ies) (applicant) to be billed for irrigation service, and the landowner, if not he applicant, and such other information as the Manager may require from time to time. Fields with multiple water applicants utilizing a common meter shall submit a lead contact name and phone number when applications are submitted. The lead contact shall provide the District office with information requested during the water season as needed. A field containing multiple water applicants utilizing a common meter or multiple fields with different water applicants utilizing a common meter are to agree on water splits at the time applications are submitted. The agreed splits shall be submitted to the District in writing with the application and signed by all participating parties.

In all instances, the landowner shall be responsible for all charges for water used upon his or her land. When the application for water is made by a tenant, the applicant, and all other tenants making such use of water, shall be jointly and severally liable with the landowner for all water charges.

RULE 13 – MEASUREMENT OF WATER

Except as hereinafter provided for Temporary and Special Purpose deliveries of water, all deliveries will be made only through District approved or District owned and operated meters or outlets. The District Manager will provide meter specifications and installation measures. Meters must be installed to the Districtís specifications at the landownerís expense. Meters will become the property of the District so that they may be properly maintained. Any alteration, modification or removal of said meters shall be done only with the supervision of or by District personnel. No one is to remove or tamper with any metering device at any time. This uniformity will promote reliability of service. If a meter is damaged or becomes inoperable as a result of District operations or District personnel the meter will be replaced by the District at District expense. A meter shall be replaced or repaired at the landownerís expense when the meter is damaged or proven inaccurate as a result of landowner or tenant operations. In the event a landownerís meter is damaged due to the actions of another landowner or landownerís tenant, the District will charge all repairs to that landowner who was responsible for said damage.

Meters will be routinely tested. The scheduling and method will be at the discretion of the District. Should a water user suspect the inaccuracy of a District meter between scheduled testing intervals, the water user may request testing. If the test indicates that the meter is within 5% of accuracy, the water user will pay for the testing. Should the test show that metering is not within 5% of accuracy, the District will pay the cost of testing and make the proper adjustments.

When a meter is discovered as not working as a result of mechanical problems or an obstruction, the amount of water is calculated using the rate of flow in C.F.S. (cubic feet per second) observed the last time the meter was read and working properly. The rate of flow is multiplied by the number of hours it was not working and divided by 12.1, to arrive at the total acre feet used.

RULE 14 – DETERMINATION OF ACREAGE IRRIGATED

The District will periodically survey each tract of land by means of aerial photography or other means provided by the appropriate County Farm Service Agency for the purpose of determining the acreage to be used in calculating all District charges. The acreage will include all irrigable land. If any such survey shows a change in the acreage, the effect thereof will be included in all subsequent bills.

the distribution of the available water supply during the period of the shortage. In the event of temporary local or similar shortages the District Manager is authorized to place in effect such variations in service, as, in his judgment the occasion requires.

RULE 11– INTERRUPTION OF WATER SERVICE

The District may temporarily discontinue or reduce the amount of water to be furnished to the Water User for the purpose of investigation, inspection, maintenance, repair or replacement of any District facilities. The District may also temporarily discontinue or reduce water deliveries for vegetation abatement measurements or to the extent required by any environmental regulation that may be imposed upon the District for protection of fish or other environmental concerns. So far as feasible, the District shall give the water user due notice, in advance, of such temporary discontinuance or reduction, except in case of emergency an effort shall be made to notify the water user as soon as possible. In no event shall any liability accrue against the District or any of its officers, agents, or employees, for any damage, direct or indirect, arising from such temporary discontinuance or reduction of water deliveries.

RULE 12 – WASTE OF WATER

Any water user who deliberately, carelessly or otherwise wastes water or who uses an unreasonable amount of water to irrigate properly, will be refused the use of water until such conditions are remedied or will have his use curtailed by the amount of waste, as the District Manager may determine.

The District reserves the right to refuse delivery of water to any lands when it appears to the satisfaction of the District Manager that its proposed use or method of use would require such excessive quantities of water as would constitute waste.

The District spill policy is as follows:
36” Riser not to exceed 1” spill
30” Riser not to exceed 1 ¼” spill
24” Riser not to exceed 1 ½” spill
18” Riser not to exceed 1 ¾” spill

All return flow from use of district water shall be the property of the District when it reaches a drain or a canal maintained by the District. No drain water shall flow from one entity field into another entity field without first passing through a District approved metering structure. In water short years the District Manager may preapprove water conservation techniques on a case by case basis requiring all parties submit a written plan with an agreement signed by all participating parties.

RULE 5 – SALE OR TRANSFER OF TITLE TO LANDS

When land affected by a Water User application is sold or title otherwise transferred to another party, the District shall be under no obligation to deliver water to such lands until the Water User Application is assigned to and assumed by the new landowner. Such assignments and assumption agreements shall be on forms provided by the District, executed and completed in a manner satisfactory to the District.

RULE 6 – CONTROL OF WATER

All water diverted by the District and delivered within the boundaries of the District, by means of District canals, laterals, drains, including private drains, is and remains the property of the District and is subject to control, diversion, rediversion, reclamation, reuse, relift, sale and resale, by the District as it sees fit. No landowner or water user within the boundaries of the District acquires any proprietary right to water delivered to him by the District by reason of such use nor does such landowner or consumer acquire any right to resell and/or relift water provided by the District for purposes of irrigating additional land for which no application has been made and District fees and charges paid. If water is used on lands either within or without the District, which water has heretofore been diverted and/or delivered by the District for use on lands within the District, whether or not that person utilizes water by routing it first through a conduit, flowing it across other lands within the District, recapturing it from drains, or otherwise, said use of water will be subject to the rules and regulations of the District, including measurement of all applicable charges of the District for the use of such water. All drainage from District lands remain the property of the District and shall not be restricted, diverted or pumped without the written permission of the District Manager. Any delivery or drainage water restricted, diverted or pumped to non–district properties shall subject the tenant/property owner to a minimum fine of $750 per occurrence. Immediate curtailment of water deliveries will occur to the field (s) of origin until the Manager is satisfied that the conditions are paid to the District Office. Additional associated charges may include and are not limited to the annual costs per acre imposed on similar District properties for operation and maintenance fees and assessments and the cost of Bureau of Reclamation project water and related component inputs or the current cost of water from the Sacramento River Contractors Association, whichever is higher. Per acre charges will be calculated for and encompass the entire property the diversion was made to utilizing Farm Service Agency acreage measurements. Estimates of water usage will be made by District personnel, consistent with the determination of water usage within the District, for purposes of determining acre feet of water delivered. Any commingled water, regardless of origin, with District water will be considered entirely as District water. The Board of Trustees reserves the right to determine whether any additionalcharges will be imposed.

RULE 7 – CHARGES FOR WATER

The Board shall annually adopt a schedule of rates to be charged by the District for water service prior to the water application date. The total charges for water furnished shall be based on the total estimated cost of operation and maintenance of the pumping plants and delivery system of the District during each season including, but not limited to, the cost of electric power, operating charges, repairs, maintenance, upkeep of pumping plants, incidental expenses of operation and District overhead.

RULE 8 – TIME OF PAYMENT

Payment of the seasonal water charge for the irrigation of each tract of land applied for shall be made prior to delivery of water to the tract, or prior to April 30 whichever is first, or as scheduled by the Board of Trustees, in the form of a deposit based on the acre foot price and unit duty for the particular crop. The acre foot price and unit duty shall be annually adopted by the Board of Trustees.

For special cases, payment of the seasonal charge for water shall be made in such amounts and at such times as the Manager may determine to be necessary in each case so as to insure that all water so delivered is paid for in advance. No water shall be delivered in advance of said deposit. No water shall be served to a parcel of land until all Operation/Administration, custom work charges, fines, delinquent charges including interest, or any other outstanding District obligations have been paid in full. No water shall be delivered until any Federal, State or County documents, required by the District, are accurately completed and submitted to the District office.

Any Federal, State or County documents submitted to the District office deemed to be in error will be correctly resubmitted within sixty (60) days of initial notification. Noncompliance of these terms will subject applicant to fines of $300.00 per document per incident in addition to future water delivery delays. Fine amounts and time demands for documents may be subject to change depending on constraints levied by auditing or enforcing agency.

An additional deposit will be required when the initial deposit has been depleted. The amount of the additional deposit or partial deposit shall be determined by the District Manager. For any additional deposit or any balance due on the account payment (s) must be paid within 10 days of the date notice is mailed to the water user. In the event, the required payment is not made within the 10 day period, water service will be terminated until such time as the deposit and payment(s).

Any and all person (s) responsible for causing the District not to have enough Non–Excess, Eligible Land shall be jointly and severally responsible for the additional costs of the Full Cost Water plus any penalties, interest and related costs.

The obligation to pay for Full Cost Water, penalties, interest and related cost shall be that of the landowner, even if caused by a tenant, unless the tenant has satisfied this obligation in full.

In the event there are multiple landowner with Excess, Non–Eligible Land, the obligation to pay shall be prorated among them on the basis of the number of acre feet of water the District delivered to the Excess, Non–Eligible Land during the year (s) involved. This obligation shall attach to the property and in inure to the detriment of any subsequent landowner. It is enforceable as a lien against the property and will result in a curtailment of water delivery until paid in full.

RULE 9 – CHARGE FOR UNAUTHORIZED USE OF WATER

Water Users who take water without prior application, deposit, notification, or authority from the District will incur a minimum charge of $300.00, per occurrence, reimbursing the District for extraordinary expenses caused by such action. Unauthorized water service will be discontinued until compliance with these requirements is met. Water users will provide reasonable notification of the need for additional water as well as reasonable notification when turning water down or off. In all cases, non–notification will result in a charge of $300.00 per occurrence no matter how much water the adjustment may involve. Any violations may be cause for an immediate lockdown whereby future water modifications will be by appointment. Similar charges will apply in lift pump applications where time clocks are utilized. Any adjustments of running time in clock applications, adjustments to boards in weirs, adjustments to screw gates or any other District approved conveying apparatus shall be conveyed to the District Manager in advance or the water user will be subject to a $300.00 charge. Fines will be immediately deducted from any water deposit the offender has with the District.

RULE 10 – SHORTAGE OF WATER

Whenever a general shortage of water appears imminent, the Board of Trustees shall so find by resolution duly passed and recorded in its minutes. The resolution shall incorporate special rules and regulations to cover

Meridian Farms Water Company

Meridian Farms Water Company Water Measurement Program

Prepared for

Meridian Farms Water Company

October 2016

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Contents

Appendixes

Tables

Acronyms and Abbreviations

MFWC or Company	Meridian Farms Water Company
Reclamation	Bureau of Reclamation
Regional Criteria	*Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*
RWMP	*Sacramento Valley Regional Water Management Plan*
SB-88	Senate Bill 88

Meridian Farms Water Company Water Measurement Program

Purpose

This report describes measurement, pricing, and billing practices within Meridian Farms Water Company (MFWC or Company) and its plan to comply with the provisions of its Settlement Contract and the measurement requirements of the Central Valley Project Improvement Act and the *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors* (Regional Criteria) (Bureau of Reclamation [Reclamation], 2004).

Background

The Company diverts water at three locations along the left bank of the Sacramento River near Meridian, at River Mile (RM) 71.1L, RM 74.8L, and RM 80.0L. The main pumping plant is at RM 80.L. The Company also has state-issued water rights to collect and divert water from drains and sloughs within the Company's boundary. The Company uses a system of canals, ditches, and drains to convey water diverted from the Sacramento River as well as other inflow and recirculated tailwater to its customers.

The Company provides water for irrigation purposes to 108 customers at 191 field turnouts or farm-gates by gravity. In addition to the gravity turnouts, water for some fields is pumped by the Company by using portable diesel pumps; in a few instances, water is pumped by customers using private pumps. The Company's manager is also the manager for Reclamation District 70, Reclamation District 1660, Butte Slough Irrigation District, and Tisdale Irrigation District. The Company shares a secretary with Reclamation District 70 and employs one full-time ditch tender and a maintenance man. The ditch tender is responsible for maintaining water levels throughout the Company, as well as starting and stopping deliveries to customers. Deliveries throughout the Company are made on demand with 48-hour notice to the ditch tender when changes in deliveries are required.

Water users or customers are required to apply for water in March prior to the irrigation season. Water orders identify the field, crop, type of irrigation (e.g., flood, sprinkler, or drip), and number of acres to be irrigated for the upcoming season. The Company charges for water annually on the basis of the crop to be irrigated and the number of acres planted. Water charges are payable in three installments due April 1, June 1, and October 1. A copy of the Water Toll Payments adopted by the Company for 2013 and Application for Water are provided in Appendixes A and B, respectively.

Current Measurement Practices

River Diversions

Diversions from the Sacramento River are measured by using meters. The meters at two of the three diversion locations, RM 74.8L and RM 80.0L, are installed and maintained by Reclamation. The meter at the pumping plant at RM 71.1L is owned and maintained by the Company. All of the meters provide instantaneous flow rate and volumetric data. The meters are read and data recorded at least monthly by Reclamation. Maintenance and calibration of these meters are performed by Reclamation in accordance with their standard operating procedures.

Lateral Measurement

The Company's ditch tender operates canals and laterals to maintain water levels to assure sufficient head for gravity deliveries. Water levels are monitored at canal head gates and at check structures at key locations along the canals. Water levels throughout the system are maintained in accordance with the ditch tenders' experience and knowledge of the system and the water requirements of crops.

Turnout or Field-level Measurement

All deliveries to individual fields are made by gravity through 191 screw-gates. Delivery rates are set on the basis of water orders, the ditch tenders' experience and knowledge of the system and its demands, and communications with individual customers. In some cases, deliveries are made to fields or a group of fields by Company-owned portable pumps and to a small number of fields by landowner- or operator-owned pumps. Currently, the Company does not measure or record information regarding deliveries to fields. Table 1 identifies the number and type of turnout measurement devices and the estimated level of volumetric accuracy for each device.

Table 1. Summary of Turnout Structures
Meridian Farms Water Company Proposed Water Measurement Program

Measurement Type	Number[a]	Estimated Accuracy	Reading Frequency	Maintenance Frequency
Screw-gates	191	N/A	Daily or when changes are made	Annually or as needed
Company-owned Pumps	4	N/A		Annually or as needed
Private Pumps	14	N/A		
Total	209	N/A		

[a] The number of each type of device will be verified during the inspection and certification process.

Note:
N/A = not applicable

Turnout Measurement Program

To address the measurement requirements of the Regional Criteria and to comply with the provisions of its Settlement Contract, the Company intends to implement a turnout measurement program. The measurement program will include the following steps:

1. Evaluation of typical operational canal water-level fluctuations
2. Development and implementation of a system and methodology for monitoring changes in canal levels related to turnouts
3. Verification of number, type, and size of gates
4. Acquisition or development of ratings for screw-gates
5. Field verification of accuracy of screw-gate ratings and modification of ratings, as appropriate
6. Evaluation of options for measurement of portable pump deliveries; options include but are not limited to the following:
    - Flowmeters
    - Pump capacity and time of use
    - Pump capacity and energy usage

7. Development of a system for field recording delivery data
8. Development of a database for recording deliveries
9. Development of operation and maintenance procedures for accurate measurement of deliveries

The Company anticipates it will need to rely on outside consultants, hire additional personnel, and purchase an additional vehicle to develop and implement the measurement program. The initial cost estimate to develop and implement the measurement program is approximately $320,000 over the next 5 years. It is estimated that the ongoing annual costs to maintain the program will be approximately $50,000 per year once the program is fully implemented.

The Company proposes to implement the measurement program in phases. The first phase will be to conduct steps 1 through 7 from the list above within one of the systems in the Company. This phased approach will allow evaluation of measurement options and challenges on a limited scale before expanding the program throughout the Company. The phased approach may help minimize the overall cost of the program. The program approach and associated costs will be reviewed and revised as the program is developed. Revisions and updates will be included in the annual updates to the *Sacramento Valley Regional Water Management Plan* (RWMP) (CH2M HILL, Inc., 2007).

Pricing and Billing

The Company has two charges, an annual assessment applicable to all lands within the Company and a water charge or toll applicable to lands that request water service. The charge for water service is based on the crop to be planted and the number of acres for which water is requested. The price per acre for each crop is based on an assumed water need for each crop; the water toll for high-water-use crops, such as rice, is much higher than low-water-use crops, such as wheat or safflower. Water orders are due by mid-March, and payments for water charges are due in three installments by April 1, June 1, and August 1.

Any changes to the current pricing structure will require action by the MFWC Board of Directors. Once the program has been developed and implemented, the Company will consider changes in its current pricing policy that will incorporate some level of volumetric pricing.

Finance Plan

As identified above, the costs to develop and implement the turnout program are estimated to be approximately $320,000. As identified in the RWMP, the Company intended to begin implementation of the turn-out measurement program in 2014. Although some initial investigations have occurred, complications resulting from the extreme drought conditions experienced in 2014 and 2015, including but not limited to reduced water supplies; increased expenses related to coordination with Reclamation and other SRSCs; reduced revenues; and new requirements by the State for measuring, recording, and reporting diversions pursuant to Senate Bill 88 (SB-88) resulted in the inability to implement the turnout measurement program as described. The Company proposes to develop and implement the program over the next 5-year period, as outlined in Table 2, which identifies a schedule of tasks and the estimated annual program costs. To offset the impact of these added costs on the Company and its customers, the Company intends to seek funding through grants that may be available from Reclamation and the California Department of Water Resources. Funding availability may affect the timing of the implementation of the program. In addition, compliance with the measurement requirements imposed on the Company’s water rights under Senate Bill 88 will require financial resources that may affect the timing of implementing the program.

Table 2. Proposed Schedule of Verification Tasks
Meridian Farms Water Company Proposed Water Measurement Program

Major Tasks	2017	2018	2019	2020	2021
Evaluate canal water level fluctuation	X	X			
Develop and implement system and methodology for monitoring changes in canal levels related to turnouts	X	X	X		
Obtain or develop ratings for screw-gate deliveries	X	X			
Conduct field verification or accuracy of screw-gate ratings and modify ratings, as appropriate	X	X	X	X	X
Evaluate options for measurement of portable pump deliveries	X	X	X		
Conduct measurements to check and verify ratings at approximately 10 to 20 percent of Company turnouts each year	X	X	X	X	X
Develop a system and methodology for recording delivery data in the field	X	X			
Develop operation and maintenance procedures to assure continued accuracy of turnout measurement devices		X	X		
Purchase and develop database to incorporate volumetric pricing			X	X	X
Develop and implement volumetric pricing policy				X	X
Hire new staff		X			
Purchase pick-up truck		X			
Initial Estimate of Annual Costs	$35,000	$95,000	$55,000	$85,000	$50,000

As previously identified, the Company currently employs three people: a general manger who also manages four other entities, one full-time ditch tender, and a secretary who is also shared with other entities. The estimated costs identified in Table 2 are based on the assumption that a significant amount of the work will be conducted by a third party, such as an outside engineer or consultant. However, implementation of the measurement program will result in additional duties for the Company's existing staff. Reading and recording of deliveries will require additional time and effort by the ditch tender and general manager. Entering delivery data and producing bills for water deliveries will result in additional work for office staff and the general manager. These new tasks will likely require that the Company hire at least one additional employee. The ongoing expense to maintain the measurement program, including the cost of an additional employee and vehicle, is estimated to be approximately $50,000 per year.

Additional Water Use Efficiency Improvements

The water management program has been prepared to address specific requirements of the Central Valley Project Improvement Act and the Regional Criteria. The Company has identified the following additional improvements that may provide equal or greater benefits to overall water use efficiency:

- Update the existing outdated SCADA system
- Expand the SCADA to include water-level monitoring at key locations

These improvements would allow Company to better operate its delivery system by monitoring and coordinating river diversions and canal operations. Because of the costs associated with developing and implementing the turnout measurement program and the Company's limited resources, any improvements to the SCADA system will depend on outside funding sources.

Reference

Bureau of Reclamation (Reclamation). 2004. *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*.

CH2M, HILL, Inc. 2007. *Sacramento Valley Regional Water Management Plan.*

Appendix A
2013 Water Toll Payments

WATER TOLL PAYMENTS

Adopted by the Board of Directors April 9, 2013

Crop	Price per Acre
Services below are payable in three installments by April 1, June 1 and August 1.	
Walnut	$60.00
Rice	$120.00
Sunflower and Strawberries	$60.00
Tomato	$60.00
Onion	$70.00
Milo	$64.00
Cotton	$82.00
Corn	$80.00
Alfalfa, Grass Hay & Pasture	$90.00
Beans	$40.00
Wheat, Safflower, Winter beans, Oats, Vetch & Peas	$20.00
Prunes, Persimmons, Chestnuts & Orchards	$60.00
Vineseed, Millet & Truck Crop	$70.00
Vegetable Seed	$38.00
Non-irrigated: Wheat, Sunflower, Safflower, Winter Beans, Oats, Vetch and Peas	$14.00
Services below are payable at time of service	
Maintenance Flood (measured)	$20.00/AC-FT
Pre and/or Post Irrigation Flood	$20.00

Meridian Farms Water Company rules require a mandatory <u>48-hour notice</u> be given to your ditch-tender, Gary Hall, before water is needed. Please call (530) 682-2998.

Thank you!

Appendix B
Application for Water

APPLICATION FOR WATER

All demands for water must be made in writing at the beginning of the water year using this form. When requesting water please contact you Ditch tender Gary Hall 530-682-2998. Please give him at least a 48 hour notice before you need water.

Under no circumstances will water be delivered to water users until the first payment installment is made and the subject application for water is delivered.

Applicant's Name: ____

Business Name: ____

Landowners Name: ____

Billing Address: ____________________________**City:**________________ **Zip:** _____________

Home #: ___________________**Cell:**___________________ **Email:** _______________________

Field No. (MFWC #)	Acres Planted	Crop	Irrigation Method (Circle One)
_______________	__________	__________________	Flood/ Furrow/ Sprinkle/ Drip/ Other____
_______________	__________	__________________	Flood/ Furrow/ Sprinkle/ Drip/ Other____
_______________	__________	__________________	Flood/ Furrow/ Sprinkle/ Drip/ Other____
_______________	__________	__________________	Flood/ Furrow/ Sprinkle/ Drip/ Other____
_______________	__________	__________________	Flood/ Furrow/ Sprinkle/ Drip/ Other____
_______________	__________	__________________	Flood/ Furrow/ Sprinkle/ Drip/ Other____
_______________	__________	__________________	Flood/ Furrow/ Sprinkle/ Drip/ Other____
_______________	__________	__________________	Flood/ Furrow/ Sprinkle/ Drip/ Other____

Total Acres: __________

Sutter Mutual Water Company

Sutter Mutual Water Company

SBx7-7 Water Measurement Compliance Program

Prepared By:

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October 2016

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Sutter Mutual Water Company

SBx7-7 Water Measurement Compliance Program

PURPOSE

This SBx7-7 Water Measurement Compliance Program (Program) has been developed by the Sutter Mutual Water Company (Company) to comply with, the requirements of Water Code Section 10608.48 (WC §10608.48) and the Agricultural Water Measurement Regulation, CCR §597. The Program will become a component of the Company's Agricultural Water Management Plan. Specifically, the Program outlines how the Company has or intends to address the Efficient Water Management Practices (EWMPs) identified in WC §10608.48.

WC §10608.48(a) states that agricultural water suppliers *"shall implement efficient water management practices pursuant to subdivisions (b) and (c)."* Subdivision (b) identifies the following two *"critical efficient water management practices:*

(1) Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) Section 531.10 and to implement paragraph (2).

(2) Adopt a pricing structure for water customers based at least in part on quantity delivered."

Subdivision (c) identifies several "additional" EWMPs that are to be implemented by agricultural water suppliers *"if the measures are locally cost effective and technically feasible."* Both the Critical and Additional EWMPs are discussed below.

CRITICAL EFFICIENT WATER MANAGEMENT PRACTICES

California Code of Regulations (CCR) §597, approved on July 11, 2012, defines how agriculture suppliers comply with WC § 10608.48(b)(1). The Company currently measures its deliveries to all customers and believes it is in compliance with the provisions of Section 10608.48(b)(1) and the measurement accuracy provisions of CCR §597. The Company's water delivery measurements are described in the 2006 Sacramento Valley Regional Water Management Plan (RWMP) and its 2009 and 2010/2011 updates, which have been prepared in accordance with the United States Bureau of Reclamation's (USBR) Regional Criteria. The Company intends to meet the measurement certification requirements of CCR §597 as described below.

A. Water Delivery Measurement

As described in RWMP and 2012 Plan Update, the Company's diversions from the Sacramento River are currently measured using flow meters and pump flow charts. Flows in laterals are measured at the lateral headgates based on headgate position and differential head pressure. Drain lift pump flows are measured using power consumption records and pump capacity information or pump curves. Drainage leaving the District is measured using a formula developed by the California Department of Water Resources (DWR) for the main drainage discharge pump station.

Deliveries to fields within the Company are made through three general types of devices, rated gates, over pour checks, and undershot checks. Currently, the Company measures and records water deliveries to fields at each turnout. For rated gate turnouts, the gate opening and water levels on both the upstream and downstream side of the gate are measured and recorded together with the date and time of the readings. Flow rates are determined from tables developed by the gate manufacturer and are also recorded. Readings at each turnout are typically made twice daily; however, additional readings are made when deliveries are first started and when conditions within the canals are fluctuating or changes in deliveries are made. Similar measurements are made for undershot checks; the opening at the bottom of the check is set or measured, the differential head pressure is determined by measuring the water levels on either side of the check and the flow rates are read from tables developed from suppressed orifice flow equations. Over pour checks are used mainly to maintain water levels in laterals and delivery canals; however, in some cases they are used for turnout deliveries. These devices are limited to locations where there is sufficient fall over the check to allow for accurate measurement. In these locations, deliveries are measured using the ITRC Weir Stick which allows the flow rate to be calculated based on the width of the check structure and the reading on the weir stick. As with the other two devices readings are made and recoded twice per day or more often if warranted. For all turnouts the volume delivered is calculated based on the flow rate data recorded for each site and time of delivery.

Table 1 below identifies the number and type of turnout measurement devices along with an estimated level of volumetric accuracy for each device.

Table 1 – Summary of Turnout Structures

Measurement Type	Number[1]	Estimated Accuracy	Reading Frequency	Maintenance Frequency
Rated Gate	357	±6% to ±12%	Bi-Daily or as needed	Annual / as needed
Over Pour/Undershot Check	70	±6% to ±12%	Bi-Daily or as needed	Annual / as needed
Total	427			

[1] The number of each type of device will be verified during the inspection and certification process.

1. Certification Program

The Company intends to certify that the existing measurement devices meet the accuracy requirements for existing measurement devices using field inspections and analysis as described in CCR §597.4(b)(3). The initial certification process will include determining volumetric accuracy of each type of device under standard conditions, development of protocols to confirm each of the existing devices are installed and maintained to the manufacturer's recommendations, design specifications, or industry recognized standards. All field inspections will be conducted by individuals trained in the use of the field inspection techniques and will be documented in a report approved by an engineer. In addition to the field inspections, current operation and maintenance practices will be reviewed to assure they meet best professional practices. A summary of the operation and maintenance practices, together with any recommendations for changes, will be included in the report approved by the engineer. The initial estimate of the cost to develop and implement the certification program and to prepare the report required pursuant to CCR §597 is $200,000. The cost estimate may be revised as the certification program developed and refined. The Company intends to conduct the certification program over a three year period. Table 2 below provides the anticipated schedule for implementation.

2. Finance Plan

As identified above, the costs to certify the accuracy of the Company's existing turnout measurements and to comply with the requirements of SBx7-7 are estimated to be approximately $200,000. As identified in the 2012 RWMP, the District intended to begin implementation of the turn-out measurement program in 2014. Initial site visits and coordination with Company staff to assist in the development of the certification plan were conducted in 2016; however, complications resulting from the extreme drought conditions experienced in 2014 and 2015, including but not limited to reduced water supplies, increased expenses related to coordination with Reclamation and other SRSCs, and reduced revenues, as well as new requirements by the State for measuring recording and reporting diversions pursuant to Senate Bill 88 (SB-88) resulted in the inability to implement the certification program as described. The Company proposes to conduct the Program over the next three year period. Table 2 below identifies the estimated annual Program costs. In order to offset the impact of these added costs on the Company and its customers, the Company intends to seek funding though any grants that may be available from either the DWR or the USBR.

Table 2 – Schedule of Certification Tasks

Task	2017	2018	2019
Development of Inspection Protocols, Review of O&M Practices and Procedures	X		
Field Inspections, Testing, and Quality Control	X	X	X
Document Results and Preparation of Report by Engineer			X
Initial Estimate of Annual Costs	$90,000	$50,000	$60,000

3. Corrective Action Plan

As identified above, the Company believes its existing measurement devices meet the accuracy requirements of CCR §597. A plan for corrective action will be developed following completion of the certification program if it is determined that the existing measurement devices or practices do not meet the accuracy requirements of the regulation.

B. Pricing Structure

Prior to 2003, the Company charged customers for the volume of water delivered using the existing devices and methods described above. Beginning in 2003, the Company's Board changed the pricing policy to charge users based on acreage and duties for various crop types. The duties are based on generally recognized quantities of water required for each crop type, e.g. the duty for crops with higher water demands are greater than those with lower demands. Although the pricing policy changed, the Company has continued to measure and record deliveries at each turnout.

Once the certification plan described under Critical EWMP #1 has been completed, the Company's Board will consider and develop an appropriate pricing policy based in part on the measured volume delivered to customers in accordance with Water Code Section 10608.48(b)(2).

The results of the certification program, including the report approved by an engineer as required under CCR §594.4, together with any necessary corrective actions, and a summary the actual costs to implement the Program will be included with the Company's next update to the AWMP. Changes to the Company's pricing structure will also be included in the AWMP update.

ADDITIONAL EFFICIENT WATER MANAGEMENT PRACTICES

In addition to the critical EWMPs discussed above, Water Code § 10608.48(c) identifies additional EWMPs which are to be implemented if the measures are locally cost effective and technically feasible. These additional EWMPs are referred to in DWR’s AWMP Guidebook as Conditional EWMPs.

The Company has evaluated many of the Conditional EWMPs as part of the 2007 RWMP and its updates through addressing the targeted benefits (TBs) and quantifiable objective (QOs). The Company may further address Conditional EWMPs at a future date.

Natomas Central Mutual Water Company

Natomas Central Mutual Water Company Water Measurement Program

Prepared for

Natomas Central Mutual Water Company

October 2016

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Contents

Acronyms and Abbreviations

NCMWC or Company	Natomas Central Mutual Water Company
Reclamation	Bureau of Reclamation
Regional Criteria	*Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*

Natomas Central Mutual Water Company Water Measurement Program

Purpose

The Natomas Central Mutual Water Company (NCMWC or Company) water measurement program has been developed to demonstrate measurement, pricing, and billing practices within NCMWC in accordance with the provisions of its Settlement Contract and the measurement requirements of the Central Valley Project Improvement Act and the *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors* (Regional Criteria) (Bureau of Reclamation [Reclamation], 2004). With the implementation of the water measurement program, water measurement is considered to be fully implemented.

Water Delivery Measurement

Currently, NCMWC diversions from the Sacramento River are measured by using flowmeters consisting of propeller, magnetic, and ultrasonic flowmeters. Booster and lift pump flows are measured by using Doppler flowmeters and estimates using pump capacity information. Flow in laterals is measured at the lateral headgate on the basis of headgate position and differential head pressure. Drainage water is not pumped out of the basin during the water delivery season, typically the middle of April to the middle of September. When drainage pumping occurs, water volumes are estimated using pump capacity information.

Deliveries to fields within the Company are made through two general types of devices: rated headgates and weirs. Since 2012, the Company measures and records water deliveries to fields at each turnout. For rated gate turnouts, the gate opening and water levels on the upstream and downstream sides of the gate are measured and recorded with the date and time of the measurements. Flow rates are determined from tables developed by the gate manufacturer and are also recorded. Weir deliveries are measured using the Irrigation Training and Research Center Weir Stick, which allows the flow rate to be calculated on the basis of the width of the check structure and the measurement on the weir stick. For all turnouts, the volume delivered is calculated using the flow rate data recorded for each site and time of delivery. Currently, the Company has three more Sontek in-canal flowmeters scheduled for installation in 2016 and three more in 2017. Table 1 identifies the number and type of turnout measurement devices along with an estimated level of volumetric accuracy for each device.

Table 1. Summary of Measurement Devices
Natomas Central Mutual Water Company Water Measurement Program

Measurement Location/Type	Number	Estimated Accuracy[a]	Reading Frequency	Maintenance Frequency
Sacramento River Diversions				
Propeller meter	2	±6%	Monthly and daily	Annually or as needed
Mag meter	7	±1%	Continuous	Annually or as needed
GE Panametric	4	±1%	Continuous	Annually or as needed
Canals and Laterals				Annually or as needed
Sontek Flowmeter	12	±2%	Continuous	Annually or as needed

Table 1. Summary of Measurement Devices
Natomas Central Mutual Water Company Water Measurement Program

Measurement Location/Type	Number	Estimated Accuracy[a]	Reading Frequency	Maintenance Frequency
Recirculation Pumps				
Mace Flowmeter	9	±2%	Continuous	Annually or as needed
GE Panametric	2	±1%	Continuous	Annually or as needed
Sontek Flowmeter	2	±2%	Continuous	Annually or as needed
Customer Turnouts				
Mag meter	1	±1%	Continuous	Annually or as needed
Sontek Flowmeter	1	±2%	Continuous	Annually or as needed
Meter gates	564	±10%	Periodic	Annually or as needed
Weirs	50	±2%	Periodic	Annually or as needed

[a] The number of type of device will be verified during the inspection and certification process.

Pricing and Billing

In 2012, the NCMWC Board approved a volumetric rate structure, and the Company's billing was changed to reflect this policy. NCMWC has been measuring and recording water deliveries at each headgate since 2012. These data are collected in a paper format and, until recently the method of processing this information for billing was inefficient. The Company is in the process of implementing stormwater accounting software that will allow efficient data processing. Completion is expected in fall 2013. Until the Storm project is completed, the volume of water will be allocated based on acreage and crop type. The Company expects to complete deployment of handheld data loggers to collect the daily headgate flow information and flowmeters on a majority of pump stations in 2013. Water is billed at an applied rate set by the NCMWC Board of Directors annually and is billed three times per year: June, August, and October. A copy of a sample bill is provided in Appendix A.

Reference

Bureau of Reclamation (Reclamation). 2004. *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors*.

Appendix A
Sample Bill

Natomas Central Mutual Water
2601 West Elkhorn Blvd.
Rio Linda, CA 95673
(916) 419-5936
(916) 419-8691 FAX

INVOICE
080213

DATE
8/2/2013

SHAREHOLDER/OWNER:

Account No.	TERMS: DELINQUENT CHARGES 18% 30 DAYS AFTER DATE OF INVOICE

Field	Crop	Description	Acres	Ac/Ft	Rate	Amount
XXX	Corn	Water Delivered to Corn Crop	100	85.8	8.10	694.98

TOTAL	$694.98
Payments/Credits **$0.00**	**Balance Due** **$694.98**