



**NORTH KERN WATER
STORAGE DISTRICT**

North Kern Water Storage District
Agricultural Water Management Plan

August 2014



AGRICULTURAL WATER MANAGEMENT PLAN

FOR THE

North Kern Water Storage District

August 2014

Completed In Accordance With the
WATER CONSERVATION BILL OF 2009
(SBx7-7)

Plan Checklist

The following is a checklist of plan contents drawn from the *DWR Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan*. This checklist shows where required plan elements are presented in the North Kern Agricultural Water Management Plan.

AWMP Requirement Checklist

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
Sec.I – yes	1.4	AWMP Required?	10820, 10608.12
Sec.I – yes	1.4	At least 25,000 irrigated acres or	10853
Sec.I – NA	1.4	Less than 25,000 irrigated acres and funding provided.	10853
Sec.I.C.1 – no	1.4	Initial AWMP prepared and adopted by December 31, 2012?	10820(a)
Sec.I.C.1 – yes	1.4	December 31, 2015 update.	10820(a)
Sec.I.C.1 – yes	1.4	5-year cycle update.	10820(a)
Sec.I – NA	1.4	New agricultural water supplier after December 31, 2012 – AWMP prepared and adopted within 1 year.	10820(b)
Sec.I.C.1 - no	1.5, 4.2	1999 AWMC MOU: Report on EWMP implemented or scheduled for implementation included.	10827
Sec.I.C.1 – NA	1.5, 5	USBR water management/conservation plan:	10828(a)
Sec.I.C.1 – NA	1.5, 5.1	Adopted and submitted to USBR within the previous four years, AND	10828(a)(1)
Sec.I.C.1 – NA	1.5, 5.1	The USBR has accepted the water management/conservation plan as adequate.	10828(a)(2)
Sec.I.A – yes	1.4	UWMP or participation in area wide, regional, watershed, or basin wide water management planning: does the plan meet requirements of SBx7-7 2.8 (use checklist)	10829
Sec.I.A	3.1 A	Description of previous water management activities.	10826(d)
Sec.I.B.1 – yes	3.1 B.1	Was each city or county within which supplier provides water supplies notified that the agricultural water supplier will be preparing or amending a plan?	10821(a)
Sec.1.B.1	3.2 B.2	Was the proposed plan available for public inspection prior to plan adoption?	10841

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AWMP Requirement Checklist (cont.)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
App A	3.1 B.2	Publically-owned supplier: Prior to the hearing, was the notice of the time and place of hearing published within the jurisdiction of the publicly owned agricultural water supplier in accordance with Government Code 6066?	10841
App A	3.1 B.2	14 days notification for public hearing?	GC 6066
App A	3.1 B.2	Two publications in newspaper within those 14 days?	GC 6066
App A	3.1 B.2	At least 5 days between publications? (not including publication date)	GC 6066
Sec.I.C.1 – NA	3.1 B.2	Privately-owned supplier: was equivalent notice within its service area and reasonably equivalent opportunity that would otherwise be afforded through a public hearing process provided?	10841
Sec.I.C.1 – yes	3.1 C.1	After hearing/equivalent notice, was the plan adopted as prepared or as modified during or after the hearing?	10841
Sec.I.C.2	3.1 C.2	Was a copy of the AWMP, amendments, or changes, submitted to the entities below, no later than 30 days after the adoption?	10843(a)
Sec.I.C.3 – yes	3.1 C.2	The department.	10843(b)(1)
Sec.I.C.3 – yes	3.1 C.2	Any city, county, or city and county within which the agricultural water supplier provides water supplies.	10843(b)(2)
Sec.I.C.3- no	3.1 C.2	Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies.	10843(b)(3)
Sec.I.C.3 – no	3.1 C.2	Any urban water supplier within which jurisdiction the agricultural water supplier provides water supplies.	10843(b)(4)
Sec.I.C.3 – yes	3.1 C.2	Any city or county library within which jurisdiction the agricultural water supplier provides water supplies.	10843(b)(5)
Sec.I.C.3 – yes	3.1 C.2	The California State Library.	10843(b)(6)
Sec.I.C.3 – no	3.1 C.2	Any local agency formation commission serving a county within which the agricultural water supplier provides water supplies.	10843(b)(7)
Sec.1.C.3	3.1 C.3	Adopted AWMP availability.	10844

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AWMP Requirement Checklist (cont.)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
S.I.C.3 – no	3.1 C.3	Was the AWMP available for public review on the agricultural water supplier's Internet Web site within 30 days of adoption?	10844(a)
Sec.I.C.3 – yes	3.1 C.3	If no Internet Web site, was an electronic copy of the AWMP submitted to DWR within 30 days of adoption?	10844(b)
Sec.I.D – yes	3.1 D.1	Implement the AWMP in accordance with the schedule set forth in its plan, as determined by the governing body of the agricultural water supplier.	10842
Sec.II	3.2	Description of the agricultural water supplier and service area including:	10826(a)
Sec.II.A.1	3.2 A.1	Size of the service area.	10826(a)(1)
Sec.II.A.2	3.2 A.2	Location of the service area and its water management facilities.	10826(a)(2)
Sec.II.A.3	3.2 A.3	Terrain and soils.	10826(a)(3)
Sec.II.A.4	3.2 A.4	Climate.	10826(a)(4)
Sec.II.B.1	3.2 B.1	Operating rules and regulations.	10826(a)(5)
Sec.II.B.2	3.2 B.2	Water delivery measurements or calculations.	10826(a)(6)
Sec.II.B.3	3.2 B.3	Water rate schedules and billing.	10826(a)(7)
Sec.II.B.4	3.2 B.4	Water shortage allocation policies.	10826(a)(8)
Sec.III	3.3	Water uses within the service area, including all of the following:	10826(b)(5)
Sec.III.A	3.3 A	Agricultural.	10826(b)(5)(A)
Sec.III.B	3.3 B	Environmental.	10826(b)(5)(B)
Sec.III.C	3.3 C	Recreational.	10826(b)(5)(C)
Sec.III.D	3.3 D	Municipal and industrial.	10826(b)(5)(D)
Sec.III.E	3.3 E	Groundwater recharge.	10826(b)(5)(E)
Sec.III.F	3.3 F	Transfers and exchanges.	10826(b)(5)(F)
Sec.III.G	3.3 G	Other water uses.	10826(b)(5)(G)
Sec.IV	3.4 A	Description of the quantity of agricultural water supplier's supplies as:	10826(b)

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AWMP Requirement Checklist (cont.)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
Sec.IV.A.1	3.4 A.1	Surface water supply.	10826(b)(1)
Sec.IV.A.2	3.4 A.2	Groundwater supply.	10826(b)(2)
Sec.IV.A.3	3.4 A.3	Other water supplies.	10826(b)(3)
Sec.IV.A.4	3.4 A.4	Drainage from the water supplier's service area.	10826(b)(6)
Sec.IV.B	3.4 B	Description of the quality of agricultural waters suppliers supplies as:	10826(b)
Sec.IV.B.1	3.4 B.1	Surface water supply.	10826(b)(1)
Sec.IV.B.2	3.4 B.2	Groundwater supply.	10826(b)(2)
Sec.IV.B.3	3.4 B.3	Other water supplies.	10826(b)(3)
Sec.IV.C	3.4 C	Source water quality monitoring practices.	10826(b)(4)
Sec.IV.B.4, Sec.IV.C.2	3.4 B.4	Drainage from the water supplier's service area.	10826(b)(6)
Sec.V	3.5	Description of water accounting, including all of the following:	10826(b)(7)
Sec.V.A	3.5 A	Quantifying the water supplier's water supplies.	10826(b)(7)(A)
Sec.V.B	3.5 B	Tabulating water uses.	10826(b)(7)(B)
Sec.V.C	3.5 C	Overall water budget.	10826(b)(7)(C)
Sec.V.D	3.5 D	Description of water supply reliability.	10826(b)(8)
Sec.VI	3.6	Analysis of climate change effect on future water supplies analysis.	10826(c)
Sec.VII	3.7	Water use efficiency information required pursuant to Section 10608.48.	10826(e)
Sec.VII.A	3.7A	Implement efficient water management practices (EWMPs).	10608.48(a)
Sec.VIII	3.7 A.1	Implement Critical EWMP: 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).	10608.48(b)
Sec.VII.A	3.7 A.1	Implement Critical EWMP: Adopt a pricing structure for water customers based at least in part on quantity delivered.	10608.48(c)
Sec.VII.A	3.7 A.2	Implement additional locally cost-effective and technically feasible EWMPs.	10608.48(c)

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AWMP Requirement Checklist (cont.)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
Sec.VII.B	3.7 B	If applicable, document (in the report) the determination that EWMPs are not locally cost-effective or technically feasible.	10608.48(d)
Sec.VII.A	3.7 A	Include a report on which EWMPs have been implemented and planned to be implemented.	10608.48(d)
Sec.VII.A	3.7 A	Include (in the report) an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future.	10608.48(d)
NA	5	USBR water management/conservation plan may meet requirements for EWMPs.	10608.48(f)
Sec.VIII.D	6 A	Lack of legal access certification (if water measuring not at farm gate or delivery point).	CCR §597.3(b)(2)(A)
Sec.VIII.A	6 B	Lack of technical feasibility (if water measuring not at farm gate or delivery point).	CCR §597.3(b)(1)(B), §597.3(b)(2)(B)
Sec.VIII.B	6 A, 6 B	Delivery apportioning methodology (if water measuring not at farm gate or delivery point).	CCR §597.3.b(2)(C)
Sec.VIII.A	6 C	Description of water measurement BPP.	CCR §597.4(e)(2)
Sec.VIII.C	6 D	Conversion of measurement to volume.	CCR §597.4(e)(3)
Sec.VIII.F.4	6 E	Existing water measurement device corrective action plan? (if applicable, including schedule, budget and finance plan)	CCR §597.4(e)(4)

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- Appendix A. Public Hearing Notice
- Appendix B. Public Hearing Notification Letters
- Appendix C. Resolution of Plan Adoption
- Appendix D. North Kern WSD: Rules and Regulations for Distribution and Use of Water
- Appendix E. Water Meter Accuracy Verification Form

List of Acronyms

AF	acre-feet
AWMP	Agricultural Water Management Plan
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
CVC	Cross Valley Canal
CVP	Central Valley Project
CVRWQCB	Central Valley Regional Water Quality Control Board
DWR	Department of Water Resources
EC	Electrical Conductivity
ET	Evapotranspiration
ET _c	Crop evapotranspiration
ET _o	Reference evapotranspiration
EWMP	Efficient Water Management Practice
ID	Irrigation District
IRWMP	Integrated Regional Water Management Plan
GWMP	Groundwater Management Plan
KCWA	Kern County Water Agency
LGA	Local Groundwater Assistance
M&I	Municipal and Industrial
MUD	Municipal Utility District
ppm	parts per million
RRID	Rosedale Ranch Improvement District
RWMG	Regional Water Management Group
USACE	U.S. Army Corps of Engineers
UWMP	Urban Water Management Plan
SBx7-7	Water Conservation Act of 2009
SCADA	Supervisory Control and Data Acquisition
SWP	State Water Project
TDS	Total Dissolved Solids
WSD	Water Storage District

AGRICULTURAL WATER MANAGEMENT PLAN

Section I. Plan Preparation and Adoption

The North Kern Water Storage District (North Kern, North Kern WSD, or District) Agricultural Water Management Plan (AWMP) has been prepared in accordance with the requirements of the Water Conservation Bill of 2009 (SBx7-7, Water Code §10820). Figure 1 is a map showing the location of the District. Because the District serves an area greater than 25,000 acres and was formed before December 31, 2012, North Kern is among the water suppliers required to prepare a plan. Development of the plan has been supported by a grant for \$50,000 from the Department of Water Resources (DWR).

This document conforms to the framework presented in *A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan* (Guidebook) that was issued by the DWR on October 12, 2012 to aid water suppliers in preparing Agricultural Water Management Plans in accordance with the requirements of SBx7-7. Although this plan was prepared in conformance with the Guidebook, some of the requirements presented in the Guidebook, such as consideration of facilitating alternative uses for lands with exceptionally high water duties or whose irrigation contributes to significant problems, are not applicable to the District's facilities or operations.

The requirements introduced by SBx7-7 are intended to encourage agricultural water suppliers to assess current efficient water management practices, to evaluate additional practices that may conserve water, and to provide for the accurate measurement of water. As such, the AWMP process presents an opportunity for water suppliers to demonstrate existing and planned activities and programs designed to improve water use efficiency.

Included in Section VII of this plan is an analysis of each of the Efficient Water Management Practices (EWMPs) presented in the Guidebook. The EWMPs are grouped into the following categories:

- Critical Efficient Water Management Practices
 1. Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of California Water Code Section 531.10 and to implement paragraph (2) of the legislation.
 2. Adopt a pricing structure for water customers based at least in part on quantity delivered.
- Conditional Efficient Water Management Practices
 1. Facilitation of alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including problem drainage.
 2. Facilitation of use of available recycled water that otherwise would not be used beneficially, meets health and safety criteria, and does not harm crops or soils. The use of recycled urban wastewater can be an important element in overall water management.

3. Facilitate the financing of capital improvements for on-farm irrigation systems.
4. Implement an incentive pricing structure that promotes one or more of the following goals:
 - A. More efficient water use at the farm level such that it reduces waste;
 - B. Conjunctive use of groundwater;
 - C. Appropriate increase of groundwater recharge;
 - D. Reduction in problem drainage;
 - E. Improved management of environmental resources, and
 - F. Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.
5. Expand lined or piped distribution systems, construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage.
6. Increase flexibility in water ordering by, and delivered to, water customers within operational limits.
7. Construct and operate supplier operational outflow and tailwater systems.
8. Increase planned conjunctive use of surface water and groundwater within the supplier service area.
9. Automate canal control devices.
10. Facilitate or promote customer pump testing and evaluation.
11. Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.
12. Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following:
 - A. On-farm irrigation and drainage system evaluations;
 - B. Normal year and real-time irrigation scheduling and crop evapotranspiration information;
 - C. Surface water, groundwater, and drainage water quantity and quality data, and
 - D. Agricultural water management educational programs and materials for irrigators.
13. Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional change to allow more flexible water deliveries and storage.
14. Evaluate and improve the efficiencies of the suppliers' pumps.

A. Description of Previous Water Management Activities

Water management activities previously implemented or now being implemented by the District include:

- Encourage and facilitate the construction of irrigation distribution system facilities to lands which rely exclusively on pumped groundwater for the purpose of expanding the District’s capability to deliver surface water in lieu of groundwater pumping.
- Deliver surface water in lieu of groundwater pumping when practicable; use water pricing, as appropriate, to encourage such deliveries.
- Maximize use of available surface water supplies for irrigation and spreading; use water pricing, water exchanges, and water banking as appropriate.
- Enter into temporary contracts for CVP water which is available from time to time on the Friant-Kern Canal.
- Develop water exchanges and/or water banking arrangements that result in a net increase in District water supplies, when practicable.
- Encourage USACE to expedite the “fix” for Isabella Dam deficiencies and remove the storage restriction that has been in place since 2006.
- Maintain existing recharge capability in areas of the District that urbanize.
- Encourage and support neighboring water agencies with the importation of available surface water supplies.
- Recharge the aquifer with high quality surface water.
- Promote water use efficiency through financial support of the North West Kern RCD-DWR Mobile Laboratory and by encouraging landowners to take advantage of this resource by requesting field irrigation evaluations.
- Actively participates in regional water management planning through the Poso Creek Regional Water Management Group. The District also participates in local water resource management forums, including the Semitropic Water Storage District’s Groundwater Monitoring Committee, the Kern River Watershed Water Quality Coalition, the Kern Fan Monitoring Committee, and the Kern Groundwater Management Committee.
- Expand the District’s website to include data on groundwater levels and quality.
- Encourage the installation of flow meters on private wells.
- Identify wells monitored by DWR or the Kern County Water Agency (KCWA) and consolidate water level readings from these wells with readings from wells measured by North Kern.
- Identify wells which are sampled for water quality by DWR or KCWA.

As noted above, the District participates in area-wide, regional, watershed or basin-wide water management planning through the Poso Creek Regional Water Management Group.

B. Coordination Activities

1. Notification of AWMP Preparation

SBx7-7 does not specify how much advance time is required for notification of cities and counties of plan preparation, does not require notification to any other agency(s) and does not require that comments from any city, county or other agency must be solicited and considered. In complying with these provisions, North Kern notified the entities shown in Table 1. Appendix A presents the public notice of plan preparation, and Appendix B includes Public Hearing Notification Letters.

2. Public Participation

Public participation activities associated with preparation of the AWMP are presented in Table 1.

C. Plan Adoption and Submittal

The purposes of this AWMP are to assess North Kern's current and planned water management operations and to respond to the provisions of SBx7-7, the associated Agricultural Water Management Planning Act (Section 1, Part 2.8, Division 6 of the Water Code), and the subsequent Agricultural Water Measurement Regulation requirements (described in Title 23 California Code of Regulations). The plan describes the District's status in implementation of two new mandatory EWMPs and includes a discussion of the potential impacts of climate change on District operations. The two new mandatory EWMPs required by SBx7-7 are:

- 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) of the legislation.
- Adopt a pricing structure for water customers based at least in part on quantity delivered.

The plan includes an analysis confirming that the District is in compliance with the legislation's requirements, noted above, regarding 1) delivery measurement, and 2) volumetric pricing.

1. Plan Adoption

In preparing this plan, North Kern solicited public input by holding a public hearing and inviting oral and written comments prior to adoption of the plan at a Board of Director's meeting on _____, 2014. Table 1 shows the state and local interested parties who were notified of and/or provided input to this AWMP. Appendix C of this document includes a Resolution of Plan Adoption. The first update of the plan will be submitted to DWR by December 31, 2015 and will be based on a revised Guidebook expected to be issued by DWR in early 2015. Subsequent to this first update, the plan will be updated on a 5-year cycle. North Kern is a public entity but was not a signatory to the 1999 MOU with the Agricultural Water Management Council and is not a CVP contractor. Therefore, the District has not

prepared either an AWMP or a USBR management/conservation plan in the past.

2. Plan Submittal

The steps to be followed in submittal of AWMPs are described in the *Guidebook* and are outlined in Table 1. A copy of the adopted plan was submitted to DWR and the other entities shown on Table 1 on ____, 2014.

3. Plan Availability

The requirements for availability of the District’s AWMP are presented in *A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan*. The District’s compliance with these requirements is shown in Table 1.

The AWMP, as adopted by the District, will be available from the District by request.

Table 1. Summary of Coordination, Adoption and Submittal Activities

Potential Interested Parties	Notified of Plan Preparation	Assisted in Preparation	Received Draft Plan	Notified of Public Meetings	Notified of Intention to Adopt	Sent Copy of Adopted Plan
County of Kern	X			X		X
City of Shafter	X			X		
City of Wasco	X			X		
DWR						X
Bakersfield Public Library						X
California State Library						X

D. Plan Implementation

North Kern is implementing EWMPs based upon the program described in Section VII of this AWMP. These EWMPs include improvements to district operations that enhance water management and promote water conservation as well as the EWMPs mandated by SBx7-7 that promote water measurement and volumetric pricing.

Section II. Description of the North Kern Water Storage District and Service Area

A. Physical Characteristics

The North Kern WSD, established in 1935, is a public agency which supplies surface water from the Kern River and groundwater to primarily agricultural customers. About 52,000 acres of the 60,000 gross acres (87 percent) in the North Kern service area have been essentially fully developed to irrigated agriculture for over forty years; however, cropping patterns have varied over the years.

Most of the water in the Kern River comes from snowmelt, with peak runoff occurring from April through July, during which time about two-thirds of the annual flow volume occurs. Historically, the supply available to North Kern from this source has ranged from less than 10,000 acre-feet in a “dry” year to nearly 400,000 acre-feet in a “wet” year. Owing to the highly variable Kern River supply, North Kern supplements available surface water supplies with pumped groundwater in “dry” years, and recharges the underlying groundwater using spreading ponds (about 1,500 acres) in “wet” years.

1. Size of the Service Area

The District was organized in 1935 and adopted its “Project Report” in 1950, with implementation of improvements laid out in the report beginning shortly thereafter. Fundamentally, the Project provided for the District to purchase the right in perpetuity to all water accruing under various Kern River “pre-1914” water rights. Because the river rights purchased by North Kern were largely “junior” rights and subject to large swings in yield depending on river hydrology, the Project Report also described a series of projects focused on “re-regulating” these highly variable supplies for the purpose of “maintaining economic pumping lifts” for landowners within the District. Re-regulation was primarily to be accomplished through construction and operation of “recharge/spreading ponds” to maximize the capture of wetter year river supplies accruing to the rights and groundwater wells to “recover” previously recharged water in drier years when surface supplies accruing to the rights were limited.

To supplement its “base” Kern River supplies described above, the District entered into an additional Kern River water supply contract with the City of Bakersfield in 1976. Although the “basic term” of this contract expired at the end of 2011, the contract continues pursuant to “extension term” provisions and is expected to continue to provide water supplies to the District in the future, particularly during wetter years. In addition to its Kern River supplies, the District uses occasional flows available from Poso Creek and takes advantage of other supplies available from the State Water Project (SWP) and the Federal Central Valley Project (CVP) from time to time. These water supplies have allowed the District to maintain a positive long-term supply balance, primarily for agricultural purposes.

The District is comprised of two service areas; a surface water service area (Class 1) and a groundwater service area (Class 2), each comprising about one-half of the District’s area. These service areas are identified on Figure 2. North Kern delivers surface water and/or pumped groundwater to satisfy all of the irrigation water requirements of the surface water service area. The remaining one-half of the

District principally relies on groundwater pumped through the use of on-farm wells; however, to the extent that the District has water available for spreading (i.e., over and above the needs of the surface water service area) and there is an irrigation demand that can be physically reached, surface water is delivered to the Class 2 service area as well.

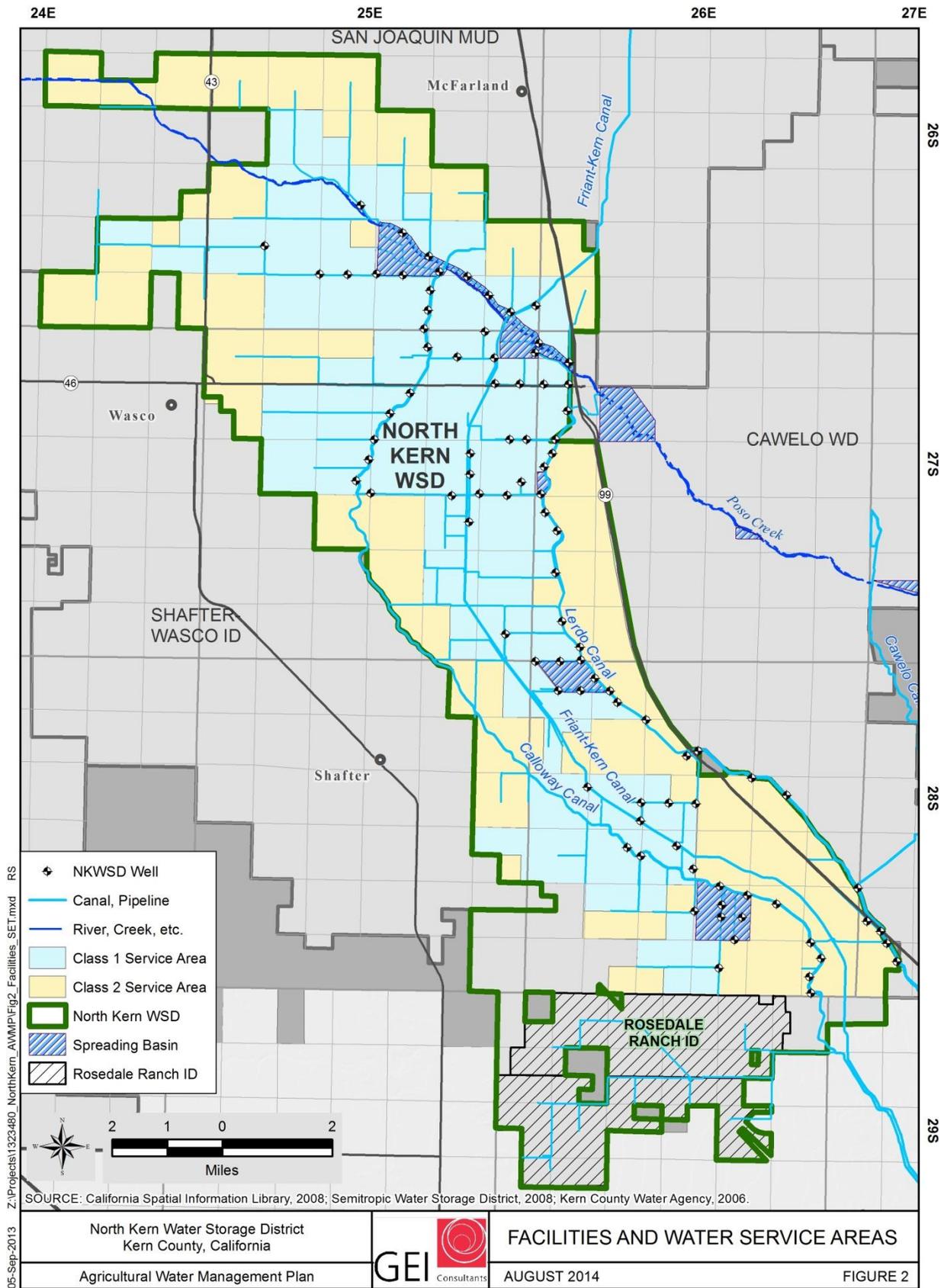
In addition to the 60,000-acre “old District”, since 1980, North Kern has also serviced approximately 9,200 acres of additional land referred to as the Rosedale Ranch Improvement District (RRID). This area is located immediately to the south of the “old District” (near the City of Bakersfield) and has a distribution system with the capacity to meet the irrigation water requirements of all irrigated lands. The Improvement District does not benefit from the same water rights that are available to the “old District”; accordingly, groundwater remains the principal source of water within RRID, with surface water being purchased and delivered by North Kern on an “as-available” basis, which is relatively infrequent. Because RRID does not hold the same water rights as North Kern and does not have access to the same sources of water, RRID is not included in the plan’s water balance or in the discussion of water management practices. The RRID service area is identified on Figure 2.

Table 2. Water Supplier History and Size

Date of Formation	1935
Source of water	
Local surface water	X
Local groundwater	X
Gross acreage at time of formation	61,854 acres
Gross acreage - current service area (2012) – Old District	60,000 acres
Gross acreage – current service area (2012) – RRID	9,200 acres
Current irrigated acreage (2012) – Old District	52,936 acres
Current irrigated acreage (2012) - RRID	7,400 acres

North Kern is governed by a five-member Board of Directors. Each member represents a geographical area within the District known as a division. Each board member must be a landowner (or a representative of a landowner) within the District and be elected by the landowners within their division.

North Kern Water Storage District – Agricultural Water Management Plan



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North Kern Water Storage District Kern County, California		FACILITIES AND WATER SERVICE AREAS
Agricultural Water Management Plan	AUGUST 2014	FIGURE 2

Land use within North Kern is primarily agricultural. In the 1950s, at the time of North Kern’s original project, the District’s lands were developed almost exclusively to annual crops. Currently, permanent crops, principally nuts and grapes, account for about 85 percent of the irrigated area. In the past, the principal annual crops have included cotton, tomatoes, and wheat. While the cropping pattern has changed over time, the total farmed acreage has varied with the economics of farming. Going forward, it is reasonable to anticipate that the farmed acreage will continue to evidence modest annual fluctuations without any increasing trend (since the District is essentially fully developed) or decreasing trend.

Where farm lands in North Kern are proximate to urban areas, there has been pressure to convert these lands to urban uses. Urbanization is occurring throughout the Kern County Subbasin and other water districts are also facing this issue. To date, the Rosedale Ranch area has been the primary target for urbanization as the City of Bakersfield expands to the north. Approximately 1,000 acres have been annexed to the City of Bakersfield since formation of the Improvement District in 1980. Rosedale Ranch continues to carry on discussions with appropriate agencies to help ensure the management of the groundwater resource. In 2006, the City of Shafter annexed about 5,200 acres located within North Kern, generally in the area bounded on the south by Seventh Standard Road and extending north about five miles. Most of the annexed land remains in irrigated agriculture. The anticipated magnitude of the urbanization trend to both North Kern and RRID, in terms of land use, is shown in Table 3.

Table 3. Expected Changes to Service Area

Change to Service Area	Estimate of Magnitude	Cause of Change	Effect on Water Supplier
Reduced Service Area	Negligible	Urbanization	No substantive impact
Increased Service Area	Negligible		None
Reduction in Irrigated Area	Negligible		None

2. Location of the Service Area and Water Management Facilities

North Kern is located in Kern County, west of U.S. Highway 99, southwest of the City of McFarland, northwest of the City of Bakersfield, and east of the cities of Shafter and Wasco. As noted previously, while most of North Kern lies north of Seventh Standard Road, those lands lying south of Seventh Standard Road fall into Rosedale Ranch Improvement District. Figure 1 illustrates the District’s location within Kern County. Neighboring irrigation districts are Cawelo WD to the east, Shafter-Wasco ID and Semitropic WSD to the west, and Southern San Joaquin MUD to the north. Similar to North Kern, these other water districts rely on surface water supplies for irrigation from the SWP, the CVP and the Kern River to supplement groundwater supplies.

North Kern and neighboring districts overlies a common groundwater basin. Due to concerns regarding the future reliability of historically available surface water supplies, in 2007 North Kern and other districts and entities in the Poso Creek region prepared the Poso Creek Integrated Regional Water Management Plan (Poso Creek IRWMP) that identified potential new facilities and “non-structural”

measures to improve intra- and inter-district management of water supplies.¹ The overarching goal of the Poso Creek IRWMP is to maximize the capture and use of surface water supplies available to the region and thereby reduce the impacts of existing and potential regional loss of water supply reliability.

Delivery of surface water and groundwater in North Kern is accomplished through a network of largely unlined canals; however, the system also includes some pipelines and lined canals. The District’s principal supply artery, and the most upstream of its two points of diversion from the Kern River, is the Beardsley-Lerdo system. This system is entirely gravity and consists of the diversion structure, or headworks, on the Kern River and a canal which delivers water along the eastern or “high” side of the District. The lined portion of this canal extends from the headworks to the District’s boundary and is referred to as the Beardsley Canal, while the portion within North Kern is unlined and is referred to as the Lerdo Canal. Up to 850 cfs has been conveyed through the Beardsley Canal for delivery into the District. The second point of diversion, located about 4.5 miles downstream of the first, is the Calloway Headworks which serves the relatively large, unlined section of the Calloway Canal. This facility is also entirely gravity and extends for 10.4 miles before entering the District at Seventh Standard Road. This “wet-year” facility has a capacity of 1,000 cfs at the headworks. Distribution laterals are generally unlined ditches and deliver water to farm turnouts by gravity from the previously-described main conveyance facilities. The main conveyance canals and distribution laterals within North Kern are shown on Figure 2.

Typically, District-owned wells are only used during “dry” years when surface water supplies are inadequate. Groundwater is delivered to customers during dry years via a network of small, lined canals running parallel to the larger, unlined canals used for conveyance of surface water. The District owns and operates about 100 wells at locations shown in Figure 2. Approximately 200 privately-owned wells in the Class 2 service area are used to meet irrigation demands in this part of the District.

Poso Creek traverses the north part of the District, however, significant flows from this creek are infrequent, and it is dry much of the time. The District holds a water rights permit for the diversion and use of Poso Creek water. An agreement with Cawelo WD and Semitropic WSD provides for allocation of Poso Creek water among the three districts. In addition, the channel of Poso Creek is periodically used for groundwater recharge with other surface water supplies available to North Kern. Water is only recharged in Poso Creek when the stream bed is dry so water introduced for recharge does not contribute to the creek’s natural flow. Table 4 provides a summary of existing irrigation facilities in North Kern.

Table 4. Water Conveyance and Delivery System

System Used	Number of Miles
Unlined Canals	130
Lined Canals	20
Pipelines	20
Drains	0

¹ The Poso Creek IRWMP was initially adopted in 2007; however, a 2014 Plan Update was recently prepared and adopted, which brings the Plan into compliance with “Proposition 84” standards.

North Kern relies heavily on storage and recovery of groundwater for the year-to-year regulation which is required to manage North Kern's highly variable Kern River supplies. Seasonal regulation and some year-to-year regulation are provided by the District's use of conservation storage space in Isabella Reservoir.

The U.S. Army Corps of Engineers (USACE) constructed Isabella Dam in the 1950s and is responsible for day-to-day operations. Isabella Reservoir, with a total storage capacity of 568,500 acre-feet, is located well to the east of the District in the southern Sierra Nevada Mountains. Later, in the 1960s, the District contracted with the United States to acquire conservation storage capacity in Lake Isabella as a means to further regulate its Kern River supplies. Surface water supplies regulated in Isabella Reservoir are used conjunctively with the groundwater storage underlying the District.

Isabella Reservoir is a multiple purpose water storage facility with the primary mission being flood control. Flood control operating criteria developed by the USACE require that total reservoir storage be no more than 170,000 acre-feet by November 1 of each year, unless otherwise approved by USACE. Historically, the maximum total reservoir storage approved by USACE has been 245,000 acre-feet. With a minimum pool of 30,000 acre-feet, North Kern's carryover storage ranges from about 34,000 to 48,000 acre-feet.

In addition to flood control, the reservoir is used to storing water for irrigated agriculture, release water to generate electricity, and as a recreation and water sports facility. North Kern is not responsible for maintenance of the reservoir but does pay its allocated share of maintenance costs based on a contract with the USACE.

North Kern's share of the available conservation space in the reservoir ranges from 24 to 34 percent. Based on the reservoir's capacity at the spillway crest, this implies a range of about 129,000 to 183,000 acre-feet. However, current storage restrictions have reduced this range to about 79,000 to 112,000 acre-feet.

The District has small volumes of operational storage available in mid-system reservoirs within its service area. However, since this storage is used exclusively for canal regulation, this reservoir capacity is not included in Table 5.

Table 5. Water Supplier Reservoirs

Reservoir	Capacity (AF)	North Kern's Storage Rights (AF)
Isabella Reservoir (at Spillway Crest)	568,500	129,000 - 183,000
Isabella Reservoir (with USACE storage restriction)	360,000	79,000 – 112,000
Isabella Reservoir (carryover storage)	170,000	34,000 – 48,000
North Kern Reservoirs*	N/A	N/A

* Small operational storage facilities within North Kern WSD, not included in AWMP budget.

The majority of land within the District’s service area is well drained, and the need for on-farm surface drainage is minimal since the majority of irrigated farmland is irrigated with low-volume application methods. Table 6 summarizes the existence of tailwater/operational outflow recovery systems. Currently, North Kern has no District-operated recovery system, while the number of on-farm operated tailwater/operational outflow recovery systems is minimal.

Table 6. Tailwater/Operational Outflow Recovery System

System	Yes/No
District Operated Tailwater Recovery	No
Landowner Operated Tailwater Recovery	Yes

Following is a list of recent key improvements made to North Kern maintained canals and conveyance channels; refer to Figure 2 for specific canal names. This list supplements the description of previous water management activities presented in Section 1 and the description of specific EWMP implementation and reporting included in Section VII (Table 49).

- Installed new pump station and one mile of 96-inch diameter concrete pipe to convey water from the Calloway Canal to the Lerdo Canal, a 40-foot lift. This improvement increases the District’s ability to take advantage of CVP supplies that become available from time to time from the Friant-Kern Canal (typically during “wet” years) by allowing such water to reach all of the District’s irrigation demand and spreading ponds. In addition, it eliminated a portion of the 8-1 Canal and the associated canal seepage. [*Calloway-to-Lerdo Intertie*]
- Installed a lined canal between the Calloway Canal and the Cross Valley Canal (CVC), including a new turnout on the CVC, all of which increases the District’s ability to divert and utilize water supplies that are available in the California Aqueduct from time to time and to facilitate water management exchanges. [*Calloway-to-CVC Intertie*]
- Converted the 8-9 and 9-6 canals into pipeline conveyances, which eliminated potential seepage and evaporation losses.

- Implemented Supervisory Control and Data Acquisition (SCADA) monitoring to check water levels at strategic locations in the District’s distribution system and prevent overflow of regulating reservoir storage.
- Lined portions of the Calloway Canal with bentonite to reduce seepage potential, specifically in areas that were known to exhibit relatively high rates of seepage.
- Replaced old, worn-out propeller meters (McCrometer and Seametrics models) at turnouts with new meters.
- Implemented iPhone scanning and real-time water meter reading network so water consumer usage can be uploaded to the District’s server and accounting program. This has reduced human error in reporting water usage and has assisted in verifying compliance with SBx7-7 delivery volume measurements.

3. Terrain and Soils

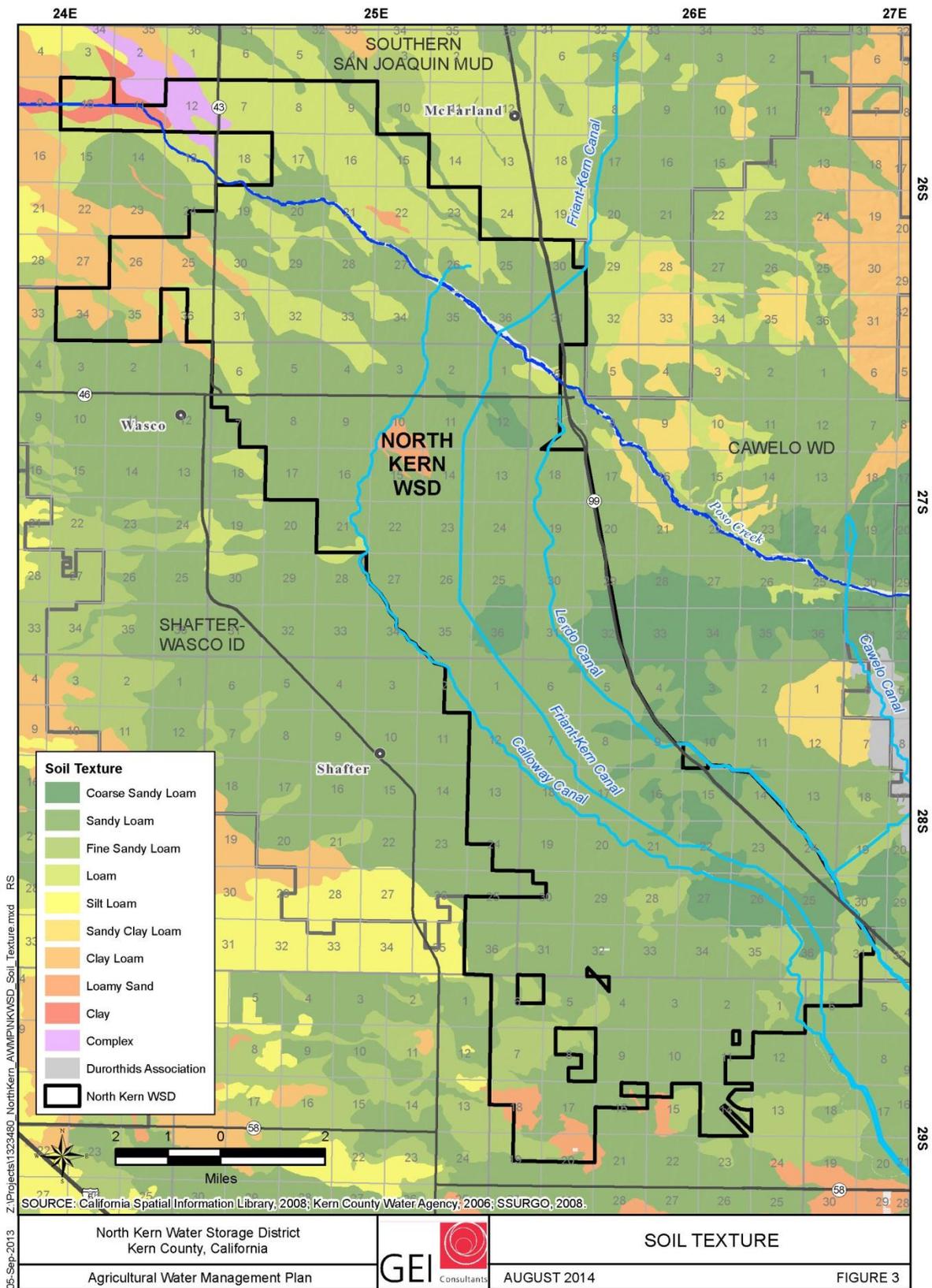
The North Kern Water Storage District is located on the valley floor of the southern portion of the San Joaquin Valley, a physiographic trough. The northwest-southeast trending valley is bounded by the Sierra Nevada Range to the east, the Tehachapi Mountains to the south and the Temblor Range and Coast Range to the west. The valley floor is characterized by low alluvial plains and fans and by overflow lands and old lakebeds.

Alluvial deposits in the Kern County sub-basin generally consist of sand, silt, and clay laid down in a complex sequence principally by the Kern River, Poso Creek, Deer Creek, the White River, small drainages along the Sierra Nevada Mountains to the east, and to a lesser extent, by streams along the Coast Range to the west. The terminus for these flows in the geologic past was Tulare Lake, located to the north of Kern County on the west side of the San Joaquin Valley. The axis of the San Joaquin Valley Basin along the west side of the valley has been subsiding over time and, as a generalization, the sediments tend to dip and thicken towards the axis of the basin and pinch out on the east and west edges. The District’s service area is flat with land surface elevations ranging from over 320 feet above sea level on the east to less than 300 feet above sea level on the west.

The predominant irrigation systems in North Kern are above-ground drip systems for permanent orchard and vineyard crops. Annual crops are irrigated largely with hand-move sprinkler systems. Over the last five years, the percentage of acreage irrigated by each of the systems noted above has remained constant.

The soil types in Kern County vary in structure, texture, and chemistry with geographical location. Valley floor soils within North Kern are derived mostly from mixed granitic and sedimentary rocks and are characterized as saline-alkaline. The generalized soils map units or soil associations underlying the area are described in the published soil survey for northwestern Kern County and are presented in Figure 3. A general soil map unit consists of one or more major soil types and some minor soils that occur together in a recognizable pattern.

North Kern Water Storage District – Agricultural Water Management Plan



Soils are described in this report in terms of associations because of the size of the District and because of their similarities to each other. Soils within the District do not have any identifiable impacts upon water operations and management in the service area.

Table 7 summarizes the topographic characteristics of the irrigated lands.

Table 7. Landscape Characteristics

Topography Characteristic	Percent of the District	Effect on Water Operations and Drainage
Flat Land	100%	Land is adaptable to sprinkler and micro irrigation systems

4. Climate

North Kern lies at the southern end of the San Joaquin Valley, a portion of the valley that is partially surrounded by a horseshoe-shaped ring of mountains. The Sierra Nevada Mountains to the east shut out most of the cold air that flows southward over the continent in winter. It also catches and accumulates snow, which provides irrigation water for use during the dry summer months.

Summers are typically hot and dry. The average length of the growing season is 265 days, typically lasting from March to November. December and January are characterized by frequent fog or low clouds which occur mostly at night. These conditions prevail when cold, moist air is trapped in the valley by a high pressure system. In extreme cases, fogginess or cloudiness may occur continuously for two to three weeks. The depth of the fog or clouds is usually less than 3,000 feet. Under these conditions, there usually are clear skies and mild temperatures in the surrounding foothill and mountain areas. Most of the precipitation occurs in the winter with little to none occurring during the summer months of June through August. By contrast, rates for evaporation and transpiration are low in the cooler, wetter months and peak during the hot, dry summer growing season.

Table 8 summarizes climate data from the CIMIS station at the City of Shafter. Temperatures in the summer are typically in the upper 90s and nights are fairly warm. Throughout the year, the mean temperatures vary from 38°F in December to 98°F in July. Annual precipitation typically ranges between five to seven inches. More detailed climatic data from the Shafter station are presented in Table 9.

Table 8. Summary Climate Characteristics

Climate Characteristic	Value*
Average Precipitation	5.80 Inches
Minimum Monthly Precipitation	0 Inches
Maximum Monthly Precipitation	5.97 Inches
Minimum Temperature (Avg. December Minimum)	38.3 °F
Maximum Temperature (Avg. July Maximum)	98.5 °F

*Obtained from DWR CIMIS data for Shafter/USDA Station #5.

Table 9. Detailed Climate Characteristics

Month/Time	Average Precipitation (inches)	Average Reference ET_o (inches)*	Average Minimum Temperature, °F	Average Maximum Temperature, °F
January	0.9	1.60	38.6	56.9
February	1.1	2.41	42.6	63.9
March	1.0	4.36	45.8	68.9
April	0.6	5.67	50.1	75.9
May	0.2	6.96	57.3	84.6
June	0.1	8.12	64.0	92.4
July	0.0	8.10	69.6	98.5
August	0.1	7.75	68.5	96.6
September	0.2	5.74	63.5	90.1
October	0.3	3.97	54.8	80.7
November	0.7	1.82	44.7	66.8
December	0.6	0.99	38.3	56.5
Wet Season	4.3**	11.18**	42.0***	62.6***
Dry Season	1.5**	46.31**	61.1***	89.4***
Annual	5.80**	57.49**	53.2***	77.7***

*Obtained from DWR CIMIS data for Shafter/USDA Station #5. “Wet Season” constitutes average of November through March; “Dry Season” covers remaining months (April through October).

**Total seasonal and annual values

***Average of seasonal and annual monthly values

B. Operational Characteristics

1. Operating Rules and Regulations

North Kern’s adopted *Rules and Regulations for Distribution and Use of Water* (Rules and Regulations) is the guideline for District operations and delivery of water (included as Appendix D). The *Rules and Regulations* cover the procedures which are followed to distribute irrigation water in an orderly, efficient, and equitable manner.

As presented in the *Rules and Regulations*, water orders are to be placed a minimum of 48 hours prior to the time that service is requested, and water deliveries run continuously until the scheduled amount of water has been delivered. No “turn on” orders are accepted for less than a 24-hour period unless special arrangements have been made with the District or the District has in effect a less-than-24 hour-program where water users can place orders for periods of fewer than 24 hours. For the purpose of properly scheduling District activities and facilities, “turn off” orders are given at the same time as “turn on” orders.

Although the *Rules and Regulations* describe North Kern’s obligations for water delivery, in practice, the District strives to accommodate growers’ water orders, regardless of notice, so long as the orders can

be delivered without disrupting other scheduled orders. Therefore, North Kern routinely operates as a scheduled on-demand system. On the day a water order is put into effect, one of the district’s canal tenders turns the delivery gate on or off, in accordance with the scheduled delivery, at the time a canal tender passes the gate on his regular run. Generally, turn ons, turn offs and adjustments are made in the mornings. Whenever possible, service is provided as requested; however, at times, the District may require the rescheduling of service due to capacity limitations within the District’s distribution system or necessary shutdowns for emergencies beyond the District’s control.

Table 10. Supplier Delivery System

Type	Check if Used	Percentage of System Supplied
On Demand		0 %
Arranged Demand	X (48 hr notice)	100 %
Rotation		0 %

North Kern delivers nearly all of the irrigation water required in the Class 1 Service Area, and deliveries to the Class 2 Service Area are made to the extent supplies are available. Table 11 illustrates factors used to allocate water in North Kern. These factors are considered in setting the annual water allocation that is applied uniformly across the District.

Table 11. Water Allocation Policy

Basis of Water Allocation	(Check if applicable)			Allocation	
	Flow	Volume	Seasonal Allocations	Normal Year	Percent of Water Deliveries (%)
Land within the service area		x			97
Reservoir storage					
Riparian rights					
Water year type		x			
Amount of land owned					
Predicted runoff					

Although the District makes every reasonable effort to comply with water orders, the conveyance and delivery capabilities of the District’s facilities, as well as the achievement of overall economy of operational costs, make it necessary that at times, and particularly during periods of peak irrigation use, essentially 24-hour operation of facilities be maintained to assure that all water users receive adequate supplies of irrigation water.

In the event of emergencies, water users may turn off the supply of water to their turnout. In these events, water users must immediately notify the district office by telephone or in person. Water users

who do not notify the District and receive authorization prior to the change may be charged a special service fee for each occurrence.

Table 12 illustrates the lead times for requested service, as part of the arranged-demand service, as mentioned earlier.

Table 12. Actual Lead Times

Operations	Hours/Days
Water orders	48 hours
Water shut-off	48 hours

2. Water Delivery Measurements or Calculations

All deliveries of surface water and groundwater by the District are measured. Meter readings at each turnout are taken every day a turnout is running and also at the end of every month by District staff, using permanently stationed on-farm propeller meters (McCrometer and Seametrics models). Bar code readings are used to ensure the time and location of each measurement and to reduce transcription errors by electronically downloading data into the District’s dispatch office. Most deliveries to irrigators are measured using the on-farm meters, which are periodically checked as part of the District’s maintenance program. The meters provide a very accurate method of water measurement at District turnouts. Table 13 shows levels of accuracy for typical types of measurement devices.

All propeller meters used by the District are equipped with totalizers, which accumulate the volume of flow at each turnout. According to the manual *SBx7 Flow Rate Measurement Compliance for Agricultural Irrigation Districts* by the Irrigation Training & Research Center of the California Polytechnic Institute, San Luis Obispo, devices with totalizers provide measurements that are sufficiently precise to assume that the flow rate accuracy is equivalent to the calibrated volumetric accuracy. As a result, the devices used by the District to measure delivery rates provide data that enables reliable computation of volumes of water delivered from North Kern canals. Section VIII of this report discusses steps the District is taking to comply with the water measurement requirements of SBx7-7 by verifying the accuracies of metering devices.

Table 13. Water Delivery Measurements

Type of Measurement	Frequency of Measure (Days)	Frequency of Calibration (Months)	Frequency of Maintenance (Months)	Est. Level of Accuracy (%)
Propeller meters	Daily	Infrequently	As needed	± 5%
Weirs	Daily	Infrequently	As needed	± 10%
Pump, runtime	15 days	As needed	As needed	± 5%

3. Water Rate Schedules and Billing

The North Kern WSD Board of Directors annually establishes a base service charge which is applied on a per-acre basis to all lands and is based on budget requirements and Board policy. Water tolls are based

on available water supply, estimated deliveries, and the revenue required to balance the District’s budget.

Effective February 1, 2013, the water toll rate is \$115.00 per acre-foot for Class 1 water and \$185.00 per acre-foot for Class 2 water for water users not participating in the “standby” program. Another option for Class 2 water includes a “standby” (i.e. guaranteed allocation) for water delivery including a flat-rate fee of \$35.00 charged in May and \$150.00 per acre-foot upon delivery.

Table 14. Water Rate Basis

Type of Billing	Check if Used	Percent of Water Deliveries (%)	Description
Volume of Water Delivered	X	100	All water billings are based on volume of water delivered
Area (acres)			N/A
Crop			N/A
Land Assessment			N/A

A different but uniform rate is set for each of the Class 1 and Class 2 service areas each year so as to balance the District’s budget for that year. Table 15 provides this information in tabular form.

Table 15. Rate Structure

Type of Billing	Check If Used	Description
Uniform	X	Varies from year to year based on availability of surface water and need for groundwater pumping

Currently North Kern bills its irrigation water users either at the end of each month, or the first day of the following month, depending on the volume and timing of water deliveries to users. The frequency of billing is shown in Table 16.

Table 16. Frequency of Billing

Frequency	Check If Used
Monthly	X

4. Water Shortage Allocation Policies

Water supplies on the Kern River vary depending on watershed precipitation, snow melt runoff, and North Kern’s share of the prior year’s carryover storage in Isabella Reservoir. As such, water supply planning must take into consideration the amount of water that will be available during the irrigation season, the current year’s water requirements, and the target carryover storage for the following season.

During years of short surface water supply, North Kern conjunctively uses groundwater, through the operation of District-owned wells, and water users in the Class 2 service area increase their use of groundwater through the operation of private wells. North Kern currently has the well capacity to avoid

prorating deliveries to Class 1 lands, except in extremely dry years such as 2013, which is one of the driest years in the over 100 years of flow records on the Kern River.

Table 17 lists the measures that the North Kern Board may exercise to respond to water shortages.

Table 17. Decreased Water Supplies Allocation

Allocation Method	Check If Used
Decrease Allocated Water	X
Shorten Irrigation Season	N/A
Restrict Water to Certain Crops	N/A

The District may refuse to deliver water to irrigators as a consequence for wasting water, either willfully, carelessly, or on account of defective ditches or pipelines. The District may also refuse to deliver water to inadequately prepared land or users who flood certain portions of the land to an unreasonable depth or amount in order to properly irrigate other portions. Water service may be resumed when these conditions have been remedied. Table 18 summarizes enforcement methods available to curtail wasteful water use.

Table 18. Enforcement Methods of Allocation Policies

Enforcement Method	Check If Used
Shut-off of Water	
Refuse service	X
Fines/Penalties	

5. Basis for Reporting Water Quantities

The nature of North Kern’s water rights is such that there is significant year-to-year variability in the available surface water supplies. In a “dry” year, surface water supplies are very limited and pumping from District-owned-and-operated wells is significant. In a “wet” year, surface water supplies are sufficient not only to satisfy irrigation water requirements (and thereby avoid the use of District-owned deep wells), but to make significant deliveries to spreading ponds for direct groundwater recharge.

Given the high degree of variability in the District’s surface water supplies and operations, a “median” runoff year on the Kern River was considered to be the most appropriate choice for a “representative year”. For example, owing to the high degree of variability, an “average” or greater water supply year occurs in about one out of three years. Additional considerations in the selection of a representative year included that it be a relatively recent year which reflects the “current” level of development. Further, in 2007, a court decision was rendered which affected North Kern’s water rights going forward.

2008 was selected as the year during the period beginning in 2007 when flow in the Kern River most closely approximated the long-term median annual runoff. During 2008, annual natural flow of the Kern River at the First Point of Measurement was only 4 percent below the average annual runoff index computed over the period of record extending from 1894 through 2011. Figure 4 illustrates the variation in Kern River supply under North Kern’s water rights during the period from 1992 through 2012.

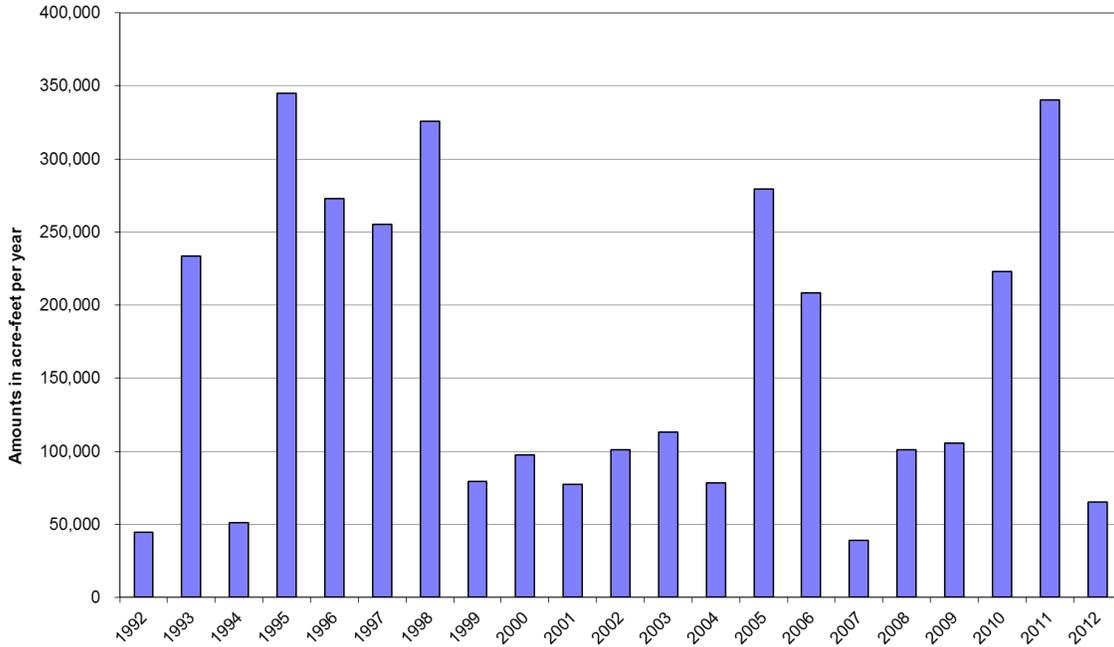


Figure 4. Annual Kern River Supply under North Kern’s Water Rights

The selection of calendar year 2008 as the representative year is presented in Table 19.

Table 19. Representative Year

	Description
Representative year based upon	2008
First month of representative year	January
Last month of representative year	December

Section III. Description of Quantity of the Water Uses of the Agricultural Water Supplier

North Kern’s principal surface water supply is the Kern River, which is diverted and delivered northward into the District through a largely open canal, gravity system. The District serves approximately 210 accounts with an average of 280 acres per account.

Owing to the highly variable Kern River supply, North Kern supplements available surface water supplies with underlying groundwater resources. During “wet” years, when irrigation water requirements are easily met, significant deliveries of surface water are made to irrigation and spreading (i.e. for groundwater recharge). The District maintains approximately 100 water wells that are used to supplement surface water supplies, primarily during “dry” years.

North Kern is well positioned to participate in exchanges to supplement local water supplies, which involve SWP and CVP supplies owing to its proximity to major SWP and CVP conveyances and service areas.

A. Agricultural Water Use

The primary crops grown within North Kern are deciduous trees (mostly almonds and pistachios), grape vines, grains, row crops, and nursery crops. Improvements in irrigation water delivery systems and changing economic conditions have brought many changes to the crop mix within the District. Nut trees and grapes have been among the crops with the most rapidly expanding acreages, now accounting for around 85 percent of the total irrigated area. During the last several decades, thousands of acres of annual crop land have been converted to these high value permanent crops.

The change from annual to permanent crops has led to a “hardening” of the District’s total water requirements over time, especially in recent years. Table 20 summarizes agricultural water use within the District for 2008.

Table 20. Agricultural Water Use for 2008 (AF)

Source	2008
Agricultural Water Supplier Delivered	
Surface and groundwater	149,988
Other (M&I Use)	N/A
Other Water Supplies	
Surface Water	N/A
Groundwater (Private Pumping*)	N/A
Other	N/A

* Private pumping exists, but is not reported to the District.

Table 21 presents water needs for specific crops grown within the North Kern service area. The efficiency of on-farm applications and crop water demands vary by crop, soil type, irrigation method and other factors; however, for the purposes of this water balance, a uniform adjustment for crop water

demands in excess of ET was applied to all crops. This adjustment was approximated by comparing the estimated average unit crop ET derived from Table 21 (164,919 ac-ft divided by 52,396 acres or 3.15 ac-ft/ac) with the per-acre volume of Class 1 water deliveries measured by the District in 2008, 92,976 ac-ft. Dividing the volume of delivered water by the area served by Class 1 water, estimated to be 50 percent of the total cropped area served in 2008 or 26,198 acres, yields a Total Crop Water Demand of 3.55 ac-ft/acre, a benchmark assumed to satisfy all water requirements of Class 1 lands.

This benchmark can be met by applying a uniform adjustment of approximately 13 percent to the Crop ET Requirement values presented in Table 21. The 13 percent adjustment for evaporative losses and deep percolation includes a value of 5 percent that major growers in the District commonly apply as a leaching requirement. As noted in Table 45, surface water runoff from irrigated lands in North Kern is negligible. Also, as shown in Table 42, effective precipitation in 2008 was only 3,362 acre-feet (1.8 percent of the Total Crop Water Requirement computed in Table 21).

Table 21. Agricultural Crop Data for 2008

Crop	Total Acres	Estimated ETc (ft)	Crop ET Requirement (AF)	Crop Water Demand in Excess of ET (AF)	Total Crop Water Demand (AF)
Alfalfa Hay	3,678	4.10	15,080	1,960	17,040
Almonds	30,289	3.28	99,348	12,915	112,263
Peppers	152	1.62	246	32	278
Grain – Corn	182	2.95	537	70	607
Grain – Wheat	626	2.07	1,296	168	1,464
Grapes – Table	5,818	2.81	16,349	2,125	18,474
Pecans	188	3.34	628	82	710
Pomegranates	334	3.38	1,129	147	1,276
Cotton	754	2.71	2,043	266	2,309
Open Land	1,568	0	0	0	0
Roses	2,961	3.28	9,712	1,263	10,975
Pistachios	2,601	4.11	10,690	1,390	12,080
Apples	1,256	3.45	4,333	563	4,896
Cherries	27	4.17	113	15	128
Olives	83	3.59	298	39	337
Vegetables – Misc	1,723	1.62	2,791	363	3,154
Others	156	2.09	326	42	368
TOTAL	52,396	3.15	164,919	21,439	186,358*

* As referenced in the text above, the approximation of total “applied” irrigation volume for the service area from the District’s internal water budget (North Kern WSD 2008) is approximately 185,956 ac-ft, less than one percent different from the computed Total Crop Water Demand presented in this table.

The District’s gross service area now encompasses approximately 60,000 acres. As shown in Table 22, approximately 52,400 acres were irrigated from surface water and groundwater sources in 2008, and the total crop water demand was estimated at about 186,400 acre-feet.

Table 22. Irrigated Acres for 2008 (acres)

Service Area	60,000
Surface Water and Groundwater Irrigated Area	52,396

For the purposes of this report, cropped acres are the same as irrigated acres with the amount of irrigated land not cropped at any time during the year shown in Table 21 as “Open Land”. Over 85 percent of the cropped acres are planted with permanent crops with almonds being the predominant permanent crop with 30,289 acres. Inter-cropping is not a common practice within the North Kern service area.

Table 23. Multiple Crop Information for 2008 (acres)

Cropped	52,396*
Inter-cropping	Negligible
Double cropping	7,306

*Includes crops irrigated with surface water and groundwater.

B. Environmental Water Use

North Kern does not make deliveries of water specifically for environmental purposes. Any environmental water uses realized from District-maintained water supplies are incidental to the District’s operations. In particular, to the extent that there is water in the District’s canals or the 1,500 acres of spreading ponds that are periodically flooded, it is available to local wildlife and provides incidental habitat benefits. The USACE is responsible for Isabella Reservoir operations and any environmental use of water stored in Isabella Reservoir is incidental to that operation.

These potential sources do not qualify as consumptive environmental water uses applicable to the AWMP water balance and Table 24 has been completed accordingly.

Table 24. Environmental Water Uses for 2008

Environmental Resources	Volume (AF)*
In-stream flow releases	0
Streams	0
Lakes or reservoirs	0
Riparian vegetation	0
Total	0

*There is no water consumption assigned to environmental water uses.

C. Recreational Water Use

Recreational activities at Isabella Reservoir, also known as Lake Isabella, include camping, fishing, and boating. The USACE is responsible for day-to-day reservoir operations, while the Kern County Parks and Recreation Department administers the recreational activities at the lake. North Kern is not responsible for any recreational activities at Lake Isabella. Recreational use of District water supplies is incidental to the District’s storage of water in the reservoir, which is for the purpose of regulating the

supplies. Accordingly, no consumptive use of water has been assigned North Kern’s water in Isabella storage for the purpose of the water accounting in this plan.

Table 25. Recreational Water Uses for 2008

Recreational Facility	Volume (AF)*
	N/A

* There is no water consumption assigned to recreational water uses.

D. Municipal and Industrial Water Use

North Kern delivers only raw (non-potable) water throughout its service area; accordingly, there are no direct deliveries for M&I purposes. All M&I water use in the North Kern service area is supplied by groundwater pumping. To date, the City of Shafter, other local communities, rural residences and businesses have relied exclusively on groundwater pumped from the Kern County Subbasin for domestic and commercial uses. When available surface water supplies permit, the District replenishes the underlying groundwater through significant recharge operations which are conducted at multiple spreading pond locations. The spreading operations are carried out in support of the pumping required to satisfy the irrigation water requirements within the District; however, as a practical matter, the same groundwater system supplies both agricultural uses and M&I uses.

In 1952, North Kern entered into an agreement for the use of water rights which limited uses of the water to irrigation, livestock watering, and groundwater replenishment. In 2008, North Kern entered into an amendment to the 1952 agreement which provides for M&I water uses. To date, these uses have been relatively small. In particular, the City of Shafter has pumped less than 1,000 acre-feet for such purposes.

Table 26 summarizes the District’s municipal and industrial water uses.

Table 26. Municipal/Industrial Water Uses for 2008 (AF)

Municipal/Industrial Entity	2008
Municipal Entity	
	357 (By City of Shafter)
Industrial Entity	
Total	

E. Groundwater Recharge Use

Indirect recharge occurs to the extent that the District delivers surface water in lieu of pumped groundwater to satisfy irrigation water requirements. Kern River water which is surplus to immediate irrigation requirements and cannot be regulated in the District’s share of conservation storage space available in Isabella Reservoir is available for direct recharge. In this regard, North Kern makes use of over 1,500 acres of spreading ponds, the dry channel of Poso Creek, and unlined canals. The spreading ponds have been in use for over 60 years and consist of relatively small ponds or cells within a given spreading site, separated by contour dikes. There are five sites, which range from about 60 acres up to

about 600 acres, with the locations shown on Figure 2. Since the spreading ponds were constructed in the 1950s, North Kern has spread over 3.25 million acre-feet of water. It is noteworthy that, prior to the development of its extensive spreading grounds, North Kern initiated field experimentation and research in 1936 regarding the use of artificial recharge methods in the southern San Joaquin Valley.

During particularly “wet” years, direct recharge through the use of spreading ponds is significant in the basin. Table 27 lists the acre-feet of water allocated towards groundwater recharge in 2008.

Table 27. Groundwater Recharge Water Uses for 2008 (AF)

Location/Groundwater Basin	Method of Recharge	2008
District Spreading Ponds	Spreading of Surface Water	2,384
District Canal Seepage*		25,377
Poso Creek*		103
Total		27,864

*Values have not been reduced by potential evaporation, represent gross estimates.

F. Transfer and Exchange Use

North Kern is well-positioned to participate in exchanges which involve SWP and CVP supplies owing to its proximity to major SWP and CVP conveyances and service areas. Regarding CVP water, it is noted that the Friant-Kern Canal slices through the middle of North Kern from north to south. In addition, two of North Kern’s immediate neighbors are CVP-Friant contractors; namely, the Southern San Joaquin Municipal Utility District and the Shafter-Wasco Irrigation District. Regarding SWP water, the Cross Valley Canal conveys SWP water from the California Aqueduct into the metropolitan Bakersfield area, where water is pumped into North Kern’s Beardsley Canal for delivery to the Cawelo Water District. Though not a long-term CVP contractor, North Kern has purchased CVP water that has been available from time to time, typically during the peak runoff period of wet years, generally through “Section 215” contracts. In this regard it is noteworthy that the District has constructed two turnouts from the Friant-Kern Canal to facilitate such purchases, as well as having instituted water banking and exchange arrangements with neighboring districts. Table 28 summarizes North Kern activity in water exchanges in 2008.

Table 28. Transfers and Exchanges Water Uses for 2008

From What Agency	To What Agency	Type of Transfer or Exchange (Ag to M&I, M&I to Ag, or Ag to Ag)	Volume (AF)
North Kern WSD	Semitropic WSD	Agricultural to Agricultural	5,412
North Kern WSD	Shafter-Wasco ID	Agricultural to Agricultural	2,829
North Kern WSD	Kern-Tulare WD	Agricultural to Agricultural	361
North Kern WSD	Kern-Tulare WD	Agricultural to Agricultural*	5,014

*Noted in 2011 AHR as “Friant-Kern Canal Pump-in Deliveries”.

In 2012 North Kern and other members of the Poso Creek Regional Water Management Group (Poso Creek RWMG) completed State (California Environmental Quality Act – CEQA) and Federal (National Environmental Policy Act – NEPA) environmental documents for groundwater banking, transfer, and exchange programs among the members of the RWMG. These programs, which may involve SWP,

CVP and local water supplies, envision the expansion of water management programs among the RWMG in response to reductions in historically available regional surface water supplies as documented in the Poso Creek IRWMP. Expanded water banking, transfer and exchange programs designed to improve regional water management will assist in reducing the adverse impacts on regional groundwater conditions and agricultural operations associated with regional losses of surface water supplies.

As noted elsewhere in this report and in the Poso Creek IRWMP, North Kern has substantial assets to both recharge and recover water supplies for banking, transfer and exchange purposes. North Kern is also faced with potentially large reductions in its historically available Kern River water supplies due largely to the State Water Resources Control Board’s decision in 2010 to remove the Kern River from the “fully appropriated stream” list and proposed actions of the City of Bakersfield and the Kern Delta Water District. Consequently, North Kern must optimize the use of its water and facilities assets through banking, transfer, and exchange programs within the Poso Creek region, and in others areas of Kern County, which can be assisted because of the District’s excellent proximity to the Friant-Kern Canal and CVP “Friant Division” contractors. These actions are necessary for the continuation of viable agricultural operations within the District.

G. Other Water Use

All water uses of any significance have been described previously in this section. Negligible volumes of water are used within the District for livestock watering, mixing with agricultural chemicals before spraying, and dust abatement. Table 29 notes that the cumulative water use for these purposes is insignificant.

Table 29. Other Water Uses for 2008 (AF)

Water Use	2008
No other uses of significance	N/A

H. Projected Water Use

Projections of future water use in the District are directly related to the future availability of water supplies. Should North Kern’s surface water supplies be reduced from historical levels, both the District and the District’s landowners will increase reliance on groundwater; the same situation applies to other members of the Poso Creek RWMG. However, it is very unlikely that continuously high levels of groundwater pumping can be sustained without the availability of adequate supplemental surface water supplies. It is intended that existing and future groundwater banking, transfer and exchange programs will bring additional surface water supplies into North Kern to offset some of the losses in historically available supplies.

As previously discussed, Kern River water supplies constitute the significant majority of surface water supplies available to the District to support groundwater levels and agricultural operations. As discussed more fully in Section V.D – Water Supply Reliability and Section V.E – Future Water Supply, reductions in the historical availability of the District’s Kern River supplies are likely in the future, and significant reductions are possible. Additionally, the availability and reliability of other historical surface

water supplies to support groundwater conditions in the Poso Creek Region have been reduced as a result of environmental concerns affecting the SWP and CVP-Delta and CVP-Friant, and it is likely that supplies from these sources will continue to be reduced due to on-going environmental restrictions. Although the districts overlying the Poso Creek drainage are implementing plans and projects through the IRWM process intended to mitigate reductions in historically available surface water supplies, it is unlikely that these projects will fully offset these reductions. Should offsets be insufficient, absent a reduction in demand, it is reasonable to expect an increased reliance on pumped groundwater going forward.

Future demand patterns in the District will also certainly change as some irrigated agricultural lands are converted to urban uses; however, the total demand may or may not change depending on a number of factors, including the density of the urban development. There may be less recharge with urban development, owing to impervious surfaces and piping of wastewater to a treatment facility for reuse. If dual systems are part of the urban development, then non-potable supplies could be delivered to landscape irrigation uses.

Section IV. Description of Quantity and Quality of the Water Resources of the Agricultural Water Supplier

A. Water Supply Quantity

1. Surface Water Supply

With regard to surface features, the Calloway, Friant-Kern, and Lerdo canals run north-south through the District; Poso Creek runs northwest through the northern part of the District; and the Kern River is south of the District. North Kern’s principal surface water supply is the Kern River, diverted and delivered by gravity to water users through the aforementioned canals. Poso Creek is a relatively small, intermittent source of local surface water. Table 30 shows North Kern’s diversions from the Kern River for the years 2007-2011 in acre-feet per year (amounts are measured at Seventh Standard Road, the District’s south boundary).

Surface water is retained and regulated in the District’s conservation storage space in Isabella Reservoir, as noted in Table 5. The USACE constructed Isabella Dam in the 1950s and is responsible for day-to-day reservoir operations. Isabella “surface storage” is used by the District to supplement groundwater storage associated with the District’s recharge and recovery activities. Table 31 lists restrictions or imposed limitations on sources of North Kern’s water supply, in particular, the storage of water in Isabella Reservoir.

Table 30. Surface Water Supplies (AF)

Source	Diversion Restriction	2007	2008	2009	2010	2011
Kern River	Water year type and priority rights	73,177	93,321	84,909	180,110	358,165

Source: North Kern WSD

Table 31. Restrictions on Water Sources

Source	Restrictions or Imposed Limitations	Name of Agency Imposing Restrictions	Operational Constraints
Kern River	Storage	USACE	Dam-safety considerations caused USACE to impose a maximum storage restriction of 360,000 AF, which is about 200,000 AF less than the reservoir’s capacity at spillway crest. This restriction will be in place until the dam-safety concerns have been addressed.

2. Groundwater Supply

In years of deficient surface water supply, continuity of delivery to the surface water service area is maintained by the operation of approximately 100 wells which are owned and operated by the District, while on-farm wells are used to meet irrigation demands in the remainder of North Kern.

Long-term water-level data in selected wells representing the unconfined to semi-confined aquifers are used to evaluate groundwater movement, storage conditions, and pumping costs. Historically, water levels in supply wells have been measured twice a year, in both the “spring” and “fall”, with the timing of these measurements intended to coincide with the annual water level high and low, respectively. Measurement of water levels will continue to be performed in both spring and fall to show seasonal variations in water levels throughout the District, and groundwater levels at select wells will be monitored on a monthly basis. These data have been made available to the KCWA and the DWR for the District-owned wells.

The average depth to groundwater in the District has been around 200 feet at the end of a “wet” period (1986) and around 270 feet at the end of a “dry” period (1993). Over the last 20 years, the annual (average) spring water levels have fluctuated within a band of about 50 feet. Seasonal fluctuations can be significant and are a function of the amount of groundwater pumping in a given year and the location within the District. In general, seasonal fluctuations are greatest in the northern portion of the District and are less pronounced in the south.

The San Joaquin Valley portion of Kern County is referred to as the Kern County Subbasin, the north boundary of which is coincident with the north county line. North Kern WSD is within the Kern County Subbasin, designated as DWR Groundwater Basin Number 5-22.14, and the District is shown in relation to the groundwater basin boundary in Figure 5.

The Kern County Subbasin is well-studied, with major investigations having been conducted by both state and federal agencies. Project reports and environmental documents prepared by local water districts are a source of more site-specific data. Table 32 summarizes information on the size and capacity of the Kern County Subbasin. Importantly, the “safe yield” of the basin - the amount of water that can be withdrawn based on “natural” basin replenishment (i.e., excluding conjunctive use/banking programs) - has not been determined but is clearly a relatively small fraction of groundwater production from the Subbasin in dry years. Table 33 lists the firm responsible for preparation of the District’s groundwater management plan. The executive summary of this plan is available upon request.

Table 32. Groundwater Basins

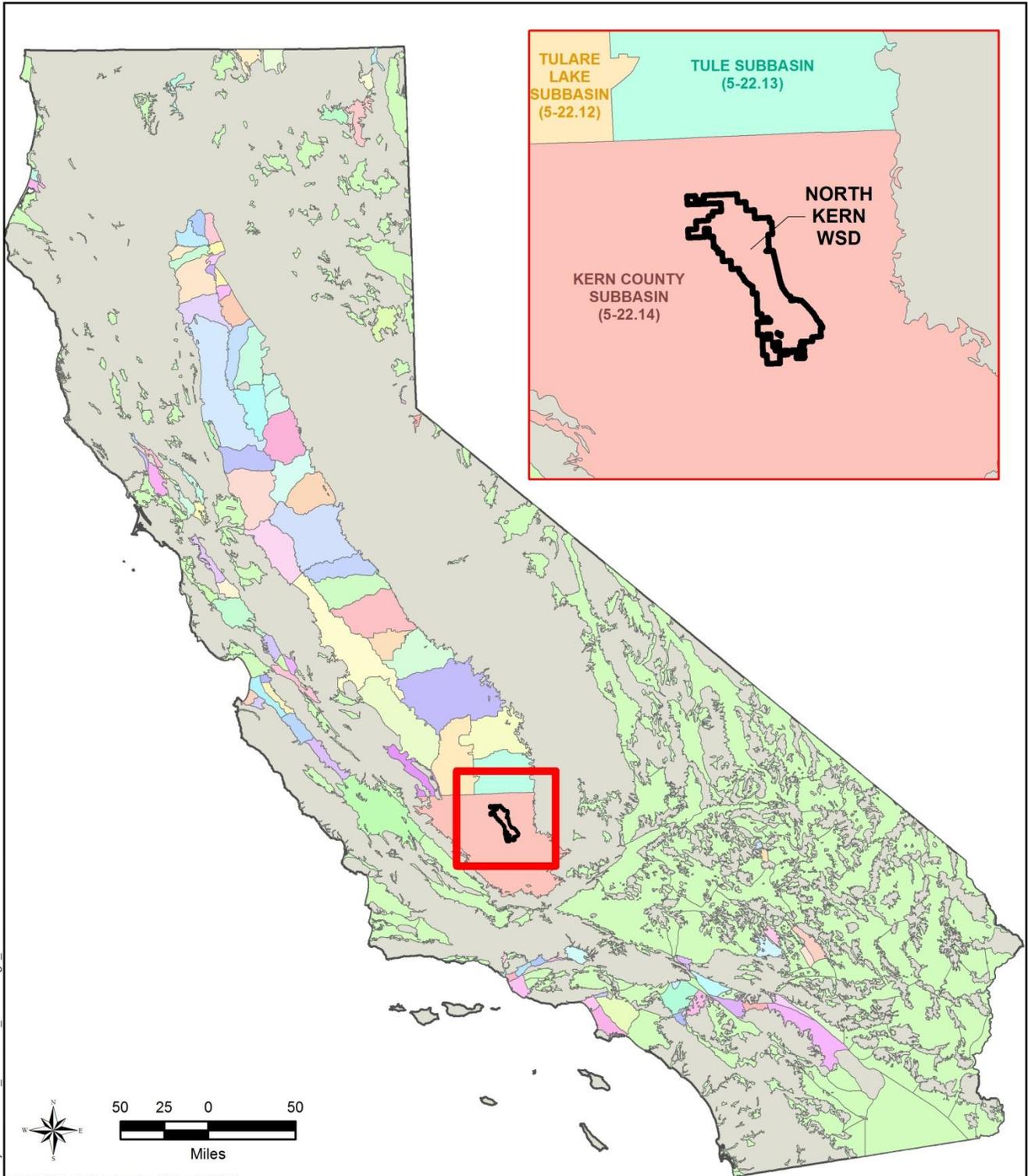
Basin Name	Size (Sq. Mi.)	Estimated Capacity (AF)	Safe Yield (AFY)
Kern County Groundwater Subbasin	3,040	40,000,000	Unknown

DWR San Joaquin District Kern County Groundwater Basin Information:

http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/5-22.14.pdf

Table 33. Groundwater Management Plan

Prepared By:	GEI Consultants
Year:	2012
Is Appendix Attached?	No, but it is available upon request



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SOURCE: DWR Bulletin 118, v.3, 2003.

<p>North Kern Water Storage District Kern County, California</p>		<p>DISTRICT BOUNDARY IN RELATION TO GROUNDWATER BASINS</p>
<p>Agricultural Water Management Plan</p>	<p>GEI Consultants</p>	<p>AUGUST 2014 FIGURE 5</p>

Irrigation Wells

Groundwater pumping by the District is used to offset deficiencies in available surface water supplies. About one-half of the District’s approximately 100 wells were constructed in the 1950s and are about 800 feet in depth, while wells constructed since that time are typically drilled to a depth of about 1,000 feet, with the top of the screened interval located from 400 to 500 feet below ground surface and extending 500 to 600 feet.

Pumping lifts vary with hydrology and with location; however, they are estimated to have ranged from 350 to 400 feet over recent years. The at-well pumping drawdowns during the irrigation season can exceed 100 feet, but are typically about 50 to 75 feet. Based on a 2008 field survey, privately-owned on-farm wells totaled over 200, about 70 percent of which were in a ready-to-operate condition.

During the drier years, the District’s well field is principally operated during the nine-month period extending from February through October and is operated at or near capacity from May into August. Annual pumpage from District wells has ranged up to 100,000 acre-feet. Conversely, there are years where available surface water supplies are adequate and the well field is not used at all. In fact, there have been instances where District wells have not been operated for several consecutive years, as illustrated in Figure 6.

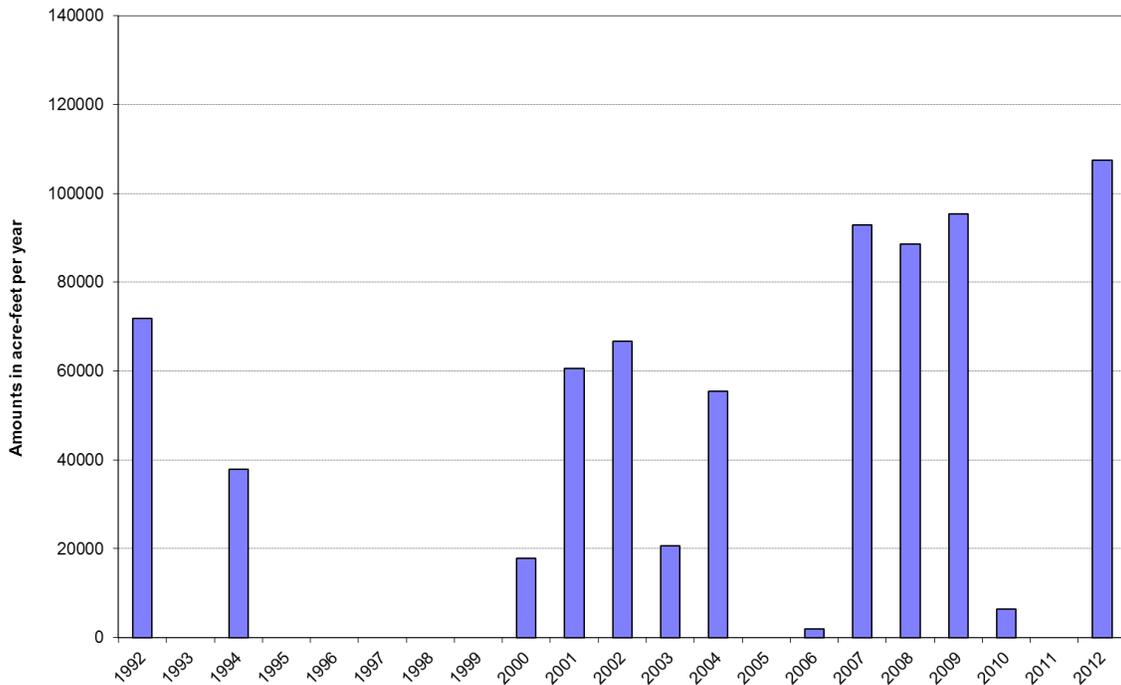


Figure 6. Groundwater Pumping from District-Owned Deep Wells.

District water is priced lower in wet years when Kern River supplies are “plentiful”, thereby incentivizing the use of District (surface) water over groundwater pumping. In dry years, the District pumps large volumes of groundwater and District water prices are higher, encouraging water users to conserve.

The volume of measured groundwater pumped within the boundaries of North Kern in 2008 for discharge into the North Kern distribution system is shown in Table 34. Although additional non-district (or privately-owned) wells are pumped within the District for direct application onto farmland without conveyance through North Kern facilities, the volume is not reported to the District.

Table 34. Groundwater Supplies for 2008*

Groundwater Basin	2008 Total (AF)
District Deep Wells	88,611
Non-District Deep Wells	4,522
Total	93,133

* Measured volume discharged into district facilities for conveyance and use within the District

3. Other Water Supplies

In general, North Kern does not have uncontrolled inflows to the District. The exception to this is Poso Creek which is frequently dry but which, at times, is a source of unregulated inflow. Flows from Poso Creek are measured at weirs which enable the District to estimate inflows except during storms when accurate measurement by the weirs is not possible.

4. Drainage from the Water Supplier’s Surface Area

Drainage Wells

Drainage wells and surface drainage systems are not employed by the District. As Table 35 summarizes, there are no flows to saline sinks or to a perched water table.

Table 35. Drainage Discharge for 2008

Surface/Subsurface Drainage Path	AF
Flows to saline sink	None
Flows to perched water table	None

B. Water Supply Quality

North Kern’s groundwater and surface water quality is generally good to excellent. Surface water diverted from the Kern River originates from snowpack in the Sierra Nevada Mountains, in particular the Kings-Kern Divide. The Kern River watershed covers approximately 2,300 square miles of the western slopes of the Sierras towards the southern end of the Central Valley. Kern River water contains low amounts of total dissolved solids (TDS) and minimal or negligible amounts of other water quality constituents that impact agricultural and/or domestic water use. The quality of the underlying groundwater is much more variable.

The District is a member of the Kern River Watershed Coalition Authority which, among other things, implements the Central Valley Regional Water Quality Control Board (CVRWQCB) Irrigated Lands Regulatory Program (ILRP). North Kern also performs water quality monitoring consistent with the ILRP including water quality analyses at the canal inlets for the main supply arteries. Water quality sensors collect data for temperature, conductivity and pH which are later analyzed by the District.

1. Surface Water Supply – Kern River (Head of the Beardsley Canal)

Water is diverted from the Kern River at two points. The principal supply artery, and most upstream diversion, is the Beardsley-Lerdo canal system. Surface water quality monitoring is generally performed at this station, indicative of the water from the Kern River that is diverted into North Kern canals. The diverted water at this location has a TDS of approximately 69 milligrams per liter (mg/l) with low concentrations of other constituents, as seen in Table 36. The quality of the river water is fairly consistent from year to year.

Note that Table 36 presents data from 2012 and not from the representative year used in previous tables and text (2008). This presents a more current depiction of the quality of water diverted from the Kern River.

Table 36. Surface Water Supply Quality – 2012

Parameter	Units	2012
B	mg/l	< 0.1
Ca	mg/l	13
Mg	mg/l	2.4
Na	mg/l	15
K	mg/l	0.94
Cl	mg/l	4.4
SO ₄	mg/l	17
NO ₃	mg/l	< 2.0
TDS	mg/l	69

2. Groundwater Supply

Groundwater in the eastern part of the subbasin is typically sodium bicarbonate type water, while groundwater to the west is characterized by calcium sulfate type water. Criteria set by the DWR define three classes of groundwater, referred to as Class 1 (TDS < 700 ppm), Class 2 (700 ppm < TDS < 2000 ppm), and Class 3 (TDS > 2000 ppm), where Class 1 is the best quality. Most of the historical water quality sampling in the District has been done for agricultural purposes. Based on this sampling, groundwater underlying the District generally meets the Class 1 criteria; however, there are exceptions. The most notable is an area of high salinity extending south from the Shafter Airport to near Seventh Standard Road and Highway 99. Outside of this area, total dissolved solids (TDS) concentrations in the District groundwater typically range from 250 to 500 ppm which is good from an irrigation water perspective.

Of the constituents typically included in an irrigation water quality analysis, nitrate nitrogen (NO₃) is one constituent with concentrations that have, in some cases, exceeded the corresponding primary drinking water maximum contaminant level (MCL) of 10 mg/L. In particular, there are three principal areas where this has occurred:

- 1) Between Highway 46 and Kimberlina Road.
- 2) South of Kimberlina Road and east of the Friant-Kern Canal.
- 3) South of Dresser Avenue, primarily northeast of or near the Friant-Kern Canal.

Full drinking water quality analyses are much more limited in North Kern. With the recently lowered MCL for arsenic of 0.01 mg/L, meeting these standards may be problematic for many public supply wells in the San Joaquin Valley; however, testing to date suggests that arsenic concentrations in groundwater underlying North Kern is typically below the MCL.

3. Other Water Supplies

There are no additional water supplies other than those described in this plan, so the characteristics of the District’s water supply are captured through monitoring of surface water and groundwater.

4. Drainage from the Water Supplier’s Surface Area

The District does not provide any drainage facilities, nor does it control or monitor any on-farm subsurface drainage systems. Therefore limitations to drainage reuse is not of concern to the District, as shown in Table 37. As noted above, the District does participate in and help facilitate the ILRP in cooperation with the KCWA and the Kern River Watershed Coalition Authority, including participating in a cooperative program to monitor water quality on Poso Creek.

On-farm tailwater drainage within the District’s service area is minimal due to the prevalence of low-volume and level-basin irrigation systems. In cases where on-farm tailwater is generated, the water users typically contain it within their property.

Table 37. Drainage Reuse Effects

Analyte	Drainage Reuse Limitations				
	Increased Leaching	Blending Supplies	Restricted Area of Use	Restricted Crops	Other
TDS	N/A	N/A	N/A	N/A	N/A

C. Water Quality Monitoring Practices

1. Source Water

North Kern regularly monitors the quality of surface water diverted from the Kern River to confirm the suitability of this water for agricultural use. The majority of monitoring locations are at main supply diversions from the Kern River. Groundwater is occasionally monitored at district deep well locations, typically in years of heavy use due to low surface water supply. Table 38 provides general information on monitoring of source water quality in the District.

Table 38. Water Quality Monitoring Practices

Water Source	Monitoring Location	Monitoring Practice	Frequency of Analysis
Kern River	Head of the Beardsley	Agricultural Suitability	Monthly
Kern River, Groundwater*	7 th Standard, Zachary, Kimberlina, Stiff House	Agricultural Suitability	Monthly

* During wet years all flow at this location may be surface water. During dry years, groundwater is also conveyed past this location with the volume of groundwater inversely proportional to the availability of surface water

2. Drainage Water

Drainage water is essentially non-existent in the district due to extent of permanent crops. As noted in Table 39, North Kern will conduct monitoring of surface drainage and groundwater as needed to confirm the suitability of this water for reuse.

Table 39. Water Quality Monitoring Programs for Surface/Sub-Surface Drainage

Monitoring Program	Analyses Performed	Frequency of Analysis
Surface and Groundwater	EC and NO ₃	As needed

Section V. Water Accounting and Water Supply Reliability

A. Quantifying the Water Supplier’s Water Supplies

1. Agricultural Water Supplier Water Quantities

Diversions of surface water from the Kern River vary from year to year depending on the weather, the amount of runoff, and operational considerations. For purposes of the AWMP, 2008 was chosen as the reference year representing a typical water delivery year. Table 40 summarizes monthly diversions from the Kern River to North Kern delivery canals in 2008. Note that these values represent the monthly amount of water arriving within District boundaries after consideration of operational losses which occur outside of the District’s service area (which include canal seepage and evaporative losses at Isabella Reservoir).

Table 40. Surface and other Water Supplies for 2008 (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Kern River	1,512	7,076	12,724	10,065	12,269	12,001	11,985	6,920	6,058	3,774	5,492	3,445	93,321
Transfers & Exchanges	0	0	0	0	0	0	0	0	0	0	0	0	0
Recycled Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,512	7,076	12,724	10,065	12,269	12,001	11,985	6,920	6,058	3,774	5,492	3,445	93,321

Along with water diverted from the Kern River, North Kern and local communities and irrigators pump groundwater from the Kern County Subbasin. North Kern reporting of groundwater pumping includes district-owned wells, about 100 at different locations across the District, and estimations of pumping from privately-owned wells within the District boundaries. All groundwater pumped by North Kern, and water received through exchanges with neighboring districts, is used to supplement the available surface water supply when it is less than the demand.

Table 41 summarizes the quantity of groundwater pumped by North Kern in 2008. This includes the District-owned deep wells, as well as those private wells which are pumped into the District’s system for conveyance and delivery.

Table 41. Groundwater Supplies Summary for 2008 (AF)

Month	District Deep Wells	Non-District Deep Wells ¹	Total ²
January	0	0	0
February	0	0	0
March	0	0	0
April	8,197	0	8,197
May	14,414	0	14,414
June	14,855	835	15,690
July	15,377	1,224	16,601
August	13,676	1,061	14,737
September	10,798	561	11,359
October	10,361	581	10,942
November	933	260	1,193
December	0	0	0
Total	88,611	4,522	93,133

¹Pumped into North Kern distribution system for irrigation use within the District

²Does not include private groundwater pumping not conveyed through district facilities

2. Other Water Sources Quantities

Surface water diverted from the Kern River and groundwater are the two sources of water actively managed by North Kern. Effective precipitation constitutes an uncontrolled source of supply which reduces the applied irrigation water requirement. Table 42 shows the estimated volume of effective precipitation for 2008, based on North Kern’s total irrigated area. This estimate is based on KCWA’s published estimate of the average effective precipitation per acre for 2008 (KCWA 2008), and the 52,396 total irrigated acres within the service area.

Table 42. Effective Precipitation Summary for 2008 (AF)

Total Annual Effective Precipitation	3,362
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B. Quantification of Water Uses

Table 43 shows the volume of water delivered through District facilities to North Kern irrigation customers in 2008. The volume of water delivered is based on flow measurements at the farm turnouts.

Table 43. Applied Water for 2008

	Volume (AF)
District Deliveries to Farm Turnouts	149,988

Table 44 summarizes water uses within the North Kern service area for 2008. The calculated crop ETc was used in developing the District’s water balance (Table 44). During this year, there were estimated to be 52,396 irrigated acres within the District and total crop water demand for the irrigated areas during that year was estimated to be 186,358 acre-feet as developed in Table 21 and described in the text which accompanies the table.

The estimate of losses from the canal system is based on balancing measured system inflows and outflows and is recorded in Table 44 as “conveyance seepage and evaporation” (item 4).

Table 44. Quantify Water Use for 2008 (AF)

Estimated Water Use	2008
Crop Water Use	
1 Crop Water Requirement (includes ET _c and an allowance for leaching)	186,358
2 Leaching (included in item 1) ^(a)	N/A
3 Cultural practices ^(a)	N/A
Conveyance and Storage System	
4 Conveyance seepage & evaporation	25,377
5 Conveyance operational outflows ^(b)	N/A
6 Reservoir evaporation ^(c)	0
7 Reservoir seepage ^(c)	0
Environmental Use	
8 Environmental use – wetlands	0
9 Environmental use – other	0
10 Riparian vegetation	0
11 Recreational use	0
Municipal and Industrial	
12 Municipal (from Table 26)	0
13 Industrial (from Table 26)	0
Outside the District	
14 Transfers or Exchanges out of the service area (from Table 28)	13,616
Conjunctive Use	
15 Groundwater recharge ^(d)	2,487
Other (from Table 29)	N/A
Subtotal	227,838

^(a) Included in item 1, see Table 21 and preceding text.

^(b) Operational outflows are directed into the channel of Poso Creek for groundwater recharge.

^(c) Included in item 4.

^(d) This amount reflects direct recharge only, i.e., it does not include canal seepage (which is included in item 4) or the deep percolation of applied irrigation water.

Table 45 summarizes the amount of monitored on-farm surface and subsurface drainage water leaving the service area. As discussed earlier, drainage wells and surface drainage systems are not employed by the District.

Table 45. Quantify Water Leaving the District for 2008 (AF)

Drain Water	2008
Surface drain water leaving district	0
Subsurface drain water leaving district	0
Subtotal	0

Table 46 shows that there are no irrecoverable losses from the District.

Table 46. Irrecoverable Water Losses for 2008 (AF)

Drain Water	2008
Flows to saline sink	None
Flows to perched water table	None
Subtotal	None

C. Overall Water Budget

Table 47 summarizes the total water supplies available in 2008 to the North Kern service area. Surface water is the volume of water diverted from the Kern River to the North Kern water system (canals). The groundwater volume includes both North Kern pumping from deep wells and private pumping that is discharged for conveyance into district facilities, but does not include private pumping not conveyed through the North Kern distribution system. The total rainfall in the North Kern service area for the period of January through December 2008 was 3.50 inches. The unit effective precipitation for 2008 was estimated at 0.77 inches per acre for the San Joaquin Valley portion of Kern County by KCWA (KCWA 2008). Based on 52,396 acres of irrigated land, the total effective precipitation is estimated at 3,362 acre-feet.

Table 47. Quantify Water Supplies for 2008 (AF)

Water Supplies	2008
1 Surface Water (summary total from Table 40)	93,321
2 Groundwater (summary total from Table 41)	93,133
3 Annual Effective Precipitation (summary total from Table 42)	3,362
4 Water purchases*	0
5 Transfers or exchanges into District*	0
Subtotal	189,816

*Included in item 1.

Table 48 summarizes the water budget for the service area. Because of the uncertainty regarding the lack of accounting for the extent of private pumping in the North Kern water budget, the closure term of the budget represents an approximation of the level of private pumping that occurred in 2008.

Table 48. Budget Summary for 2008 (AF)

Water Accounting	2008
1 Subtotal of Water Supplies (Table 47)	189,816
2 Subtotal of Water Uses (Table 44)	227,838
3 On-farm Drainage Water Leaving Service Area (Table 45)	0
Closure term attributed to estimated private pumping within North Kern	38,022

The District's measured deliveries of water to Class 1 and Class 2 lands (North Kern WSD, 2008) were used to verify the estimate of private pumping contained in Table 48. As noted earlier, Class 1 irrigation

deliveries serve approximately 50 percent of the irrigated acreage in North Kern and are assumed to fully satisfy total water requirements. By contrast, Class 2 deliveries, which serve the remaining 50 percent of the irrigated acreage, must be augmented by private pumping to meet total water requirements. For this reason, the difference between the volume of water delivered in 2008 to Class 1 lands (92,978 AF) and the volume delivered to Class 2 lands (57,010 AF) may be used as a surrogate to represent the volume of private pumping. This difference of 35,968 acre-feet varies by approximately 5.5 percent from the value presented in Table 48, which suggests that the closure term is a reasonable approximation of private pumping.

D. Water Supply Reliability

The Kern River is North Kern’s principal source of surface water supply and the amount available to the District in any given year is highly variable, ranging from less than 10,000 acre-feet in a “dry” year to nearly 400,000 acre-feet in a “wet” year. Therefore, efficient water management practices and conjunctive management (i.e. the coordinated use of surface water and groundwater sources) are critical. During “dry” years with reduced availability of surface water supplies, the District relies on carryover storage in Isabella Reservoir to the extent available, but also relies heavily on pumped groundwater (derived primarily from previously recharged surface water).

The Poso Creek IRWMP identified water supply reliability as the region’s principal water resources concern going forward and identified and prioritized a number of projects to mitigate the anticipated reduction in water supply reliability. Several of these projects have been constructed, are under construction, or will be under construction in the near term. Some examples of improvements to District facilities are illustrated in Section II.

Because North Kern shares a common groundwater basin with other districts in the Poso Creek region, the future reliability of water supplies available to support agriculture in North Kern is closely tied to regional water supply reliability.

Despite the significant success of North Kern’s conjunctive use program, as well as water management programs conducted by other districts in the Poso Creek region, significant concerns regarding future regional groundwater conditions persist. These concerns result from reductions of historically available surface water supplies to the region. Specifically, over the last five to ten years supplies of SWP and CVP “Cross Valley Contractors” and “Friant Division” supplies available to the region have been reduced as a result of environmental issues affecting the California Bay-Delta and the “San Joaquin River Settlement”. Additionally, over the last several years, Kern River water supplies historically available to the region have also been reduced, and further reductions in Kern River supply could result from proceedings pending before the State Water Resources Control Board.² Surface water supply reductions result in increased levels of groundwater pumping with adverse impacts on groundwater levels and conditions.

² In April 2010, the State Board removed the Kern River from the “fully appropriated stream” list, indicating their intention to process several pending “applications for appropriation” – including an application filed by North Kern.

E. Future Water Supply

North Kern derives nearly all of its surface water from diversions from the Kern River; therefore, future changes in the North Kern water supply will be driven by changes in Kern River hydrology and particularly by the volume, nature and timing of precipitation in the watershed. The discussion presented in Section VI of this plan describes how climate change may affect the hydrology of the Kern River watershed.

In addition to variations in the District's Kern River supplies associated with hydrology, the District is faced with serious threats to its historical Kern River supplies through projects and actions proposed by the City of Bakersfield and the Kern Delta Water District. If implemented, these projects would result in a significant reallocation of Kern River supplies away from North Kern and toward the City and/or Kern Delta. Given North Kern's heavy dependence on Kern River supplies, such a reallocation would result in a corresponding increase in groundwater pumping which would have substantial adverse impacts on North Kern's water supply balance.

To the extent portions of North Kern's historical Kern River supplies are reduced as described above, less surface water would be available to offset groundwater pumping and for direct groundwater recharge. Combined with other reduction in the availability of regional surface water supplies, recharge to the underlying groundwater reservoir would be significantly reduced while pumping would increase to offset the loss of surface water supplies.

While changes in watershed hydrology may reduce the reliability of surface water from the Kern River watershed in ways the District cannot control, the District will adapt its water management practices to respond to these changes to the extent practicable. This may involve adaptive management strategies for water consumers or the expansion of water banking transfers and exchanges, which are addressed in the discussion that follows.

1. Expansion of Water Banking, Transfers, and Exchanges

In response to potential losses of historical Kern River supplies and resulting adverse impacts to groundwater, North Kern, through the Poso Creek IRWMP, has identified and constructed several major capital improvements that enhance the District's capabilities to conjunctively use its Kern River supplies, other surface supplies available to the District, and, through water banking, transfer, and exchange agreements, surface supplies available to other agencies in the Poso Creek region, Kern County, and along the Friant-Kern Canal.

The District's primary objective in developing additional banking, transfer and exchange programs is to maximize deliveries of surface water supplies into the District to offset potential losses in historical supplies which support groundwater conditions underlying the District and thereby sustain future agricultural operations. To accomplish this objective, it is in the District's interest to consider diverse water banking, transfer, and exchange programs with Poso Creek RWMG agencies, other agencies in Kern County, and agencies within the Friant-Kern Canal service area.

Existing Water Banking and Exchange Programs

North Kern has implemented water banking and exchange programs to optimize management of water supplies, increase the total volume of water brought into the District, and develop facilities to improve future water management. These programs include numerous “bucket-for-bucket” exchanges, one-time “low priority/mutually agreeable” banking programs, and several longer-term higher priority programs. All of the District banking programs include provisions whereby 10 percent of the water banked is “left behind” (not recovered) to support groundwater levels in the District. Furthermore, development of the higher priority programs included construction of facilities (e.g., wells, turnouts, etc.) that benefit both the banker and the District.

Expansion of Water Banking and Exchange Programs

As discussed previously, through the Poso Creek IRWMP, North Kern identified several capital projects to improve the District’s water management capabilities in order to partially compensate for losses in water supply reliability. More specifically, the District identified projects focused on significant conveyance improvements that allow the North Kern to more fully utilize its existing water management assets, particularly its facilities to recharge water in wetter years.

Many of “North Kern’s” projects identified in the Poso Creek IRWMP have been completed or are in the process of being completed, and the District has effectively established additional water banking and exchange “capacity” particularly with regard to water supplies available from the CVP Friant Division and the SWP. For the reasons previously described, North Kern intends to develop additional banking and exchange programs to more fully utilize its recharge capabilities to support the viability of continued agricultural operations in the District. These programs will increase the District’s overall water supplies since a minimum of 10 percent (and as much as 50 percent or more) of additional water recharged in the District will not be recovered by bankers and will thereby support groundwater conditions underlying the District.

District Water Banking and Exchange Capacity

As noted previously, the District has substantial recharge and recovery assets/capabilities. The use of most of these assets is prioritized to manage the District’s highly variable surface water supplies for the direct benefit of District landowners (primarily agricultural operators). However, during certain periods, substantial portions of these assets are available to support banking and exchange programs with third parties.

- Recharge Capacity

In addition to substantial capacity to recharge water “in-lieu” of groundwater pumping by the District and District landowners, North Kern operates about 1,500 acres of recharge ponds with a capacity to recharge up to 25,000 AF of water per month and with a maximum annual recharge capacity of 300,000 AF. The District directly recharges significant quantities of water in about three of ten years, with an average of 150,000 AF recharged in its spreading ponds in these years. Although the District has an additional 150,000 AF of physical recharge capacity available in these wetter years, based on the typical timing for the availability of wet year supplies from the

Friant and SWP systems, it is not reasonable to assume additional water would be available for recharge during the entire year. However, through expanded water banking programs, additional recharge on the order of 75,000 AF is possible in wet years, with lesser quantities recharged in moderately wet years. These additional recharge volumes would increase the District’s water supplies by up to 15,000 AF per year on average based on a “2 for 1” type unbalanced banking program (i.e., 50 percent of water recharged is left behind). Finally, should the District lose a portion of its historical supplies, additional recharge capacity would become available for third-party banking and exchange programs.

- **Recovery Capacity and Timing**

A portion of additional water recharged through expanded banking programs (typically 50 percent to 90 percent) must be recovered for the banking entity. North Kern operates a system of 100 wells with an approximate instantaneous capacity of 350 cfs. This capacity is approximately equal to peak irrigation season demands for Class 1 lands.³ Unused District well capacity is available for use by Class 2 lands in the District and to return water to District banking and exchange partners.

If the District’s wells were operated continuously over a 10-month period, total production could be on the order of 200,000 AF. Since the maximum District Class 1 and 2 demands met from District wells is approximately 150,000 AF, about 50,000 AF per year of well capacity would be available to return previously banked water to banking partners. Approximately 15,000 AF per year of this capacity is committed to the District’s existing banking programs.

As noted above, the District’s instantaneous well recovery capacity roughly matches its peak irrigation season obligation to Class 1 lands. Consequently, under very dry conditions when the District has limited surface water storage available in Lake Isabella, little well capacity is available to return water to banking partners during the peak irrigation months (approximately May through August). To the extent North Kern’s banking partners require recovery of previously banked water during this period, additional wells would be necessary. Importantly, these additional “peaking” wells will not increase the total volume of previously banked water recovered from the District, but will simply allow the timing of water recovery to match the banking partners’ needs.

3. Effects of Expanded Water Banking and Exchange Programs

As previously discussed, in 2012 North Kern and other members of the Poso Creek RWMG completed CEQA and NEPA environmental documentation for groundwater banking, transfer, and exchange programs among the RWMG. These programs envision the expansion of water management programs among the RWMG to assist in reducing the adverse impacts on regional groundwater conditions (and agricultural operations) associated with losses of surface water supplies. Since these programs are intended to reduce the adverse impacts of regional water supply losses by bringing additional wetter

³ The District supplies nearly all of the water required to meet the irrigation water requirements of the Class 1 service area.

year supplies into the region, analyses concluded that the programs would be environmentally beneficial compared with the “no project” alternative.

To support the continued viability of agricultural operations in the District, through this AWMP North Kern is proposing to broaden water banking and exchange programs previously reviewed in the Poso Creek environmental documents to include other agencies in Kern County with State and Federal water supply contracts as well as CVP “Friant Division” contractors located outside of Kern County. Broadening these programs outside the Poso Creek RWMG would provide the District with additional opportunities to supplement water supplies available for agricultural operations in the District. Since these programs would increase District surface water supplies they would be expected to incrementally improve groundwater conditions.

The secondary source of water supply for the District is groundwater. Although not immediately affected by changes in surface water hydrology, local groundwater is derived from surface water hydrology in that groundwater recharge is driven primarily by excess surface water (i.e. beyond irrigation requirements) during wet years and percolation of applied irrigation water.

Section VI. Analysis of Effect of Climate Change

A. Effects of Climate Change on Water Supply

The future of the District's water supply will be driven largely by changes in hydrology and particularly by the volume, nature and timing of precipitation in the Kern River watershed. This section describes analyses of how climate change may affect the hydrology of the Central Valley including this watershed.

Several investigations of the possible effects of climate change to surface and groundwater sources in the Central Valley have been conducted by the USGS California Water Science Center (CAWSC). Two of these studies (USGS, 2009; Water Resources Research, 2012), report the results of modeling used to quantify the hydrological effects of warming climate scenarios including a model of runoff and recharge from the watersheds of the Sierra Nevada Mountains and a model of agricultural water-deliveries and use in the Central Valley. These scenarios were based on a commonly accepted projection of 21st century climate from the GFDL CM2.1 (Geophysical Fluid Dynamics Lab Climate Model 2.1) global climate model, responding to assumptions of rapidly increasing greenhouse-gas emissions. The scenarios predict California's climate as becoming warmer (+2 to +4° C) and drier (10-15 percent) during the mid- to late 21st century, relative to historical conditions. Based on projections from this model, the CAWSC reports suggest that climate change could result in the following types of water resources impacts:

- Declines in total streamflow (up to 40 percent) leading to reduced surface water deliveries for agriculture and riparian habitat.
- Increased demands for irrigation water with reduced surface water deliveries that would be met by increased groundwater pumpage. This in turn, would be likely to lead to the following impacts:
 - Increased streamflow infiltration;
 - Reduced base flow;
 - Reduced groundwater outflows;
 - Increased depths to groundwater, and
 - Increased land subsidence.

These combined effects have the potential to change the Central Valley from a surface-water dominated system, relying on groundwater to supplement years where surface supplies are inadequate to meet demand, to a groundwater dominated system (Water Resources Research, 2012).

Local communities, rural residences, and businesses rely on groundwater from the Kern County Subbasin as their main supply. North Kern only pumps groundwater when surface supplies are inadequate to satisfy demand (e.g. during dry years). Currently, North Kern recharges groundwater during wet years in spreading ponds and unlined canals across the District.

The combination of groundwater use in dry years and recharge in wet years has provided a balance in water supply. Should climate change result in a reduction in water available from the Kern River, this may prompt North Kern to increase the frequency of groundwater pumping which would lead to a decrease in groundwater storage without the necessary means of replenishing the depleted storage. According to a third CAWSC study (Proceedings of the Eighth International Symposium on Land Subsidence, 2010), Kern County can expect an extreme amount of land subsidence due to the increased demand on groundwater that will result from climate change.

B. Effects of Climate Change on Agriculture’s Water Demand

Climate change is expected to increase both daytime and nighttime temperatures in the Central Valley resulting in lengthening of the growing season. This general increase in temperatures coupled with greater variability and unpredictability in precipitation is expected to lead to increases in evapotranspiration resulting from warmer seasons; thereby creating an increase in demand for irrigation water and an increase in the year-to-year variability of demand.

Temperate fruit and nut trees such as almonds, pistachios, and apples require adequate winter chill to produce economically viable yields. Increased temperatures in the Central Valley are expected to reduce winter chill hours thereby causing adverse effects on the yield of these orchard crops which currently account for approximately 77 percent of total crops in the District. By the end of the century, the safe winter chill needed for these crops is predicted to disappear. Today, the number of hours of winter chill in the San Joaquin Valley has shrunk from about 1,500 a few decades ago, to approximately 1,000 to 1,200 hours (PLoS ONE, 2009). Some farmers are beginning to overcome this change by planting trees closer together and using new varieties.

Studies are now underway to prepare farmers for the likely impacts of climate change. Such efforts include breeding varieties of fruit trees which can withstand the decreased winter chill hours, developing tools to aid the crops in coping with insufficient chill, and researching the temperature responses of particular orchard crops to better understand potential long-term effects. However, some solutions such as replanting orchards with altered crop varieties or the installation of aiding tools may not be feasible for many irrigators.

C. Response to Effects of Climate Change

North Kern is committed to monitoring key indicators of climate change that affect the hydrology of the Kern River watershed and growing conditions in the District’s service area. The goal of the District is to utilize the available surface water and groundwater resources as effectively as possible in meeting the requirements of the District’s water users. It is worth noting, however, that the District’s control over water supplies is limited; thus management practice changes will need to be adaptive in nature.

Section VII. Water Use Efficiency Information

A. EWMP Implementation and Reporting

Table 49 summarizes the status of implementation of EWMPs at North Kern. As the table indicates, each of the EWMPs listed in the DWR publication the *Guidebook* is now being implemented.

The District has chosen to implement some EWMPs that, when viewed in isolation, are not locally cost effective water conservation measures but that contribute to the District's overall water management strategy.

Table 49. Report of EWMPs

Water Code Reference	EWMP	Current Status	Status of EWMP
10608.48.b(1)	Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2) of the legislation.	Proceeding with implementation	North Kern currently measures, monitors, and controls flows throughout its water delivery system. The District also measures deliveries in order to bill water users accurately for the volume of water used. The District is committed to comply with the requirements of SBx7-7 by verifying the accuracy of measurement of irrigation water deliveries using the methodology described in Section VIII of this report.
10608.48.b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered	Currently Implemented	North Kern charges water users based on the volume of water delivered.
10608.48.c(1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage	Not Applicable	North Kern facilitates and considers requests for alternative land uses, but does not actively search for alternate land use possibilities.
10608.48.c(2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils	Currently Implemented	The District considers requests for use of recycled water. One potential area of interest is use of water originating from oilfields.
10608.48.c(3)	Facilitate financing of capital improvements for on-farm irrigation systems	Currently Implemented	The District does not provide direct financial support for capital improvements to on-farm systems. However, North Kern does assist in implementation of on-farm improvements by agreeing to provide a fixed level of financial support to irrigators and then reducing water charges according to a schedule that will satisfy the commitment of support.
10608.48.c(4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) more efficient water use at the farm level; (B) conjunctive use of groundwater; (C) appropriate increase of groundwater recharge; (D) reduction in problem drainage; (E) improve management of environmental resources; (F) effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Currently Implemented	North Kern's Board of Directors annually establishes a water rate that is the basis for volumetric pricing of delivered water. Water is priced higher in dry years when the District incurs significant pumping costs, and lower in wet years with little or no district pumping. Wet-year pricing is set at levels below the costs for landowners to pump their private wells, thereby encouraging the conjunctive use of available surface water <i>in lieu</i> of groundwater pumping.
10608.48.c(5)	Expand line or pipe distribution system, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage.	Currently Implemented	North Kern has two main conveyance canals which are capable of diverting water from the River and delivering it within the service area. One of these canals is lined between the River and North Kern, and is the principal conveyance facility. Within North Kern, seepage from canals and regulatory reservoirs is recoverable as pumped groundwater. North Kern has 20 miles of lined canal within the District which was constructed specifically for dry-year operations in order to reduce canal seepage. Some of the unlined distribution canals have been replaced with buried pipelines. The preponderance of the District's distribution system remains unlined, adding to the District's recharge capability during wet years.
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits.	Currently Implemented	To the extent that deliveries are being made from storage in Isabella Reservoir the District's ability to be flexible in water order times are limited. The District, however, does strive to add flexibility to water ordering and delivery wherever possible. This includes the use of in-system storage reservoirs to help regulate mismatches between water supply and demand. In addition, District policy allows water transfers between water users within the boundaries of the District. The policy allows water users to transfer water to parcels owned or rented by the water user.
10608.48.c(7)	Construct and operate supplier operational outflows and tailwater recovery systems	Not Applicable	Due to the nature of the on-farm irrigation practices utilized in North Kern, spillage and tailwater recovery systems are not utilized and would have little effect on water use efficiency.

Table 49. Report of EWMPs, Continued

Water Code Reference	EWMP	Current Status	Status of EWMP
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Currently Implemented	The District has been operating a very significant and successful conjunctive use project for over 60 years. Kern River and other surface water available to North Kern is used in preference to groundwater to the extent available. In “wet” years, available supplies which are in excess of irrigation demand are used to recharge the underlying groundwater (primarily through 1,500 acres of dedicated spreading ponds). In “dry” years, groundwater is pumped to offset deficiencies in available surface water supplies. Through the Poso Creek IRWMP, North Kern identified and has constructed several major capital improvements that enhance the District’s capabilities to conjunctively use it Kern River supplies, other surface water supplies available to the District and through water banking, transfer, and exchange agreements, surface water supplies available to others in the Poso Creek region, Kern County, and on the Friant-Kern Canal.
10608.48.c(9)	Automate canal control structures	Currently Implemented	North Kern has automated approximately 21 water level and flow monitoring stations at water diversion points and has installed monitoring stations along some reaches of its canals. The District has identified another 2 locations that could be automated for greater water management flexibility. The District has added, and will continue to add, canal automation to its in-house SCADA system in order to enhance water delivery flexibility to water users. The District has also installed controls to enable automate operation of some wells. With this automation, the wells can be turned on and off remotely when the water level in the canal drops below a preset point. As with other district initiatives, North Kern has proceeded with implementation of this EWMP as a vehicle to improve customer service.
10608.48.c(10)	Facilitate or promote customer pump testing and evaluation	Currently Implemented	Upon request by the customer, North Kern tests private water supply pumps that pump into district canals. The District has installed water flow meters on all District-owned pumps.
10608.48.c(11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports	Proceeding with Implementation	The North Kern Board of Directors is in the process of appointing a Water Conservation Coordinator.
10608.48.c(12)	Provide for the availability of water management services to water users.	Currently Implemented	North Kern (1) measures all deliveries to water users and provides each user with the volume of water delivered during each billing cycle; (2) financially supports the mobile irrigation lab which is operated by the North West Kern RCD (which provides free irrigation system performance testing to District growers); and (3) publishes a periodic newsletter for the dissemination of co-op extension and other data.
10608.48.c(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Currently Implemented	The District’s surface water supply originates from the Kern River, which is regulated by Isabella Reservoir (a USACE-operated facility). Due to dam-safety considerations, USACE imposed a storage restriction on Isabella Reservoir in 2006, and this restriction will likely be in place for several years to come. In certain water supply years, reduced regulation in Isabella Reservoir increases the District’s reliance on regulation through use of groundwater storage. North Kern and the other River interests are working closely with USACE to expedite the necessary repairs and ultimately lift the storage restriction.

Table 49. Report of EWMPs, Continued

Water Code Reference	EWMP	Current Status	Status of EWMP
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps	Currently Implemented	The District has a program for regular inspection and maintenance of pumps and motors to keep them in good working order. Pumping plant efficiencies are periodically determined and, if less than a given threshold value, the pump and motor are pulled for inspection and rehabilitation.

The 2014 North Kern Water Operations budget for capital improvement and work orders contains funding for operation and continued implementation of the EWMPs described in Table 49. This budget includes \$120,000 for capital expenditures and \$181,000 for work orders. Table 50 presents the schedule for implementing EWMPs.

Table 50. Schedule to Implement EWMPs

EWMP	Activities Scheduled for 2014	Staffing Requirements	Budget Allotment	AWMC MOU Demand Measures
Critical				
1 - Water Measurement	On-going	District staff	Operations	C-1
2 - Volume-based Pricing	Currently implemented	Not applicable	Not applicable	
Conditional				
1 - Alternate Land Use	Not applicable	Not applicable	Not applicable	B-1
2 - Recycled Water Use	Currently implemented	Not applicable	Not applicable	B-2
3 - On-Farm Irrigation Capital Improvements	Currently implemented	Not applicable	Not applicable	B-3
4 – Incentive Pricing Structure	On-going	Management	Operations	C-2
5 – Infrastructure Improvements	Various activities*	District staff	Capital expenditures	B-5
6 – Order/Delivery Flexibility	On-going	District staff	Operations	B-6
7 – Supplier Operational Outflow and Tailwater Systems	Not applicable	Not applicable	Not applicable	B-7
8 – Conjunctive Use	On-going	District staff	Operations	B-8
9 – Automated Canal Controls	Currently implemented	Not applicable	Not applicable	B-9
10 – Customer Pump Test/Evaluation	On-going	District staff	Operations	
11 – Water Conservation Coordinator	Implementation planned	District staff	Operations	A-2
12 – Water Management Services to Customers	On-going	District staff	Operations	A-3
13- Identify Institutional Changes	On-going	Management	Operations	A-5
14 – Supplier Pump Improved Efficiency	On-going	District staff	Operations	A-6

* Meter, gates and turnout installations, weir and structure replacement, CT-1 Canal lining, Shafter-Wasco ID South Interconnection, Shafter-Wasco ID North Interconnection, 8-17 Calloway Central

Table 51 presents an estimate of the water savings or improvements in water management anticipated to occur over the next five and ten years as a result of programs now being implemented or being planned by the District.

Table 51. Report of EWMPs Efficiency Improvements

EWMP No.¹	EWMP	Estimate of Water Use Efficiency That Occurred Since Last Report	Estimated Water Use Efficiency 5 and 10 years in Future
5	Lined portions of Calloway Canal to reduce seepage.	NA	Estimated annual seepage reduction of 2,265 AF for lining of reaches A, B, C and D.
9	Implemented SCADA monitoring to check water levels at strategic locations in the District’s distribution system to prevent overflow of regulating reservoir storage.	NA	This project is estimated to reduce annual losses from overflow by 500 AF.
5	Converted the 8-9 and 9-6 canals into pipeline conveyance.	NA	Average annual seepage and evaporation reduction of 4,000 AF
5	Constructed a lined canal between the Calloway Canal and the Cross Valley Canal including a new turnout on the CVC.	NA	Average annual seepage reduction of 2,465 AF
5	Installed a new pump station and one mile of 96-inch diameter concrete pipe to convey water from the Calloway Canal to the Lerdo Canal.	NA	Average annual seepage and evaporation reduction of 1,900 AF
1	Replaced old propeller meters with new meters.	NA	Improved measurement accuracy but no quantifiable improvements in water use efficiency.
1	Implemented iPhone scanning and real-time water meter reading network so delivery information can be uploaded to the District’s server and accounting program.	NA	Improved accuracy in reporting of delivery information and in accounting and billing of water usage.

¹ EWMP numbers correspond to Water Code §10608.48(c).

B. Documentation for Non-Implemented EWMPs

North Kern has implemented, or is in the process of implementing, each of the recommended EWMPs other than those categorized in Table 49 as being Not Applicable. Although certain of these measures are not locally cost-effective as individual water conservation measures, the District views them as elements of a broad program that enables North Kern to provide a high level of service to its agricultural customers and to responsibly manage surface water and groundwater resources in the District’s service area. This position is summarized below in Table 52.

Table 52. Non-Implemented EWMP Documentation

EWMP #	Description	(check one of both)		Justification/Documentation
		Technically Infeasible	Not Locally Cost-Effective	
10608.48.c(1)	Facilitate alternative land uses			The District would consider requests for alternative land uses, but there is little need to modify land use as a means of improving the efficiency of irrigation service.
10608.48.c(7)	Tailwater recovery systems			On-farm practices at North Kern generate little tailwater. Spillage is now recovered and is an element of the District's groundwater recharge program.

Section VIII. Supporting Documentation Agricultural Water Measurement Regulation Documentation

A. Description of Water Measurement Best Professional Practices

Section 10608.48(b) of the California Water Code requires that agricultural water suppliers governed by this section of the code, “Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10” of the legislation. Further, Section 531.10(a) requires that, “An agricultural water supplier shall submit an annual report to the department (DWR) that summarizes aggregated farm-gate delivery data, on a monthly or bi-monthly basis, using best professional practices.”

North Kern’s ability to comply with these requirements rests on the fact that all irrigation deliveries in the District are measured to support the District’s volumetric water pricing to its customers. All deliveries are made through piped turnouts, with the diameters of the pipes ranging between 8 and 12 inches. Deliveries at most farm turnouts are measured with propeller flowmeters manufactured by McCrometer and Seametrics although a few turnouts still use Armco (Waterman) gates where flows are calculated based on the gate opening. The propeller meters are mounted within the turnout piping following accepted engineering practices and measure flow rates and also record the total volume of water delivered. Figure 7 is a photograph of a typical farm turnout from a District canal.



Figure 7. Typical North Kern Irrigation Turnout.

Data on volumes of delivered water recorded by the District are updated on a daily basis. Ditch-tenders enter water delivery readings into the District’s water management software by first scanning the code for the turnout into their cell phone and then entering the reading from the water meter. This information is emailed from the field, uploaded into the District’s water management software

and reviewed by a supervisor as a quality control procedure. Irrigated acreage is determined based upon a cropping forecast that is prepared each winter for the upcoming season. These crop reports include information obtained directly from water users that identify the crop type, irrigation method and acreage. The irrigated acreage values are verified by checking the acreage identified in the Kern County Assessor's Parcel Number database and are further field confirmed by North Kern field staff. As all turnouts at North Kern deliver water to single fields, there is a direct correspondence between the turnout identification number and the area served by that turnout.

Water delivery data are made available to water users whenever it is requested throughout the season, which enables irrigators to monitor their water usage. The District's billing system uses the pricing structure adopted by North Kern's Board of Directors and the flowmeter readings at a given farm turnout to determine the water bill associated with District deliveries through that turnout.

B. Engineer Certification and Apportionment

The methodology used to determine the individual device accuracy values found in Section 597.3(a) will be verified by a Professional Engineer using industry accepted standards. These methods will take into account the differential in water levels and/or fluctuations in the flow rate or velocity during the delivery event and the type, size and characteristics of the measuring device being verified.

Flowmeters at each farm turnout measure District deliveries to each irrigator's place of use. The flowmeter indicates the instantaneous flow rate and the cumulative total of water delivered, with the latter function referred to as a "totalizer".

Previously, meters were only repaired or replaced when a meter was observed to be malfunctioning or when a water user questioned the accuracy. However, in 2012 the District checked the accuracy of over 15 percent of the district's meters to provide documentation for this plan. The methodology used to determine whether the accuracy of a representative sample of the flow-measurement devices complies with the requirements of Section 597.3(a) is described later in this section. North Kern plans to adopt this methodology for field testing of existing flow metering devices and to present a report approved by a California-registered Professional Engineer as the basis for ongoing compliance with SBx7-7.

C. Water Measurement Conversion to Volume

SBx7-7 requires an annual volumetric accuracy of within ± 12 percent on existing devices. Since North Kern's flow-measurement devices include totalizers (which directly record cumulative flow volume), the devices' accuracy in measuring flow rates is representative of their ability to measure volumes of water delivered. Therefore, the discussion presented later in this section that relates to testing the accuracy of measurement of flow rates applies equally to determination of the accuracy of measurement of volumes of delivered water.

D. Legal Certification and Apportionment – Legal Access to the Farm-gate

North Kern staff has legal access to install, measure, maintain, operate, and monitor flow-measurement devices at all farm turnouts from the District's irrigation distribution system. In addition, with few exceptions turnouts deliver water to single fields. Therefore there are no institutional or legal impediments that restrict access to turnouts or measurement of water and, for the purposes of satisfying SBx7-7, there is no need to measure water upstream of points of delivery to individual customers.

E. Device Corrective Action Plan

As noted above, in the past North Kern has repaired or replaced flow meters only when there was some obvious deficiency in their performance or when a water user questioned the accuracy of a meter. In 2012 North Kern verified the accuracy of measurement at over 15 percent of its turnouts to document measurement accuracy for this plan.

Devices identified during the 2012 program to have measurement accuracies that departed by more than ± 12 percent from flows measured by a calibrated device will be sent to the district shop for repair. If the shop is not able to correct the inaccuracy in flow measurement, the device will be replaced. After installation in the field, the accuracy of repaired meters will be verified using a calibrated device, and an affidavit will be submitted by a California-registered Professional Engineer certifying the accuracy of each repaired meter to be within ± 10 percent by volume. New replacement meters will be laboratory certified by their manufacturer prior to installation to have an accuracy of measurement within ± 6 percent by volume. Repair or replacement of these flow meters will be completed within three years of approval of this testing program by DWR.

F. Farm Gate Measurement and Device Accuracy Compliance

SBx7-7 requires that agricultural water suppliers measure the volume of water delivered to customers with sufficient accuracy to comply with standards described in the legislation. These standards are presented below.

1. *Measurement Options at the Delivery Point or Farm-gate of a Single Customer*

An agricultural water supplier shall measure the volume of water delivered at the delivery point or farm-gate of a single customer. 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. An existing measurement device shall be certified to be accurate to within ± 12 percent by volume.

2. *Initial Certification of Device Accuracy*

For existing measurement devices, the device accuracy shall be initially certified and documented by either:

- *Field-testing that is completed on a random and statistically representative sample of the existing measurement devices. Field-testing shall be performed by individuals trained in the use of field-testing equipment and documented in a report approved by an engineer.*
- *Field-inspections and analysis completed for every existing measurement device. 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.*

3. Protocols for Field Testing

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 percent 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.

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 relevant accuracy criteria, the agricultural water supplier shall provide in its Agricultural Water Management Plan a plan to test an additional 10 percent 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.

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 relevant accuracy standards and that operation and maintenance protocols meet best professional practices.

4. North Kern WSD Program for Compliance with Water Measurement Requirements

In 2012 North Kern followed the guidelines described above by identifying 33 randomly-selected turnouts to serve as a representative sample for verification of flow measurement. This sample population represents 16.7 percent of the District's 198 turnouts. These turnouts deliver water to 10 percent of the District's irrigated area. Flows measured at each of the turnouts within the sample population were compared with measurements recorded by a calibrated ultrasonic flowmeter to determine the accuracy of measurement. The sample population is shown in Appendix E.

Because the propeller meters used by the District are equipped with totalizers, errors detected in the measurement of flow rates correspond with errors in measurement of delivered water volumes, with measurement error being defined as the percentage departure between the propeller flowmeter reading and the corresponding reading taken with the calibrated ultrasonic

meter. This formula for computing error conforms with the following language from Section 572.2 of the legislation.

“Accuracy” means the measured volume relative to the actual volume, expressed as a percent. The percent shall be calculated as $100 \times (\text{measured value} - \text{actual value}) / \text{actual value}$, where the “measured value” is the value indicated by the device or determined through calculation 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.

A histogram of the error of measurement values is shown below in Figure 8. Note that all readings were taken for a period of 10 minutes at each turnout.

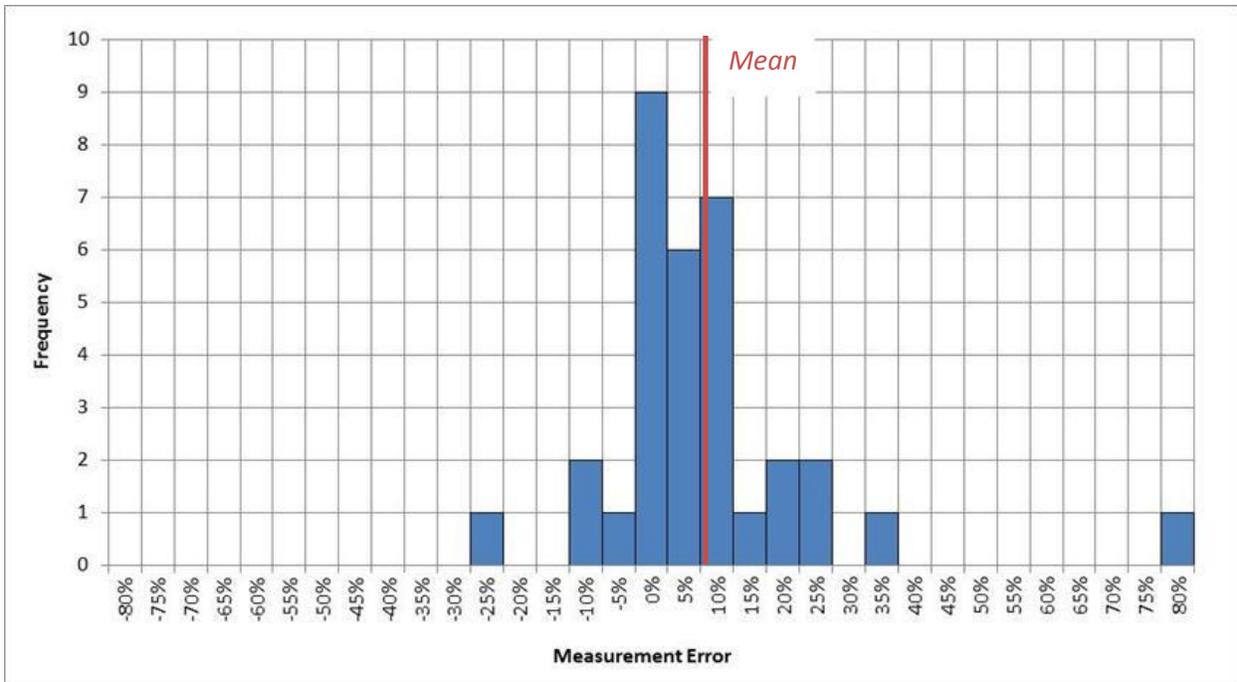


Figure 8. Histogram of percent measurement error at individual turnouts

As illustrated in the histogram, although the sample population includes a maximum value of 79 percent, the mean sample error was 6.1 percent, with a standard deviation of 16.8 percent and with approximately 58 percent of the individual error values falling within ± 6 percent of the calibrated values and 76 percent falling within ± 12 percent. This analysis indicates that flow measurement at a majority of turnouts meets the ± 12 percent volumetric measurement accuracy required by SBx7-7 for existing measurement devices, with the accuracy of about 24 percent of the sampled devices falling outside of the acceptable accuracy limits.

The next analysis was performed using sampling errors that had been weighted so that the error of measurement is proportional to the volume of water delivered at the turnout. Weighting was

accomplished by multiplying the error of measurement computed at each turnout by the flow meter reading. This weighted data yielded a 10.6 percent error of measurement for the total sample population. However, as illustrated in Figure 8, much of the total sample error is the result of errors associated with a small number of turnouts. For example, if the turnouts with the four highest weighted measurement errors (Turnouts 8-00-60-A, 8-00-78B, 8-03-25A, and 8-17-6B) were removed from the remaining population, the error of the sample population would be reduced to 5.9 percent. This value indicates that, with few exceptions, the volume of water delivered by the turnouts included in the sample population is measured at an accuracy that conforms with the standards presented in SBx7-7.

References

1. California Department of Water Resources. 2012. “A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan”.
2. California Code of Regulations; Title 23; Water; Division 2, DWR. Chapter 5.1 Water Conservation Act of 2009. Article 2. Ag Water Measurement.
3. Irrigation Training and Research Center. 2012. “SBx7 Compliance for Agricultural Districts”, draft.
4. North Kern Water Storage District, “2012 Groundwater Management Plan”, draft
5. Luedeling, E; Zhang, M; Girvetz, E.H., July 2009. “Climatic Changes Lead to Declining Winter Chill for Fruit and Nut Trees in California during 1950-2099”. PLoS ONE 4(7).
6. Hanson, R.T.; Flint, A.L.; Flint, L.E.; Faunt, C.C.; Schmid, W.; Dettinger, M.D.; Leake, S.A.; and Cayan, D.R., 2010. “Integrated Simulation of Consumptive Use and Land Subsidence in the Central Valley, California, for the Past and for a Future Subject to Urbanization and Climate Change”. Proceedings of the Eighth International Symposium on Land Subsidence (EISOLS).
7. United States Geological Survey. Fact Sheet 2009-3074. September 2009. “Effects of Climate Variability and Change on Groundwater Resources in the United States”.
8. Hanson, R.T.; Flint, L.E.; Flint, A.L.; Dettinger, M.D.; Faunt, C.C.; Cayan, D.R., and Schmid, W., 2012. “A Method for Physically Based Model Analysis of Conjunctive Use in Response to Potential Climate Change”, Water Resources Research, Vol. 48.

Appendix A
Public Hearing Notice

NORTH KERN WATER STORAGE DISTRICT

PUBLIC HEARING NOTICE

Notice is hereby given that the North Kern Water Storage District (NKWSD) will hold a public hearing on **August 19, 2014 at 7:30 AM** regarding a proposed **Agricultural Water Management Plan**, and consider adoption of the Plan.

The Water Conservation Act of 2009 requires certain agricultural water suppliers in California to prepare Agricultural Water Management Plans (AWMP). To meet the requirements of this legislation, NKWSD is preparing an AWMP. The AWMP includes a discussion of NKWSD and its irrigation facilities, water supply and demand, and various programs, policies and efficient water management practices being implemented now or planned in the coming years. The NKWSD Board of Directors will hold a hearing to consider public comments on the proposed AWMP.

A copy of the AWMP may be reviewed at the NKWSD office (33380 Cawelo Avenue, Bakersfield, CA). Written comments submitted prior to the hearing, should be directed to:

Ram Venkatesan
North Kern Water Storage District
P.O. Box 81435
Bakersfield, CA 93380

Comments may also be provided at the hearing.

If you have questions regarding the AWMP, please contact Ram Venkatesan at (661) 393-2696.

Appendix B

Public Hearing Notification Letters

P.O. Box 81435
Bakersfield, CA 93380-1435
Administration
Telephone: 661-393-2696
Facsimile: 661-393-6884



33380 Cawelo Avenue
Bakersfield, CA 93308-9575
Water Orders and Operations
Telephone: 661-393-3361
www.northkernwsd.com

MAILED
8/12/14 CC.

NORTH KERN WATER STORAGE DISTRICT

August 12, 2014

Mr. Michael James
Public Works Director
City of Shafter
336 Pacific Ave,
Shafter, CA 93263

RE: North Kern WSD Agricultural Water Management Plan – Public Hearing Notice

The North Kern Water Storage District (North Kern, District) is scheduled to hold a hearing to receive public comment on the District's Agricultural Water Management Plan (AWMP) at 7:30 AM on August 19, 2014 in the District's Board Room located at 33380 Cawelo Avenue, Bakersfield, CA. At the hearing, the District's Board will receive public comments on the draft AWMP. The North Kern Board will consider adoption of the AWMP at a meeting to be held following the Public Hearing.

The AWMP includes a discussion of North Kern and its irrigation facilities, water supply and demand, and various programs, policies and efficient water management practices, being implemented now or planned in the coming years. A copy of the draft plan is available for review at the District office.

Any comments prior to the hearing should be submitted to:

Ram Venkatesan
North Kern Water Storage District
P.O. Box 81435
Bakersfield, CA 93380

Any questions regarding the draft AWMP or the adoption process should be directed to Ram Venkatesan at (661) 393-2696 or ram@northkernwsd.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Richard A. Diamond".

Richard A. Diamond
General Manager

P.O. Box 81435
Bakersfield, CA 93380-1435
Administration
Telephone: 661-393-2696
Facsimile: 661-393-6884



33380 Cawelo Avenue
Bakersfield, CA 93308-9575
Water Orders and Operations
Telephone: 661-393-3361
www.northkernwsd.com

NORTH KERN WATER STORAGE DISTRICT

August 12, 2014

Mr. J. Paul Paris
City Manager
City of Wasco
746 8th St,
Wasco, CA 93280

RE: North Kern WSD Agricultural Water Management Plan – Public Hearing Notice

The North Kern Water Storage District (North Kern, District) is scheduled to hold a hearing to receive public comment on the District's Agricultural Water Management Plan (AWMP) at 7:30 AM on August 19, 2014 in the District's Board Room located at 33380 Cawelo Avenue, Bakersfield, CA. At the hearing, the District's Board will receive public comments on the draft AWMP. The North Kern Board will consider adoption of the AWMP at a meeting to be held following the Public Hearing.

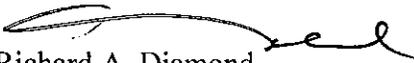
The AWMP includes a discussion of North Kern and its irrigation facilities, water supply and demand, and various programs, policies and efficient water management practices, being implemented now or planned in the coming years. A copy of the draft plan is available for review at the District office.

Any comments prior to the hearing should be submitted to:

Ram Venkatesan
North Kern Water Storage District
P.O. Box 81435
Bakersfield, CA 93380

Any questions regarding the draft AWMP or the adoption process should be directed to Ram Venkatesan at (661) 393-2696 or ram@northkernwsd.com.

Sincerely,


Richard A. Diamond
General Manager

P.O. Box 81435
Bakersfield, CA 93380-1435
Administration
Telephone: 661-393-2696
Facsimile: 661-393-6884



33380 Cawelo Avenue
Bakersfield, CA 93308-9575
Water Orders and Operations
Telephone: 661-393-3361
www.northkernwsd.com

NORTH KERN WATER STORAGE DISTRICT

August 12, 2014

County Clerk
County of Kern
1115 Truxtun Avenue,
Bakersfield, CA 93301

RE: North Kern WSD Agricultural Water Management Plan – Public Hearing Notice

The North Kern Water Storage District (North Kern, District) is scheduled to hold a hearing to receive public comment on the District's Agricultural Water Management Plan (AWMP) at 7:30 AM on August 19, 2014 in the District's Board Room located at 33380 Cawelo Avenue, Bakersfield, CA. At the hearing, the District's Board will receive public comments on the draft AWMP. The North Kern Board will consider adoption of the AWMP at a meeting to be held following the Public Hearing.

The AWMP includes a discussion of North Kern and its irrigation facilities, water supply and demand, and various programs, policies and efficient water management practices, being implemented now or planned in the coming years. A copy of the draft plan is available for review at the District office.

Any comments prior to the hearing should be submitted to:

Ram Venkatesan
North Kern Water Storage District
P.O. Box 81435
Bakersfield, CA 93380

Any questions regarding the draft AWMP or the adoption process should be directed to Ram Venkatesan at (661) 393-2696 or ram@northkernwsd.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Richard A. Diamond".

Richard A. Diamond
General Manager

Appendix C

Resolution of Plan Adoption

RESOLUTION NO. 14-89
ADOPTING NORTH KERN WATER STORAGE DISTRICT'S
AGRICULTURAL WATER MANAGEMENT PLAN

WHEREAS, with the passage of the 2009 Water Conservation Act (Water Code Sections 10800, et seq. also known as SBx7-7 (the "Act")), certain Agricultural Water Suppliers are to prepare an Agricultural Management Plan, among other things, intended to encourage agricultural water suppliers to assess current efficient water management practices, to evaluate additional practices that may conserve water, and to require accurate measurement of water; and

WHEREAS, the District has prepared an Agricultural Water Management Plan pursuant to the guidelines that were issued by the California Department of Water Resources on October 12, 2012 to aid water suppliers in preparing Agricultural Water Management Plans in accordance with the requirements of the Act.

WHEREAS, the District published notice of the availability of the Plan and of a hearing regarding same, and subsequently held a hearing on August 19, 2014 to hear and consider comments from the public on the Plan; and

WHEREAS, at the noticed public hearing, there were [no] verbal objections to the Plan.

NOW, THEREFORE, BE IT RESOLVED, that the Board of Directors of the North Kern Water Storage District does hereby approve and adopt the District's Agricultural Water Management Plan as presented and prepared in accordance with the Act.

Moved by Director Waterhouse, seconded by Director Glende, that the foregoing resolution be adopted.

The following vote was had:

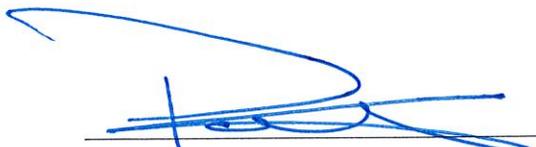
Ayes:	Waterhouse, Glende, Mendes, Fornoff, Andrew
Noes:	None
Absent:	None

The President declared the resolution adopted.

o0o

I, Patrick Mize, Secretary of the Board of Directors of the NORTH KERN WATER STORAGE DISTRICT, do hereby CERTIFY that the foregoing is a full, true and correct copy of a resolution duly adopted at a meeting of said Board of Directors held the 19th day of August 2014.




Secretary of the Board of Directors
of the North Kern Water Storage District

Appendix D

North Kern WSD: Rules and Regulations for
Distribution and Use of Water

When Recorded return to:

North Kern Water Storage District
33380 Cawelo Avenue
Bakersfield, CA 93308-9575

NORTH KERN WATER STORAGE DISTRICT

**RULES AND REGULATIONS FOR
DISTRIBUTION AND USE OF WATER**

Amended and Restated July 15, 2014

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NORTH KERN WATER STORAGE DISTRICT

RULES AND REGULATIONS FOR DISTRIBUTION AND USE OF WATER

INTRODUCTION

These Rules and Regulations are established pursuant to the requirements of Division 14, particularly Section 43003, of the California Water Code to enable the North Kern Water Storage District to perform its functions economically, and to achieve an efficient distribution of water for the benefit of the District.

These Rules and Regulations are in implementation of the District's Project as herein defined and are applicable only to lands within the District located north of Seventh Standard Road excepting the lands located within the Rosedale Ranch Improvement District of the District.

Section I. DEFINITIONS

Unless the provision or context otherwise requires, the definitions contained herein govern the construction of these Rules and Regulations.

1. "District" means the North Kern Water Storage District.
2. "District Office" is the office designated from time to time by the Board of Directors pursuant to Section 40650 of the California Water Code and is currently located at 33380 Cawelo Avenue, Bakersfield, California 93308-9575. The mailing address of the District Office is P.O. Box 81435, Bakersfield, California 93380-1435. The telephone number is 661-393-2696.
3. "District Records" means the records on file at the District Office.
4. "Board" means the Board of Directors of the North Kern Water Storage District as duly constituted pursuant to Division 14 of the California Water Code.
5. "Manager" is the person appointed by the Board pursuant to its directions to manage and control the activities of the District.
6. "Project" and Adopted Project" is the District's Original Project, adopted July 31, 1951, as modified in the Report on Modification of North Kern Water Storage District, Adopted 1950, which modified report was adopted March 3, 1964, and the new project for a proposed contract with the United States for use of conservation storage space in Isabella Reservoir, adopted by vote of the landowners on August 25, 1964 and includes District's distribution system, including rights of way, land and water used in connection therewith which are collectively referred to as "Project Facilities."

7. "Distribution System" means all fixed installations which are owned and/or operated by the District having the mission of diversion, conveyance, control, measurement, pumping, storage, spreading and delivery of water to land within the District.

8. "Class I Lands" are those lands defined and classified as Class I Lands in the 1950 Project Report on file at the District Office as modified from time to time by action of the Board. These lands are also referred to as "Canal Served Lands," and are shown on the map attached hereto.

9. "Class I Water" is project water as defined in District's adopted project that is available for delivery pursuant to these Rules and Regulations, to Class I lands or so-called "Canal Served Lands." Class I water has as its main source of supply the District's canal system, supplemented in shortage years by water obtained from groundwater from District pumps.

10. "Class II Lands" are lands defined as Class II Lands in the 1950 Project Report on file at the District Office as modified from time to time by action of the Board. These lands are also referred to as so-called "Private Pump Served Lands," and are shown on the map attached hereto. Their main source of water supply is derived from their own private pumping plants.

11. "Class II Water" is water made available by District to a portion of Class II lands. At no time is the District under any obligation to provide surface water service to Class II lands. There are three types of Class II water. "Regular Class II Water" is water made available to Class II lands in years or at times when the full water needs of Class I lands have been satisfied and/or District spreading is occurring. "Special Class II Water" is water made available to Class II lands in years or at such times when the District is able to purchase water from others for the benefit and use by Class II lands. "Emergency Class II Water" is water made available to Class II lands on a temporary, interruptible basis while the private pumping facilities serving said lands are inoperative.

12. "Special Purpose Water" is water delivered on an interruptible and nondependable basis for construction work or other special purposes not directly related to agricultural uses under conditions established by the Board.

13. "Water User" is an owner of land which is entitled to receive surface water service from the District pursuant to these Rules and Regulations.

14. "Water Toll Rate" is the charge established from time to time by the Board as the amount to be paid by Water User for surface water service furnished by the District pursuant to these Rules and Regulations.

15. "Base Service Charge" is defined at Section XIII hereof.

16. "Agricultural Use" means water delivered primarily for production of agricultural crops, livestock and incidental use.

17. "Application for Water Service" is the form to be provided by the District to be completed and filed by Water User and acknowledged by the landowner. Two different types of forms are utilized. One form or application to be executed by the Class I Water User; the other form or application to be executed by the Class II Water User.

For purposes of clarification, the singular includes the plural and masculine includes feminine.

SECTION II. AUTHORITY OF DISTRICT MANAGER AND EMPLOYEES

1. Manager

The District's Distribution system is under the exclusive management and control of the Manager. No other person except the Manager, or his designee, shall operate any of the facilities of the District's system. The responsibility for carrying out said operations shall rest with the Manager of the District, who shall designate certain District employees for operation and maintenance responsibilities of District's distribution system.

2. District Employees, Agents and Designees

The Manager shall supervise the duties and activities of all District employees, agents and designees in a manner that produces, at all times, an efficient and economical operation of all District facilities.

Any controversy arising between a Water User and a District employee, agent or designee that cannot be amicably resolved by the parties shall be directed to the Manager for consideration. If the resultant settlement decision by the Manager does not meet with the satisfaction of the Water User, an appeal in writing can be addressed to the Board of Directors, whose subsequent decision shall be final.

SECTION III. DELIVERY AND USE OF WATER

1. Water User may use project water only as provided in these Rules and Regulations. Water User acquires no property right in the District's Distribution System or in the project water and the District retains the right to all water not consumptively used by a Water User.

2. District will deliver water to Water Users through its Distribution System only pursuant to these Rules and Regulations.

3. Water furnished by the District other than Special Purpose Waters is to be used for agricultural use only. All water furnished by the District is in a raw, untreated condition and is considered unfit for human consumption without treatment. The character and quality of the water furnished may vary from time to time, and the District does not represent, guarantee or warrant in any manner or respect the character of quality thereof. The District may, however, suspend service during any period of time it has determined that the water is unfit for agricultural purposes which determination shall be final and conclusive.

4. Emergency Class II water may be made available to a person requesting such service if the Manager determines that providing such service is in the best interest of the District and will not interfere with obligations of the District. The Manager shall keep the Board advised of any Emergency Class II Water Service. Alternatively, the Board may direct that Emergency Class II water be made available upon finding such action would be in the best interest of the District and would not interfere with obligations of the District.

5. Special purpose water service may be made available if the Board determines that it is in the best interest of the District, will be for a limited period of time and will only be made if it does not interfere with the obligations of the District.

SECTION IV. APPLICATION FOR WATER SERVICE AND AUTHORIZATION FOR ADMINISTRATION THEREOF

1. In order to be eligible for surface water service the owner of the lands eligible to be served must complete, execute and file with the District an Application for Water Service which describes the lands to be served and establishes those persons authorized to place turn on and turn off orders pursuant to Section V hereof.

No application will become effective for a water user who is delinquent in any District charge or for service to any lands for which any assessment, toll or charge is delinquent unless said water user meets the criteria pursuant to Section IX-8.

Forms of the application are available at the District Office. The original and one copy of the completed application shall be returned to the District office for filing. Should the District have actual knowledge that there are Class I lands within the District for which no application has been filed, it may mail an application to the owner in accordance with the ownership and address shown on the current records at the District office. None of the foregoing establishes a duty on the District and it remains the duty of the landowner to see that a proper application is on file with the District.

When land is sold or title otherwise transferred, or when a new tenant takes possession, the District will not deliver water to such lands until a proper and binding

Application for Water Service is completed and filed by the new owner and/or the new tenant.

2. An application shall be executed by all persons that are owners of record of the lands to be served and each signature must be acknowledged before a Notary Public.

If the application is executed in any of the following capacities it shall be accompanied by the following information:

- a. A guardian, conservator, administrator, executor or trustee of a testamentary trust shall furnish a certified copy of an appropriate order of court authorizing such action.
- b. A trustee of an intervivos trust shall furnish a copy of the recorded trust powers.
- c. A partnership shall furnish a copy of a statement of partnership recorded under Corporation Code Section 15010.5. An application executed by a General Partner in a limited partnership shall furnish evidence of authority to obligate the partnership.
- d. An attorney-in-fact shall furnish a copy of the recorded power of attorney.
- e. Any other person acting in any representative capacity shall furnish evidence of his authority to act to the satisfaction of the Board.

3. If an Application for Water Service is executed by any of the following, it shall be accompanied by an Appointment of Agent to Act For Water User form which provides authority to do any and all acts to be done by the water user pursuant to these Rules and Regulations, including but not limited to, the authority to order water service for the designated lands, to receive all notices and billings from the District and to appoint sub-agents with like authority.

Such agents are to be appointed where the ownership of the land affected is in more than one person, excepting a husband and wife living at the same address, including but not limited to the situation where the subject land is owned by:

- a. A corporation.
- b. A partnership.
- c. A Limited Liability Corporation.
- d. A Limited Liability Partnership.
- e. A joint venture.
- f. The State, a county or other public agency.
- g. Similar entities.

Forms of the Appointment of Agent are available at the District office. They are to be executed and filed in the same form and manner as the application.

4. Water user or his duly appointed agent may designate a person or persons other than himself to place orders for and/or receive District billings pursuant to Section IX hereof. Said designation shall be on forms provided by the District and shall constitute the consent of the Water user to the collection by the District of all tolls and charges arising from the water orders so authorized in the manner authorized by Sections 47181 to 47185, inclusive, of the California Water Code.

5. Without limiting any other provision in these Rules and Regulations, the power and authority of an agent or designee appointed pursuant hereto shall continue until the owner of the lands affected shall revoke such appointment. In event of such revocation, the District Manager shall be notified in writing. In the event of multiple ownerships a revocation may be made by a majority of the landowners affected, determined on an acreage basis. It is understood that the agency or designation made pursuant hereto shall not be revoked by death or incapacity of less than all of the appointing landowners.

6. In administering these Rules and Regulations, the District will rely upon the records on file at the District office for matters regarding title to land, address of landowners, authorizations, appointments, designations, and the like, filed with the District by a water user pursuant hereto which are continuing representations upon which the District is entitled to rely unless and until the District has received at the District office actual written notice of revocation. Such representations are for the benefit of the lands affected and any charge or obligation arising in favor of the District by reason of its reliance upon such continuing representations, authorizations, applications, appointments, designations and the like filed with the District shall constitute a lien upon the lands affected thereby with the same force and effect and priority as an assessment lien and, in addition to all other remedies which may be available to the District shall be collectible, all as provided in Sections 47181 to 47185, inclusive, and Section 43003 of the California Water Code.

SECTION V. ORDERING WATER SERVICE AND MEASUREMENT OF WATER

The landowner, by filing a fully executed Application, making the necessary appointments and by paying all assessments, tolls and charges when due, satisfies these Rules for servicing of water orders.

Orders to turn on and turn off water shall be made by the landowner, or the person authorized pursuant to Section IV hereof, at the District Office, personally or by telephone Bakersfield, 661-393-3361 or Shafter-Wasco 661-746-3364.

Charges for water service made available pursuant to water orders will be

calculated on the basis of continuous flow, from the time of the scheduled turn on to the scheduled turn off, multiplied by the appropriate water toll rate, and in accordance with Section IV.5. hereof.

Water user acquires no property right in the District's water supply or District's facilities by filing such order and the District retains the right to all water not consumptively used by the water user.

1. Such orders shall be submitted a minimum of 48 hours prior to the time service is requested. Water delivered will run continuously day and night until the amount of water ordered and scheduled by District for the period has been delivered. No "turn on" order will be accepted for less than a 24-hour period, unless special arrangements can be made with the District or the District has in effect a less-than-24-hour run program where water users can place orders for specific less than 24-hour periods. For the purpose of properly scheduling District's activities, it is important that "turn off" orders be given at the same time that a "turn on" order is given.

2. In general, service will be provided as requested; however, at times, District may require the rescheduling of service due to capacity limitations within the District's distribution system or necessary shutdowns for emergencies beyond District control.

3. On the day the order is put into effect the system attendant will turn the delivery gate on or off, in accordance with the scheduled delivery, at the time he passes the gate on his regular run. Generally, turn ons, turn offs and adjustments will be made by District's system attendant in the mornings. Orders for a certain hour cannot be accepted, but the system attendant will cooperate with the water user as far as possible and still maintain efficient operation of the system.

4. In the event water delivery is reduced or turned off due to actions taken by the water user, his agents, designees or their employees (including but not limited to a request that District make a non-scheduled turn off) the full amount of the water service ordered by the water user and scheduled by the District shall be paid for in accordance with the terms of the Application for Water Service and the accepted water order. If a water user, his agent, servant, employee or designee effects such unauthorized turn off he must immediately notify the system attendant or District Office.

SECTION VI. EMERGENCY TURN OFF

Water user or the District may, in an emergency, turn off the supply of water at the delivery facility. If the District effects such an emergency turn off, the water user receiving service will be notified as soon as possible. As soon as service can be resumed the water user will be notified that the District is completing his order. If a water user, his agents, servants, employees or designees effects such emergency turn off he must immediately notify the system attendant or District Office. Water users, by executing the Application for Water Service, agree to be responsible for loss or damage

caused by effecting such a turn off, which amount may be collected in the same manner as the water service charges.

SECTION VII. INTERRUPTIONS IN SERVICE

Temporary shutdowns may be made by District to make improvements and repairs. Except in any emergency, all affected water users will be notified prior to making such temporary shutdowns.

In the event the District projects a water shortage for the balance of the seasonal year then the available supply will be proportioned as determined by the Board of Directors for all Class I landowners in a manner equitable and fair.

SECTION VIII. CONTROL, USE AND RECAPTURE OF WATER

1. The District will not be responsible for the control, carriage, handling, use, disposal or distribution of water delivered to water user hereunder outside the facilities then being operated and maintained by District. Water user shall indemnify, assume the defense of and hold harmless the District and its officers, agents and employees from any and all loss, damage, liability, claims or causes of action of every nature whatsoever, for damage to or destruction of property, including District's property, or for injury to or death of persons, in any manner arising out of or incidental to the control, carriage, handling, use, disposal or distribution of water outside such facilities.

2. District retains the right to all Project water not consumptively used by a water user. District may recapture water delivered to water user which may return to a District facility from any source. Such recapture shall not relieve a water user from any liability under sub-section 1 above. Once recaptured, water user causing such water to be subject to recapture shall have no recourse to District except as to such right as he may have as a water user.

SECTION IX. BILLINGS, PAYMENT AND DELINQUENCY

1. The landowner is responsible to the District for the payment of all tolls, charges and assessment incurred or assessed against said lands pursuant to said Adopted Project or these Rules and Regulations.

2. The Board may from time to time establish separate tolls for Class I Water, Regular Class II Water, Emergency Class II Water, and Special Purpose Water, less-than-24-hour-run-surcharge, or other classifications of water service it may establish. Likewise the Board may from time to time establish tolls and charges for use of District facilities. Water tolls and charges shall be filed with the District's records and shall be available for public inspection.

3. Charges for water service made available pursuant to water orders will be calculated on the basis of continuous flow from the time of the scheduled turn on to the scheduled turn off multiplied at the appropriate water toll rate.

In the event water delivery is reduced or turned off due to actions taken by the water user, his agents, or designees or their employees, including but not limited to a request that District make a non-scheduled turn off, the full amount of the water service ordered by the water user and scheduled by the District shall be paid.

4. Billings for water service made available pursuant to water orders will be prepared in accordance with water the District scheduled for delivery pursuant to turn on and turn off orders made pursuant to Section V hereof. The billings will be calculated on the basis of continuous flow during all days and nights, including Sundays and holidays, from the time of the scheduled turn on to the scheduled turn off multiplied the appropriate water toll rate and in accordance with Section IV.5 hereof.

5. For convenience of the water users, invoices for water service will be sent to the person designated in the Application for Water Service or Authorization to Receive District Billings and to place water orders shortly after the first of the month for the water taken during the prior month. Payments are due, payable and delinquent as provided in subsection IX.7 hereof.

No water will be delivered if the water user's account is delinquent or if the lands to be served are delinquent as to any District assessment, toll or charge.

6. Payment by check should be made to the order of the North Kern Water Storage District and payments may be mailed to P. O. Box 81435, Bakersfield, California 93380-1435 provided they are received with the time specified. Payments by check shall be deemed payment on the date received provided the check clears the bank in the ordinary course of business.

7. Payment is due and payable on the 1st day of the month following delivery and, if the payment is not received by the District by 5:00 o'clock p.m. on the 30th day following the date it is due and payable, said payment is delinquent within the meaning of the provisions of Water Storage District Law and the availability of water to said lands and delivery of water to said water user will be discontinued. Water service will no longer be made available to said delinquent lands and no deliveries of water will be made to said delinquent water user until all sums due and payable to District from said lands and water user, together with all interest and penalties, have been paid. To reinstate a delinquent account payment of all charges, principal and interest must be paid in full and advance payments or security deposits may be instituted by order of the Board as a condition of future availability of water to said water user. Under Water Storage District Law, such toll and charge, when delinquent, must be increased by a penalty of 10% and the resulting total bears interest at the rate of 12% per year from the date of delinquency until date of payment.

Should a water user be delinquent on January 1, the Board at its next regular meeting shall commence proceedings to collect the charge as provided in Sections 47181 to 47185, inclusive, of the California Water Code. This may lead to a sale of the property affected and to continued refusal of water service. The District may also initiate such at other times during the year as directed by the Board.

8. Upon being provided evidence that a water user may be able to utilize a deepwell or other alternative water supply, the District staff may allow a prepayment for water delivery to lands in which any assessment, toll or charge is delinquent. Upon utilization of the prepayment for water deliveries all deliveries shall cease.

SECTION X. INTERFERENCE WITH DISTRIBUTION SYSTEM

No person shall molest, tamper with, or interfere with structures, meters or devices used for the delivery of water. In this connection attention is directed to the following:

SECTION 592, PENAL CODE OF THE STATE OF CALIFORNIA: WATER DITCHES, ETC., PENALTY FOR TRESPASS OR INTERFERENCE WITH.

“Every person who shall, without authority of the owner or managing agent, and with intent to defraud, take water from any canal, ditch, flume or reservoir used for the purpose of holding or conveying water for manufacturing, agricultural, mining, irrigating or generation of power, or power, or domestic uses, or who shall without like authority, raise, lower or otherwise disturb any gate or other apparatus thereof, used for the control or measurement of water, or who shall employ or place, or cause to be emptied or placed, into any such canal, ditch, flume or reservoir, any rubbish, filth, or obstruction to the free flow of the water, is guilty of a misdemeanor.”

SECTION XI. RIGHT OF ENTRY

By execution of an Application for Water Service, water user grants to District, its agents, servants, employees, and designees, a right of entry of water user’s lands for the purpose of properly providing requested service by the water user.

SECTION XII. ENFORCEMENT OF RULES AND REGULATIONS

The manager shall be responsible for the enforcement of these Rules and Regulations. Refusal to comply with any of the Rules and Regulations shall be sufficient cause for the termination of water service, and water service will not again be furnished until full compliance has been made with all the requirements herein set forth. In no

event shall any liability accrue against the District or any of its officers, agents or employees, for damage, direct or indirect, arising from such temporary discontinuance or reduction of water deliveries.

SECTION XIII. PROCEDURE FOR ANNUALLY FIXING THE AMOUNT OF BASE SERVICE CHARGES

1. In accordance with Section 43003 of the Water Code, the following procedures are established for fixing tolls and charges authorized by Sections 43006 and 47180.

In order to provide for payment of project costs in proportion to services rendered to all lands within the District and in proportion to the services rendered to developed Class I and Class II lands under present Project conditions it is necessary that a Base Service Charge, in addition to tolls and charges fixed for surface water service, including charges for use of the District's distribution system, be established which charge shall be made due and payable on a day certain between November 1st and December 1st of each year.

The Base Service Charge is the amount of money necessary to be raised by the District to provide for and to recover costs incurred in the administration of the District, including salaries, services and supplies, and the costs incurred by reason of the construction and operation of its adopted Project, in excess of income from surface water service, including charges for use of the District's distribution system, plus a reasonable percentage not to exceed 15% for delinquency, and a percentage necessary to cover costs of collection.

Since there are no undeveloped assessable lands in the District and since all assessable Class I lands use or have the potential to use District surface water service and all other assessable lands are Class II lands developed in reliance upon the use of groundwater, which includes all commercial, industrial and residential lots or parcels, benefit from the District and its operations, District costs to be recovered from the Base Service Charge shall be allocated in accordance with the benefits attributable to Class I and Class II lands; EXCEPTING, that minimum rates per parcel may be established for tracts of land less than one acre in area.

2. It is necessary that the following procedure be established for annually fixing and collecting the Base Service Charge:

- a. At or before the regular meeting in October or at such other time as may be announced at said meeting, the Board shall consider, determine and by resolution fix the total amount to be collected by reason of such charges; The percentage for delinquency and cost of

collection attributable to such charges; the amount to be collected from Class I and Class II lands and the estimated rates per acre necessary to collect the charge from the respective classes of land; the minimum rate for sub-one acre parcels; order the adoption of the preliminary roll and that the roll be extended by the Manager in accordance with the findings of the Board and filed with the Secretary; set the time and place of hearing of objections to the roll as provided in subparagraph (d) hereof and determine the newspaper or newspapers in which notice shall be published.

- b. Prior to the fixing of the charge by the Board, the Manager shall prepare and file with the Board a report recommending an allocation of costs proposed to be collected as the Base Service Charge together with a proposed preliminary roll. The report shall contain an estimate of the total amount to be collected by reason of such charge and as allocated to Class I and Class II lands; the percentage for delinquency and cost of collection attributable to such charge; the estimated rates per acre for Class I and Class II lands and the minimum charge for parcels less than one acre in area.

The roll shall set forth the assessee parcels and assessee names for each parcel of assessable land in the District, determined in accordance with the provisions of Chapter 3, Part 1, Division 14 (commencing with Section 39050) of the Water Code and matters on file in District's records; the County Assessor's parcel numbers; the acreage assessed to each such assessee according to District's records and the classification of each such tract of land.

The Manager shall estimate the preliminary rates per acre for said charges, which rates shall be based upon the matters set forth in said roll and the determinations of the Board and shall be separately stated as a rate per acre for Class I and Class II lands and the rate of tracts less than one acre.

Said roll may include information mentioned in Sections 47325 et seq. of the Water Code dealing with collection of assessments against which bonds have been issued.

- c. Said report, resolution and preliminary roll as extended shall be filed with the Secretary and be available for public inspection at the District office. Plat maps of assessable acreage shall be prepared by the District's staff and shall be kept on file at the District's office.

Without designation the Secretary shall forthwith publish

notice of the filing of the preliminary roll, which notice shall set forth the preliminary rates per acre, the minimum charge for parcels less than one acre in area and declare the time and place set by the Board when the Board will meet and hear any objection to the charges established for said respective tracts of land as set forth in the roll. Said notice may contain matters required by Section 47325 et seq. Of the Water Code dealing with collection of assessments against which bonds have been issued. The notice shall be published once a week for two successive weeks, as provided in Sections 39057 and 47326 of the Water Code. Said hearing shall not be less than three weeks after the first date of publication.

As a convenience to the assesseees the Secretary shall deposit a copy of said notice in the mail, addressed to each assessee shown on the preliminary roll at their address as set forth in said roll. The mailing shall be completed at least 10 days prior to the hearing date.

- d. At the time and place for hearing of objections, the Board shall consider such objections to the roll and make such corrections thereto as are necessary and proper. Upon conclusion of the hearing, the Board shall by resolution adopt said roll as finally fixed and determined; make such changes in the preliminary rates per acre necessitated thereby; fix the date the charges shall be due and payable which date shall be no later than December 1; order that the charges be collected by the District Treasurer; and order the Treasurer of the District to certify said roll. provided, however, that the Board may order that a portion of the charge may be paid as a second installment due and payable no later than April 1 of the following year. The certified roll shall be filed with the Secretary of the District.
- e. The Secretary shall forthwith publish notice of the filing of the roll as finally fixed and adopted which notice shall contain the information mentioned in Subparagraph ©). hereof as the same has been finally determined. As a convenience to the assesseees, the Secretary shall deposit in the mail, addressed to each assessee as shown on the roll, an invoice stating the amount of the Base Service Charges due and payable to the District Treasurer for said parcel prior to December 1st of each year. Said invoice may include information regarding payment of calls on assessments against which bonds have been issued as is mentioned in Sections 47352 et seq. of the Water Code.

- f. The Base Service Charge becomes delinquent if payment is not received by the District Treasurer by 5:00 o'clock p.m. on the 30th day following the date charges are due and payable. Delinquent accounts and affected landowners shall be subject to the same provision applicable to water tolls and affected water users, as more particularly described at Section IX.7 above.

- g. The policy and procedure contained in this section shall continue until such time as the Board determines, pursuant to noticed public hearing, that said charges, or any of them, are to be fixed on some basis other than that herein provided or until such time as there has been a reassessment of Project costs as provided in Section 46355 of the Water Code.

SECTION XIV. ENCROACHMENT ON DISTRICT PROPERTY

Without limiting rights otherwise reserved, consent for encroachment will be required from the District before any drains, fences, pipelines or other encroachments will be permitted upon District's property. Consent forms will be furnished by the District to the applicant and must first be approved by the Manager or his designee before any construction begins. Where District rights in any property are an easement, no encroachments will be permitted which will in any manner interfere with the rights under said easement, and the District's consent must first be obtained before any pipelines or other encroachments are constructed in any easement area. The work shall be constructed to specifications approved by the District at the sole expense of the permittee and maintained to the satisfaction of the District. If such consent is granted, the permittee shall be solely responsible for and shall indemnify and shall assume the defense of and hold harmless the District and its officers, agents and employees from any and all loss, damage, liability, claims or cause of action of every nature whatsoever, for damage, to or destruction of property, including the District's property, or for injury to or death of persons, in any manner, arising out of permittee's exercise of rights and privileges given in the granting of the such consent. Issuance of consent does in no way grant a permanent right, and if the District determines at a future date that said works do in fact interfere with its operations, said works shall be removed and the District's property restored to its original state at the sole expense of the permittee. Granting of such consent does in no way and in no extent surrender or subordinate the District's control or supervision over the encroachment. Any person or his authorized agent who uses the property of District for the movement of equipment shall be responsible to District for any damage to District property. Any persons using a District right-of-way for any purpose assumes all risks associated therewith and assumes the responsibility for any damage to District property resulting therefrom and also for any damage to private property caused by such dame to District property.

SECTION XV. ACCESS TO DISTRICT RECORDS

All District records shall be maintained at the District Office. Such records are for the exclusive use of the District and shall be made available for use for other purposes only as provided by Resolution No. 80-44, as amended from time to time, adopted pursuant to the California Public Records Act (Government Code Sections 6250 et seq.).

SECTION XVI. GENERAL PROVISIONS

1. No water necessary to meet the demands of Class I lands under these Rules and Regulations shall be diverted at any time for the irrigation of Class II lands. Water user shall use the project water only upon the lands shown in his Application for Water Service and to be irrigated pursuant to the turn on order.

2. As stated in Section III.3, the water furnished by the District is not treated to make it safe for drinking purposes and anyone making such use of District water does so contrary to these Rules and Regulations at his own risk.

SECTION XVII. UNUSED ENTITLEMENT IN DISTRICT'S DISTRIBUTION SYSTEM.

The Board may authorize the use of such unused capacity in its Distribution System as the Board may in its absolute discretion determine that it is to the best interest of the Class I and Class II Lands for the benefit of areas annexed to the District by proceedings known as Annexation No. 1 (1966) upon such terms and conditions as the Board may from time to time establish.

Nothing herein contained shall detract from the conditions under which such lands were annexed to the District including that portion reading as follows: "No annexed area nor any of the landowners within the annexed area shall acquire any use or right of use of existing property of the North Kern Water Storage District, real or personal, including but not limited to rights for conveyance of water by reason of the annexation of said territory.

SECTION XVIII. CHANGES IN RULES AND REGULATIONS

These Rules and Regulations shall become effective July 15, 2014, and can or may be added to, amended or repealed at any time by resolution of the Board.

SECTION XIV. SEVERABILITY OF PROVISIONS

If any provision of these Rules and Regulations, or the application thereof to any person or circumstances, is held invalid, the remainder of these Rules and the application of its provisions to other persons or circumstances shall not be affected

thereby.

ANNEX

1. Map of District - Class I and Class II lands.
2. Copy of resolution of Board of Directors for Adoption of Rules and Regulations effective July 15, 2014.

EXHIBIT "C"

**BEFORE THE BOARD OF DIRECTORS OF
NORTH KERN WATER STORAGE DISTRICT**

IN THE MATTER OF:

RESOLUTION NO. 14-78

**AMENDING RULES AND REGULATIONS
FOR DISTRIBUTION AND USE OF WATER**

SECTION A:

WHEREAS, this Board of Directors declares and determines as follows:

1. Pursuant to Water Code § 43003.5, the Board of Directors of this District has the power to establish and amend Rules and Regulations for distribution and use of water within the District.
2. With the adoption of Resolution No. 08-76 on August 19, 2008, this District amended and restated its Rules and Regulations for Distribution and Use of Water (hereinafter referred to as "Rules and Regulations").
3. Because of changing circumstances related to administration of the District's Base Service Charges, as more particularly described in the General Manger's memorandum of July 15, 2014, it is appropriate to amend the Rules and Regulations as herein provided.
4. This Board held a noticed public hearing this date concerning the proposed amendment of the Rules and Regulations in accordance with Section XIII (g) of the existing Rules and Regulations.

SECTION B:

NOW, THEREFORE, BE IT RESOLVED AND ORDERED BY THE BOARD OF DIRECTORS OF THIS DISTRICT, AS FOLLOWS:

1. The foregoing recitals and findings, and each of them, are true and correct.
2. The District's Rules and Regulations are amended as set forth in attachment "A" hereto.
3. A certified copy of this resolution shall be recorded with the County Recorder of Kern County.

4. Copies of this resolution together with the District's Rules and Regulations as amended shall be maintained on file and open for inspection and available to District Water Users.

All the foregoing, being on the motion of Director Fornoff, seconded by Director Mendes, and authorized by the following vote:

AYES: Andrew, Waterhouse, Mendes, Fornoff

NOES: None

ABSENT: Glende

ABSTAIN: None

I hereby certify that the foregoing is a true copy of the Resolution of the Board of Directors of NORTH KERN WATER STORAGE DISTRICT as duly passed and adopted by said Board of Directors on July 15, 2014.




Secretary of the Board of Directors

Appendix E

Water Meter Accuracy Verification Form

North Kern Water Storage District - Water Meter Accuracy Verification Form

Date	Turnout No	Meter Name and Model	Year Installed	Pipe Size (in)	Flowmeter Reading (gpm) A	Ultrasonic meter Reading (gpm) B	Elapsed Time	Difference (A-B) C	Percent Error (C/B)*100	Test Person Initial
10/3/2012	8-00-29	McCrometer 03-05307-10	2003	10"	950gpm	935gpm	10Min	15gpm	1.6%	SM
10/3/2012	8-00-34	McCrometer 02-03-145-10	2002	10"	1450gpm	1504gpm	10Min	54gpm	3.5%	SM
10/3/2012	8-00-40	McCrometer		10"	1400gpm	1401gpm	10Min	1gpm	0.7%	SM
10/3/2012	8-00-63B	McCrometer 03-02610-10	2003	10"	1000gpm	1132gpm	10Min	132gpm	11.6%	SM
10/3/2012	8-00-63A	McCrometer 03-02609-10	2003	10"	1100gpm	1115gpm	10Min	15gpm	1.3%	SM
10/4/2012	8-00-60A	McCrometer 97-8729-10	1997	10"	1290gpm	1059gpm	10Min	231gpm	21.8%	SM
10/4/2012	8-00-60B	McCrometer 97-8727-10	1997	10"	500gpm	482gpm	10Min	18gpm	3.7%	SM
10/4/2012	8-00-66	McCrometer 06-66620-12	2006	12"	700gpm	946gpm	10Min	246gpm	26.0%	SM
10/4/2012	8-00-78B	Seametrics 05119468		10"	2155gpm	1739gpm	10Min	416gpm	23.0%	SM
10/4/2012	8-00-78a	Seametrics 05119483		10"	1963gpm	1844gpm	10Min	119gpm	6.4%	SM
10/4/2012	8-17-24b	McCrometer 97-05601-12	1997	12"	2100gpm	1960gpm	10Min	139gpm	7.1%	SM
10/8/2012	8-00-43	McCrometer		6"	400gpm	400gpm	10Min	0gpm	0.0%	SM
10/8/2012	8-00-24	McCrometer 97-5186-10	1997	10"	1400gpm	1414gpm	10Min	14gpm	1.0%	SM
10/8/2012	8-0-25	McCrometer 94-8453-10	1994	10"	1350gpm	1323gpm	10Min	26gpm	2.0%	SM
10/9/2012	8-03-5C	McCrometer 08-04650-08	2008	8"	500gpm	520gpm	10Min	30gpm	5.7%	SM
10/9/2012	8-03-25A	McCrometer 08-04939-08	2008	8"	1500gpm	838gpm	10Min	662gpm	78.0%	SM
10/11/2012	8-03-43A	McCrometer 97-05602-10	1997	10"	1900gpm	1740gpm	10Min	160gpm	9.1%	SM
10/11/2012	8-03-43B	McCrometer 99-02340-10	1999	10"	1350gpm	1280gpm	10Min	70gpm	5.4%	SM
10/11/2012	9-07-12B	McCrometer 98-7259-12	1998	12"	2280gpm	2340gpm	10Min	60gpm	2.5%	SM
10/11/2012	9-07-12A	McCrometer 91-12-742	1991	12"	2700gpm	2563gpm	10Min	137gpm	5.3%	SM
10/11/2012	9-00-27	McCrometer 07-12100-08	2007	8"	800gpm	758gpm	10Min	42gpm	5.5%	SM
10/11/2012	9-00-24	McCrometer 08-11724-10	2005	10"	850gpm	857gpm	10Min	7gpm	0.8%	SM
10/11/2012	8-11-8B	McCrometer 97-8730-10	1997	10"	1200gpm	1034gpm	10Min	166gpm	16.0%	SM
10/11/2012	8-11-8A	McCrometer 97-8726-10	1997	10"	1100gpm	1248gpm	10Min	148gpm	11.8%	SM
10/14/2012	8-17-6A	McCrometer 03-06877-10	2003	10"	1000gpm	976gpm	10Min	24gpm	2.4%	SM
10/14/2012	8-17-6C	McCrometer 08-07592-10	2008	10"	1300gpm	1300gpm	10Min	0gpm	0.0%	SM
10/14/2012	8-00-87D	McCrometer 03-06880-10	2003	10"	1200gpm	1184gpm	10Min	16gpm	1.3%	SM
10/14/2012	8-00-87C	McCrometer 06-03483-10	2006	10"	1400gpm	1237gpm	10Min	163gpm	13.1%	SM
10/14/2012	8-00-87B	McCrometer 99-2717-10	1999	10"	1385gpm	1286gpm	10Min	99gpm	7.6%	SM
10/14/2012	8-00-87A	McCrometer 97-08275-10	1997	10"	1800gpm	1556gpm	10Min	244gpm	15.6%	SM
10/14/2012	8-21-3A	McCrometer 06-03362-10	2006	10"	1050gpm	1032gpm	10Min	18gpm	1.7%	SM
10/14/2012	8-17-6B	McCrometer 97-08277-10	1997	10"	1500gpm	1139gpm	10Min	361gpm	31.0%	SM
10/14/2012	8-17-6D	McCrometer 03-06880-10	2003	10"	1200gpm	1184gpm	10Min	16gpm	1.3%	SM

Annual Natural Flow of Kern River at First Point of Measurement
(values in acre-feet unless noted otherwise)

Calendar Year	Annual Runoff		Variance from Median	
	Annual Runoff	Index	Annual Runoff	Annual Runoff Index
2002	424,696	58%	-125,990	-17%
2003	519,724	71%	-30,962	-4%
2004	407,305	56%	-143,381	-20%
2005	1,156,109	158%	605,423	83%
2006	1,071,841	147%	521,155	71%
2007	252,692	35%	-297,994	-41%
2008	517,997	71%	-32,689	-4%
2009	470,166	64%	-80,520	-11%
2010	910,975	125%	360,289	49%
2011	1,374,894	188%	824,208	113%

550,686	Long-Term Median Annual Runoff in acre-feet.
75%	Long-Term Median Annual Runoff Index in percent.

Note: Long-Term statistics based on 1894 through 2011.



North Kern Water Storage District
Agricultural Water Management Plan

