South Sutter Water District

AGRICULTURAL

WATER MANAGEMENT PLAN

Prepared Pursuant to Water Code Section 10826
and Executive Order B-29-15.

Prepared by

March 2016

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Sacramento, CA 95825

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1. INTRODUCTION

In 2003 South Sutter Water District (SSWD or District) developed and prepared a Water Management Plan in accordance with the Agricultural Water Management Council's (AWMC) Memorandum of Understanding (MOU) and Assembly Bill 3616 (AB 3616). SSWD updated the 2003 Water Management Plan in 2012 in accordance with the MOU. This updated Water Management Plan, together with the additional information required pursuant to SB X7-7, was submitted to DWR in 2013 in accordance with Section 10827 of the California Water Code (Water Code). The AWMC dissolved in the spring of 2013; therefore, the alternative submittal of a Water Management Plan in accordance with the MOU is no longer an option. This 2015 Agricultural Water Management Plan (AWMP) includes the information contained in the 2003 Water Management Plan and 2012 Progress Report addendum and includes additional information to demonstrate the efficient water management practices currently undertaken by SSWD as a matter of good business and stewardship. The District has prepared this AWMP in accordance with the requirements identified in the Water Code Section 10826 and Executive Order B-29-15 regarding efficient water management practices by agricultural water suppliers in California following the Guidebook to Assist Agricultural Water Suppliers to Prepare a 2015 Agricultural Water Management Plan[1]. A checklist of the Water Code requirements for the AWMP content, preparation and adoption is included in Appendix A of this AWMP.

2. COORDINATION, ADOPTION AND IMPLEMENTATION OF SOUTH SUTTER WATER DISTRICT'S AWMP

The following section identifies the coordination, notification, and adoption procedures applied by SSWD pursuant to Water Code Sections 10821, 10841, 10843, and 10844.

A. Notification of AWMP Preparation

In accordance with the provisions of the Water Code Section 10821, agricultural water suppliers[2] preparing an AWMP must notify each city and county within which it provides water supplies

[1] http://www.water.ca.gov/wateruseefficiency/sb7/docs/2015/Approved%20Final%202015%20AWMP%20Guidebook%20June%202015.pdf

[2] '"Agricultural water supplier" means a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water. "Agricultural water supplier" includes a supplier or

that the agricultural water supplier is preparing or reviewing an AWMP or is considering changes or amendments to the AWMP. SSWD notified each city and county within which it provides water supplies including the following:

- Placer County
- Sutter County
- Sutter County LAFCO
- Camp Far West Irrigation District

A copy of the letter transmitted to the aforementioned entities regarding SSWD's intention to review, update, and consider changes to its existing AWMP is provided in Appendix B.

B. Public Participation

Consistent with California Water Code Section 10841 notice of SSWD's intent to update its AWMP was published on March 16 and 23, 2016 in the Appeal Democrat. The notice identified that a draft of the AWMP was available for public review at SSWD's office. In addition, the public notice identified the time and date of a public hearing to receive input and comments to the AWMP along with the date that SSWD intended to adopt the AWMP. A copy of the public notice is provided in Appendix B.

C. AWMP Adoption and Submittal

Following the public hearing and input from stakeholders, SSWD reviewed and formally adopted the AWMP as part of the District's strategy to enhance overall system management. A copy of the resolution adopting the AWMP is provided in Appendix B.

Consistent with the California Water Code Section 10843, a copy of the AWMP was provided to the following entities;

- Department of Water Resources
- Placer County
- Sutter County

contractor for water, regardless of the basis of right, that distributes or sells water for ultimate resale to customers. "Agricultural water supplier" does not include the department.' *Water Code Section 10608.12(a).*

- Placer County Library
- Sutter County Library
- California State Library
- Camp Far West Irrigation District

The letter transmitting the AWMP to the Department of Water Resources (DWR) is provided in Appendix B. A copy of the letter and AWMP were transmitted to the aforementioned entities pursuant to the requirements of California Water Code Section 10843. An electronic copy of the AWMP was also provided to DWR consistent with California Water Code Section 10844.

D. AWMP Implementation Schedule

As further described in the AWMP, SSWD continues to implement many of the Efficient Water Management Practices (EWMPs) including the water measurement and volumetric pricing EWMPs identified in the Water Management Plan 2012 Progress Report addendum. As a result of recent dry hydrological conditions, and limited availability of surface water for delivery, SSWD was unable to proceed with the schedule previously identified to certify the accuracy of the measurement devices currently in place throughout the District. SSWD has revised the schedule to develop and implement the Water Measurement Certification Program to certify the accuracy of the measurement devices. The District intends to complete the Water Measurement Certification Program prior to the next AWMP cycle (2020). The revised implementation schedule is provided in Section 11, Schedules, Budgets, and Projected Results.

3. DESCRIPTION OF SOUTH SUTTER WATER DISTRICT

A. History

The District was formed in May 1954 to develop, store, and distribute surface water supplies for agricultural irrigation uses primarily from the Bear River via an enlarged Camp Far West Reservoir (CFW Reservoir). SSWD was also formed to utilize and distribute local surface waters originating in Yankee and Ping Sloughs, Coon Creek, Bunkham Slough, Markham and Auburn Ravines, King Slough, and Pleasant Grove Creek, located mostly in the southeastern portion of Sutter County and within the southwestern portion of Placer County, California.

Upon formation of SSWD in 1954 and prior to the completion of the enlarged CFW Reservoir in 1964, SSWD's boundaries encompassed a total gross area of 63,972 acres, of which 8,915 acres were excluded, for a net area service of 55,057 acres. The development of the surface waters, primarily enlarging CFW Reservoir and developing a distribution system, was an effort by SSWD landowners to augment and develop alternatives to a declining groundwater table that was being tapped by private agricultural wells within the service area. Reportedly, the groundwater basin was being overdrawn by 1 to 3 feet per year or by as much as 10,000 to 11,000 acre-feet per year, and the formation of SSWD and subsequent enlargement of CFW Reservoir would furnish sufficient water to replace the overdraft. The exclusion of 8,915 acres in 1954 was a result of some landowners requesting to remain exclusively on their private agricultural wells and limited surface water sources from the local sloughs, ravines, and creeks.

The 1950 census revealed a population of approximately 1,800 people within the boundaries of SSWD. Based on 1950 crop data, it was estimated that approximately 18,593 acres received approximately 99,600 acre-feet of water, of which 80,600 acre-feet was obtained from the underlying groundwater supply and approximately 19,000 acre-feet was from surface sources.

In 1956, prior to the expansion of the CFW Reservoir, approximately 20,955 acres, or 38 percent of the net SSWD area, was being irrigated with approximately 109,000 acre-feet of water, of which approximately 90,000 acre-feet was pumped from the groundwater basin and 19,000 acre-feet from surface sources. At that time, the 20,955 acres under irrigation consisted of 10,925 acres (or 52 percent) in rice production, 3,080 acres (or 15 percent) in orchards, 4,160 acres (or 20 percent) in irrigated pasture, and the remaining 2,790 acres (or 13 percent) in field or row crops.

In 1958, it was estimated that the underlying groundwater basin could safely recharge at an average annual rate of 80,000 acre-feet and that the average annual net production from the improved CFW Reservoir system could safely yield 59,000 acre-feet. Thus, it was anticipated that an average annual conjunctive yield or availability of 139,000 acre-feet was available to ultimately serve approximately 31,800 net acres (4.37 acre-feet/acre). It was also believed in 1958 that as much as 51,214 acres of SSWD's 55,057 acres were suitable for seasonal irrigation, but only 47,450 acres could be ultimately irrigated due to distribution and soil constraints.

In 1964, upon completion of the 104,400 acre-foot CFW Reservoir, conveyance canals, and some low pressure pipelines, SSWD began surface water deliveries and sold 63,630 acre-feet through its newly developed surface water system. With the exception of drought years, surface water deliveries over time have varied from 36,000 acre-feet to over 137,000 acre-feet.

A summary of the historical cropping distribution, acres irrigated, and surface water deliveries within SSWD for the period 1986-2009 is provided in Appendix C Table C1 .

B. Location, Size, and Facilities

SSWD is located along the western toe of the Sierra foothills just south of the lower reaches of the Bear River between the CFW Reservoir and the Bear River's confluence with the Feather River in southern Sutter and western Placer Counties (Figure 1). The SSWD boundaries and distribution system, starting at its northeast corner near the town of Sheridan and State Highway 65, extend to the west beyond State Highway 70 and to the southwest to the Pleasant Grove Creek Canal and Curry Creek drainage area. The SSWD service area drops approximately 80 feet in elevation from its highest elevation of 100 feet mean sea level (MSL) near Sheridan to a low elevation of approximately 20 feet MSL near its most westerly boundary, 2 miles west of where State Highways 70 and 99 depart from each other.

SSWD's boundaries currently encompass a gross area of 63,972 acres, of which 6,960 acres[3] are excluded, for a net District area of 57,012 acres (40,107 acres are in Sutter County and 16,905 acres are in Placer County). Figure 2 shows the SSWD boundary, the excluded areas, and the major surface water distribution system. No annexations or other changes to the District's service area are anticipated in the near future.

The majority of the surface water supply is provided by the Bear River where the water is stored behind Camp Far West Dam creating the CFW Reservoir. Following aerial and bathymetric surveys preformed on CFW Reservoir in 2008, the current storage capacity was determined to be approximately 93,740[4], of which approximately 1,300 acre-feet is dead storage. In most years,

[3] Lands were annexed following the formation of the District in 1954.
[4] The initial capacity of CFW Reservoir was 104,400 acre-feet. A bathymetric survey conducted in 2008 resulted in a modified area-capacity curve for CFW Reservoir and reduced available capacity to 93,740 acre-feet.

the reservoir fills by March 1 with precipitation runoff and little contribution from snowpack runoff.

The annual available water supply from CFW Reservoir is allocated each year, and a full reservoir represents only a portion (approximately 1.4 acre-feet per acre) of water users' demands. As shown in Figure 2 water released from the Reservoir is rediverted from the Bear River at a point approximately 13 miles downstream from Camp Far West Dam into the District's conveyance canal system which runs predominately north to south along the higher eastern border of SSWD. Through turnouts and head gates, water is directed into canals, the Bear River pipeline, and natural channels running from east to west, and distributed to water users. A summary table of the District's conveyance canal system including differentiation between pipelines, natural channels, and constructed canals is included in Table 1.

Flows conveyed through the District's delivery system are measured and provided to customers at turnouts via gravity or pumps; all 382 turnouts are measured by McCrometer propeller meters.

The District does not own or operate any groundwater wells.

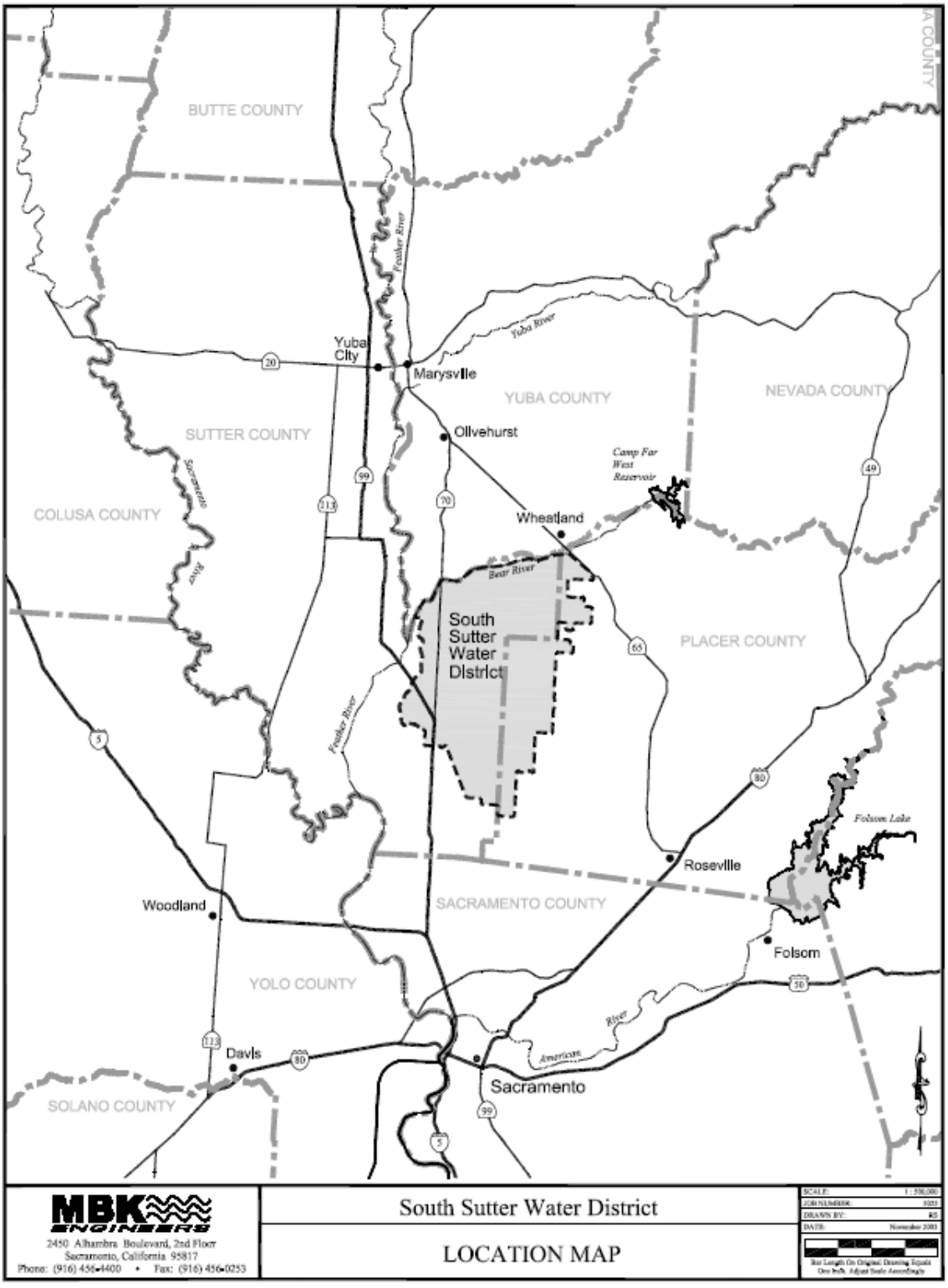

Figure 1. South Sutter Water District Location Map.

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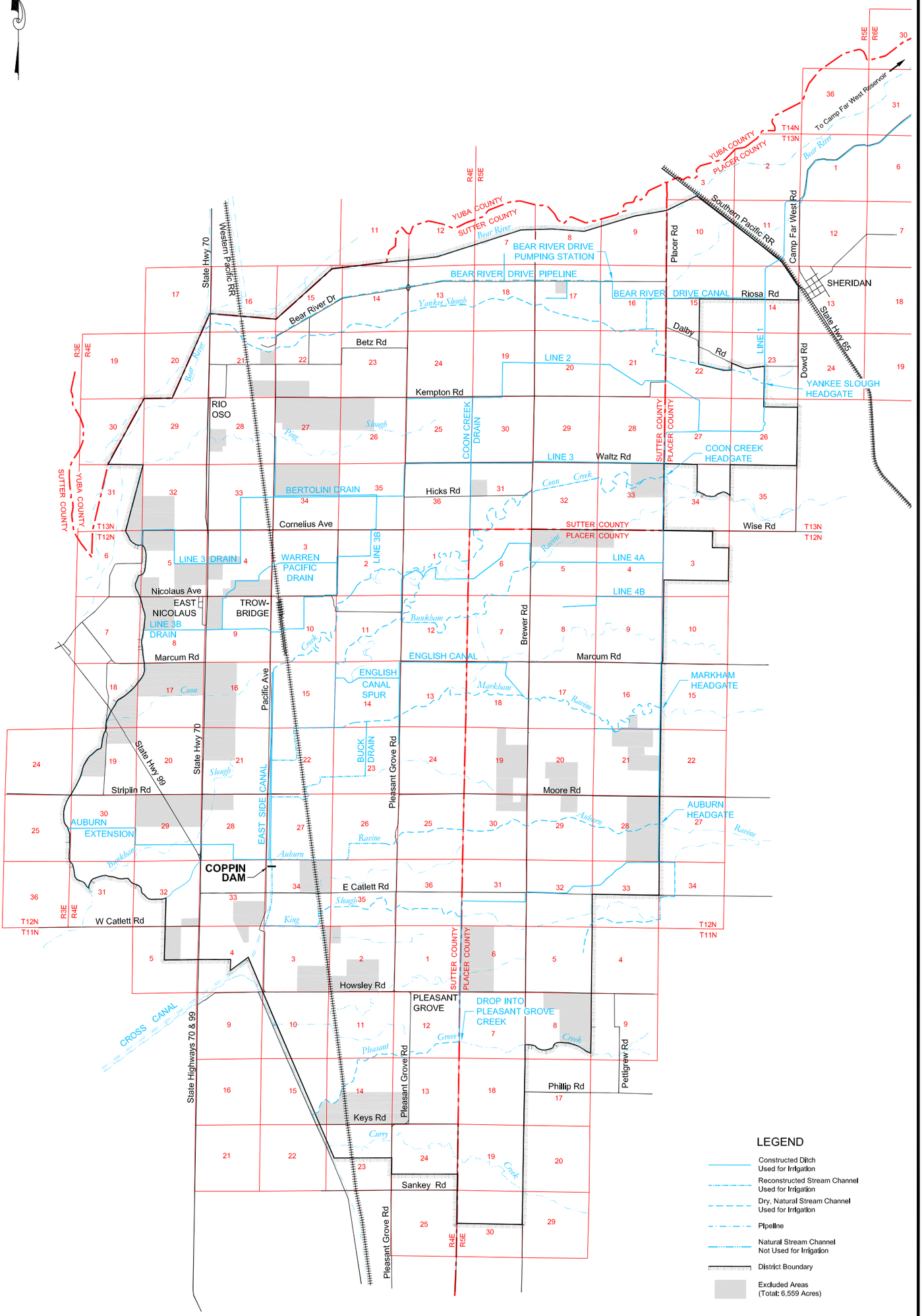

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Figure 2. South Sutter Water District Boundary, and Surface Water Conveyance System

0 2000 4000 6000 8000
Scale in Feet

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Table 1. Water Conveyance and Delivery System.

Facility Designation	Type of Canal	Construction Type	Length (miles)		
			Reconstructed Channel	Natural	Constructed
Conveyance Canal	Constructed	Earth Lined	-	-	5.5
Bear River Drive Canal	Constructed	Earth Lined	-	-	2.5
Bear River Drive Pipeline	Constructed	Pipeline	-	-	5.8
Line 1	Constructed	Earth Lined	-	-	16.1
Line 2	Constructed	Earth Lined	-	-	5.6
Line 3	Constructed	Earth Lined	-	-	6.9
Line 3B	Constructed	Earth Lined	-	-	3.1
Line 4A	Constructed	Earth Lined	-	-	5.2
Line 4B	Constructed	Earth Lined	-	-	1.6
English Canal	Constructed	Earth Lined	-	-	3.3
English Extension	Constructed	Earth Lined	-	-	1
Buck Ditch	Constructed	Earth Lined	-	-	0.8
Line 7	Constructed	Earth Lined	-	-	1
Line 1A	Constructed	Earth Lined	-	-	0.4
Bertolini Drain	Constructed	Earth Lined	-	-	2.4
Auburn Extension	Constructed	Earth Lined	-	-	3.5
East Side Canal	Constructed	Earth Lined	-	-	2.9
Coon Creek Drain	Constructed	Earth Lined	-	-	2.1
Line 3B Drain	Constructed	Earth Lined	-	-	3.2
Auburn Ravine	Natural/ Constructed	Earth Lined	2.1	4.4	-
Warren Pacific Drain	Constructed	Earth Lined	-	-	2.2
Yankee Slough	Natural/Constructed	Earth Lined	0.5	9.9	-
Coon Creek	Natural/Constructed	Earth Lined	1.0	9.4	-
Bunkham Ravine	Natural/Constructed	Earth Lined	1.1	4.3	-
Markham Ravine	Natural/Constructed	Earth Lined	1.6	6.8	-
King Slough	Natural/Constructed	Earth Lined	0.9	3	-
Pleasant Grove Creek	Natural	Earth Lined	1	2.2	-
Ping Slough	Natural	Earth Lined	-	1.4	-
		Total	8.2	41.4	75.1

C. Available Water Supplies

Surface Water Supplies and Water Rights

The major supply of surface water available to the District comes from the Bear River, where SSWD holds licensed appropriative surface water rights for direct diversion as well as storage in CFW Reservoir. In addition to surface water rights to the Bear River, SSWD holds water rights to divert local surface water from several small streams within its boundaries, including Yankee Slough, Coon Creek, Markham and Auburn Ravines, and the East Side Canal. These small streams are also utilized by SSWD as part of its conveyance system to redistribute and deliver Bear River from CFW Reservoir. Table 2 provides a summary of SSWDs water rights.

Table 2. Summary of South Sutter Water District's Surface Water Rights.

Priority Date	Water Right Application No.	Water Right License No.	Source	Purpose of Use	Amount & Place of Diversion or Storage	Season	Place of Beneficial Use
6/13/41	10221	11120	Bear River	Irrigation, Domestic and Incidental Power [2]	250 cfs Direct Diversion	from 3/1 – 6/30 and from 9/1 – 10/31	59,000 acres within SSWD and 4,180 acres within CFWID
					40,000 ac-ft Storage	from 10/1 – 6/30	
5/2/52[1]	14804	11118	Bear River	Irrigation, Domestic and Incidental Power	330 cfs Direct Diversion	from 5/1 – 9/1	59,000 acres within SSWD and 4,180 acres within CFWID
					58,370 ac-ft Storage	from 10/1 – 6/30	
8/16/51	14430	4653	Coon Creek	Irrigation	2cfs Direct Diversion	from 4/1 – 11/1	80 acres
4/12/65	22102	11121	East Side Canal, Coon Creek, Markham Ravine, and Auburn Ravine	Irrigation	40.3 cfs Direct Diversion 4,769 AF per annum	from 4/1 – 6/1 and 9/1 – 10/31	4,000 acres
8/11/71	23838	12587	Yankee Slough	Irrigation	1.35 cfs Direct Diversion 143 AF per annum	from 4/1 – 6/1 and 9/1 – 9/30	235 acres
1/4/80	26162	18360	Not Issued Yet	Bear River	725 cfs Direct Diversion	from 1/1 – 12/31	Camp Far West Dam Powerhouse

[1] SSWD received a release from priority from Applications 5633 and 5634 for Application 14804.
[2] Incidental Power is identified as a purpose of use for Applications 10221 and 14804. The powerhouse listed in the place of use for these applications is a hydroelectric facility located along SSWD's main canal.

For the protection of fish and wildlife, SSWD's Licenses and Permit for direct diversion and/or storage from the Bear River identify a minimum required release of 25 cubic feet per second during April 1 through June 30 and 10 cubic feet per second from July 1 through March 31 of the succeeding year. If the total inflow to CFW Reservoir is less than the minimum flow for a given period, then SSWD is required to bypass the inflow to the CFW Reservoir.

In February 2000, SSWD, Department of Water Resources (DWR) and the Camp Far West Irrigation District (CFWID) entered into the Bear River Agreement (commonly referred to as the

Bay Delta Settlement Agreement or BDSA) to settle the responsibilities of SSWD, CFWID, and all other Bear River water rights, to implement the objectives in the *Water Quality Control Plan for the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary* adopted May 22, 1995[5] (1995 Bay-Delta Plan).

To incorporate the BDSA into SSWD's water rights, in July 2000 the SWRCB issued Order 2000-10[6] that amended SSWD's Water Right Licenses 11120 and 11118 to provide that:

> During releases of water in connection with the change of purpose of use and place of use of up to 4,400 acre-feet transferred to DWR during dry and critical years,[7] Licensee shall increase flows in the lower Bear River by no more than 37 cubic feet per second from July through September. To avoid stranding impacts to anadromous fish in the Bear River below CFW Reservoir, Licensee shall, by the end of a release period from the reservoir in connection with said change, ramp down flows from the reservoir at a rate not to exceed 25 cubic feet per second over a 24-hour period.

The required flow volume is in addition to the minimum flow requirement in the District's Bear River Licenses (i.e., Licenses 11120 and 11118), and is measured immediately downstream of the diversion dam as spill over the diversion dam (i.e., SSWD installs boards on the diversion dam at a set elevation and controls the elevation of the diversion dam impoundment to provide the required flow).

Historically, the District has had the opportunity to purchase surplus surface water from NID under its pre-1914 water right that may be available at the downstream end of NID's system. There may be some opportunity to purchase surplus surface water supplies from NID in the future; however, it is unclear if these surplus supplies will continue to be available or if the

[5] http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/1995wqcp/docs/1995wqcpb.pdf

[6] http://www.waterrights.ca.gov/decisions/wro2000-10.htm

[7] SWRCB Order 2000-10 states: *"Dry and critical years are defined, for purposes of this order, as set forth on page 23 of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Adopted by the SWRCB in May, 1995), except that such years do not include a year in which water storage in CFW Reservoir on April 1 is at or below 33,255 acre-feet ("extreme critical year")."*

District will continue to purchase this water in the future. Recent surplus supplies provided to the District from NID are further described in Section 6 of this AWMP.

Groundwater Supplies

Currently, there are only private groundwater wells in the service area, and SSWD does not own or operate any groundwater wells. Groundwater continues to provide a dependable source and displacement for surface water, particularly during drier years. The groundwater levels in the groundwater subbasin (North American Subbasin) underlying SSWD vary both spatially and temporally, and fluctuate with seasonal and annual hydrologic conditions. Figure 3 provides a map of the District boundary and underlying North American Subbasin.

The District monitors groundwater levels at a network of 18 wells in coordination with DWR to assess the groundwater basin as described in the Districts 2009 Groundwater Management Plan (GWMP) Update and California Statewide Groundwater Elevation Monitoring (CASGEM) Measurement and Monitoring Plan. A summary of recent monitoring observations are provided in this section to generally describe the status of the groundwater subbasin underlying the District.

Annual groundwater extraction is dependent upon available surface water supplies and therefore; groundwater elevations/levels typically decline during drought periods when limited surface water supplies are available, and recover during periods of wetter hydrology when additional surface water supplies are available for delivery. Contours of equal groundwater elevation for 1963, 1971, 1978, and 1993 are included in Appendix D from two Groundwater Conditions reports prepared for the District (MBK, 1970; MBK, 1994). Also included in Appendix D is a groundwater contour map for 2014. These figures show that throughout the North American Subbasin (and underlying SSWD) groundwater elevations continue to fluctuate seasonally and through varying hydrologic conditions. The elevations depicted on the 2014 groundwater contour map (Figure D5) are similar to the elevations identified on the contour for spring 1978, which followed the dry conditions observed in 1976-1977.

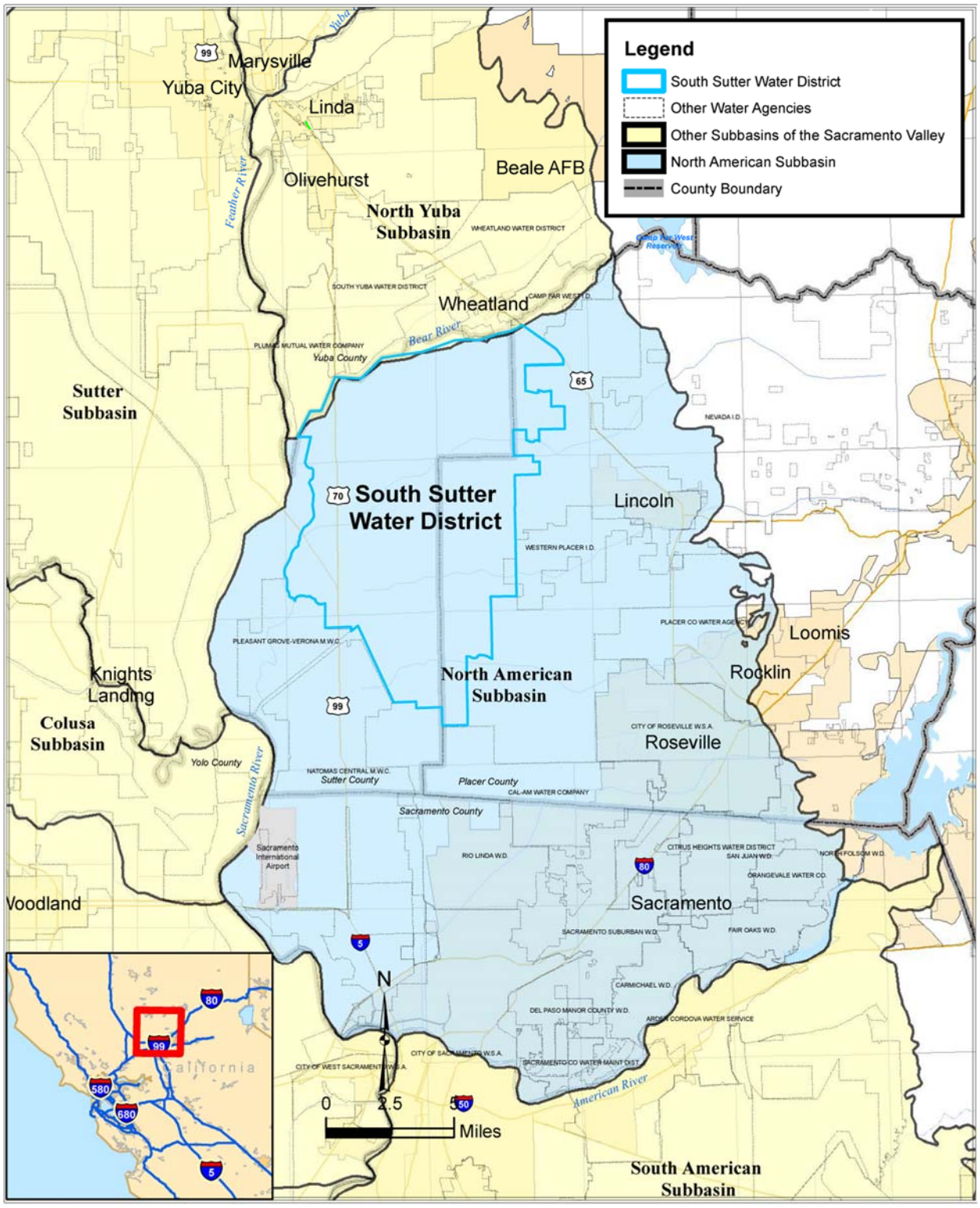

Figure 3. South Sutter Water District, North American Groundwater Subbasin.

Figure 4, Figure 5, and Figure 6 provide representative groundwater level hydrographs for groundwater monitoring wells located throughout the District for the period of 1963 through 2014. These figures demonstrate the spatial and temporal fluctuations of groundwater levels within the District that typically follow changes in annual hydrologic conditions, that is groundwater levels are typically lower following drier years and higher following wet years.

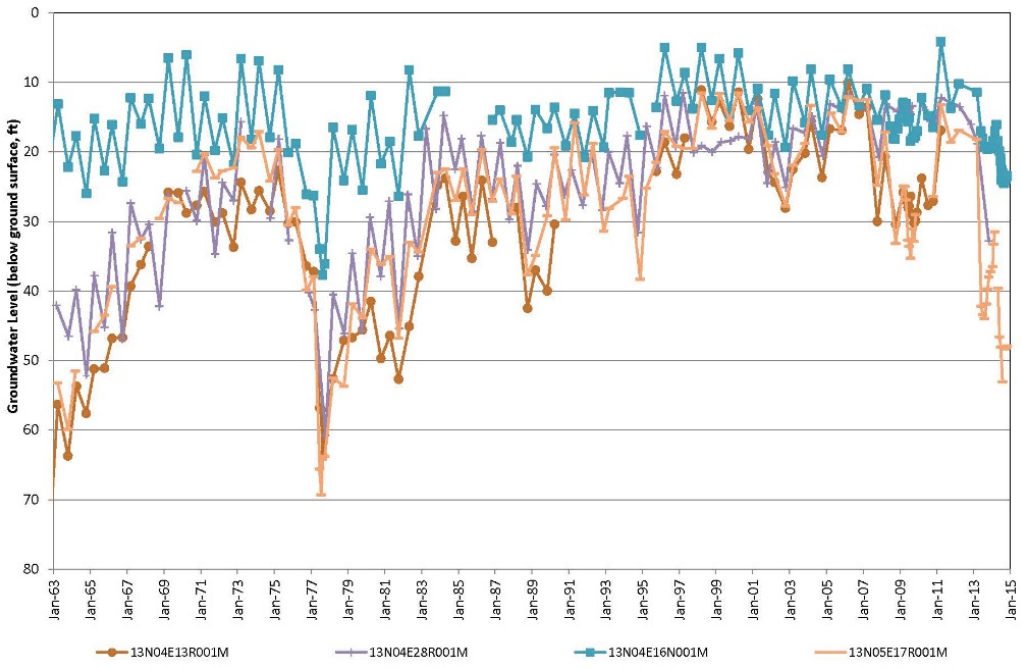

Figure 4. Groundwater Level Hydrographs for Groundwater Monitoring Wells Located Generally within the Northern Portion of South Sutter Water District.

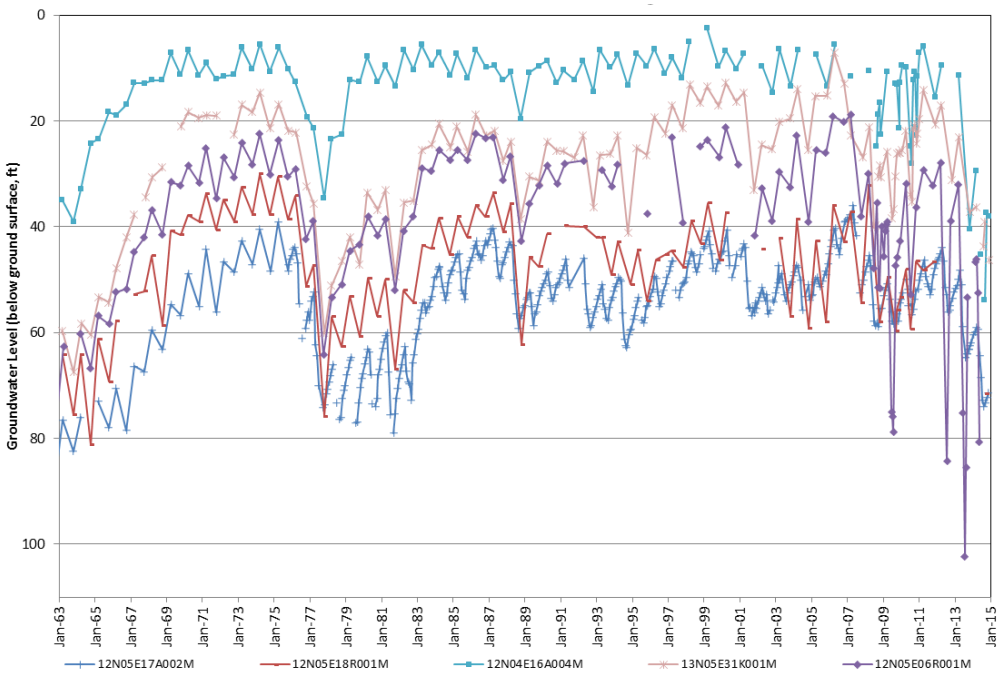

Figure 5. Groundwater Level Hydrographs for Groundwater Monitoring Wells Located Generally within the Central Portion of South Sutter Water District.

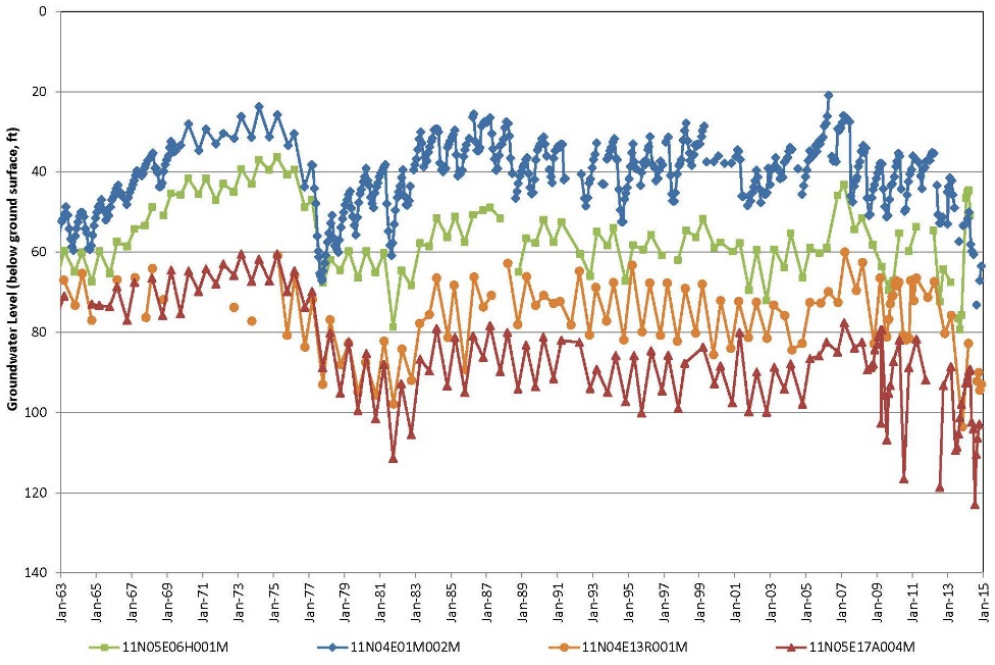

Figure 6. Groundwater Level Hydrographs for Groundwater Monitoring Wells Located Generally within the Southern Portion of South Sutter Water District.

The wells depicted in the hydrographs are generally representative of wells for the three regions within SSWD and include a longer period of record to identify potential trends and responses to groundwater pumping and hydrologic conditions. Declining groundwater levels were apparent in many of the wells prior to the construction of the CFW Reservoir and the development of a conjunctive use program, specifically in the northern region. Additionally, during the historical drought period of 1976-1977, and during the extended six-year drought period of 1987 through 1992, there were increased drawdowns and lower groundwater levels in response to the dry hydrologic conditions and limited surface water deliveries. Recent years show a similar increase in drawdowns in response to 2013-2015 drought conditions. However, as evidenced by the recovery of the groundwater levels following the 1976-1977 and the extended 1987-1992 droughts, groundwater levels are expected to recover following a period of wetter hydrology in the future.

As a whole, the groundwater basin underlying the SSWD service area has operated well as a conjunctive supply with the surface water; and the underlying basin has proven to be an important and reliable supply in times of surface water shortages. Surface water supplies are utilized as much as possible during all years; but during drier years surface water supplies are interrupted, and irrigation demands are met by increasing groundwater extraction and cropping changes. Although the increased use of the groundwater resource may result in periods of declines during drier hydrologic conditions, in general the groundwater basin continues to recover during periods of wetter hydrology (MBK, 2015)[8].

D. Topography and Soils

The general soils found in the SSWD are divided into three categories based on the terrain: (a) soils of the nearly level floodplains; (b) soils of the nearly level basins; and (c) soils of the nearly or level to rolling terraces. A description of the three categories of terrain are provided below.

The soils of the nearly level floodplains (a) are adjacent to the Bear River and the western boundary of the SSWD, extending eastward along Auburn Ravine, Coon Creek and Yankee Slough. These are moderately well drained and moderately coarse to coarse textured soils

[8] MBK Engineers, *2015 South Sutter Water District Groundwater Monitoring Report*. Jan 2015.

developed in stratified medium to coarse textured alluvium. These soils are used mostly for irrigated orchards, pasture, and row crops.

The soils of the nearly level basins (b) consist of somewhat poor to poorly drained soils developed in moderately fine to fine textured alluvium. These soils occur at an elevation of 30 to 60 feet MSL in a north/south line on either side of Highway 70 and cover a large portion of the SSWD lands. These soils have high shrink-swell behavior and are primarily used for rice, cereal grains, and some field crops.

The soils associated with the nearly level to rolling terraces (c) occur in the eastern area, mostly at elevations above 50 feet MSL. Most of these soils are well drained, with a claypan or hardpan at 40 to 60 inches, and a sandy loam or loam surface layer. These soils have a variety of land uses such as winter grain, annual range, irrigated crops, rice and pasture.

Figure 7 and Figure 8 provides a soil classification map for lands within Sutter County[9] and Placer County[10], respectively within the District's service area utilizing data developed by the Natural Resource Conservation Service (NRCS).

[9] USDA, Natural Resources Conservation Service\Sutter County, 2015 Survey
[10] USDA, Natural Resources Conservation Service\Placer County, 2014 Survey

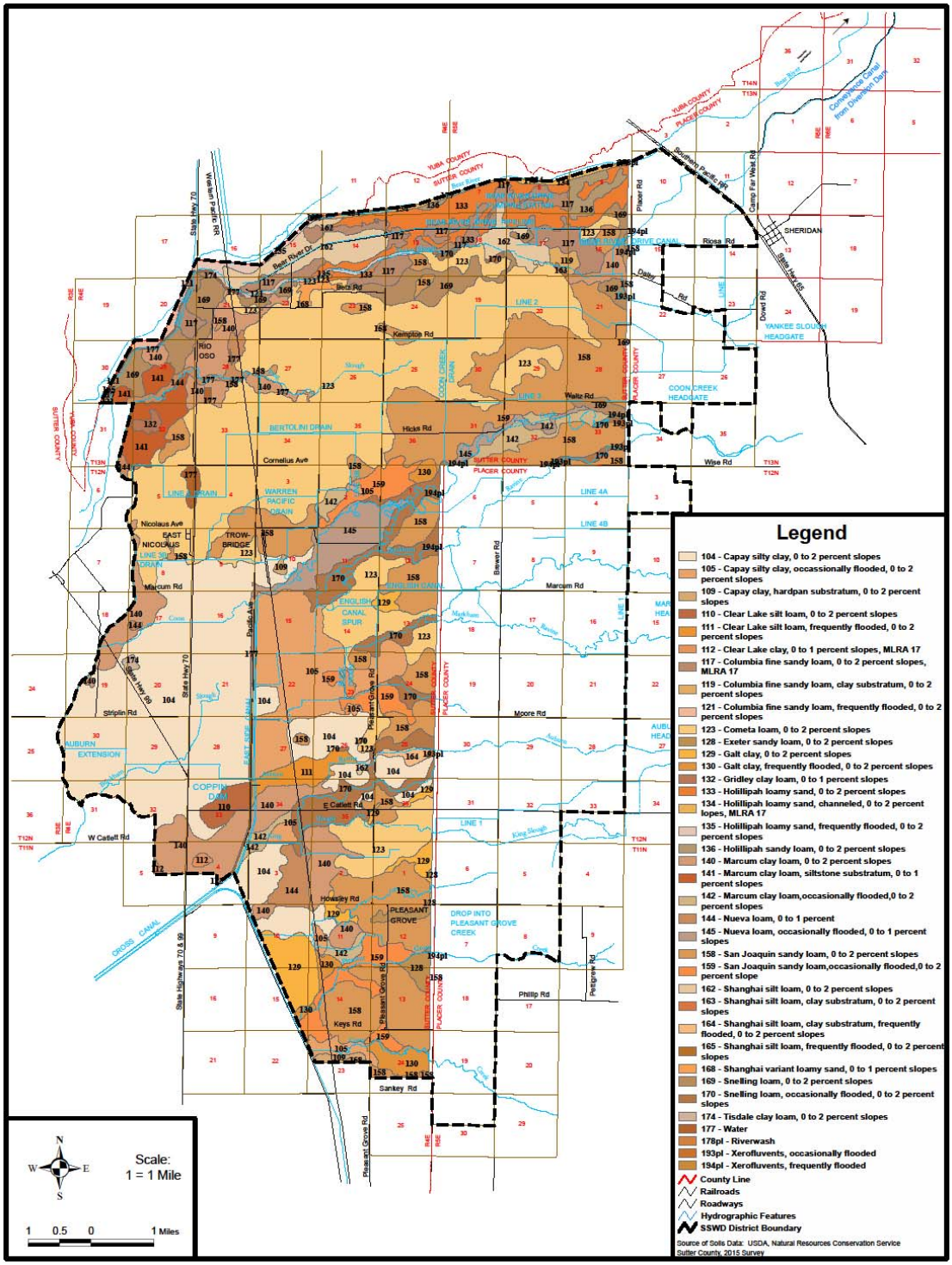

Figure 7. NRCS Soil Classification Map for Lands within Sutter County portion of SSWD.

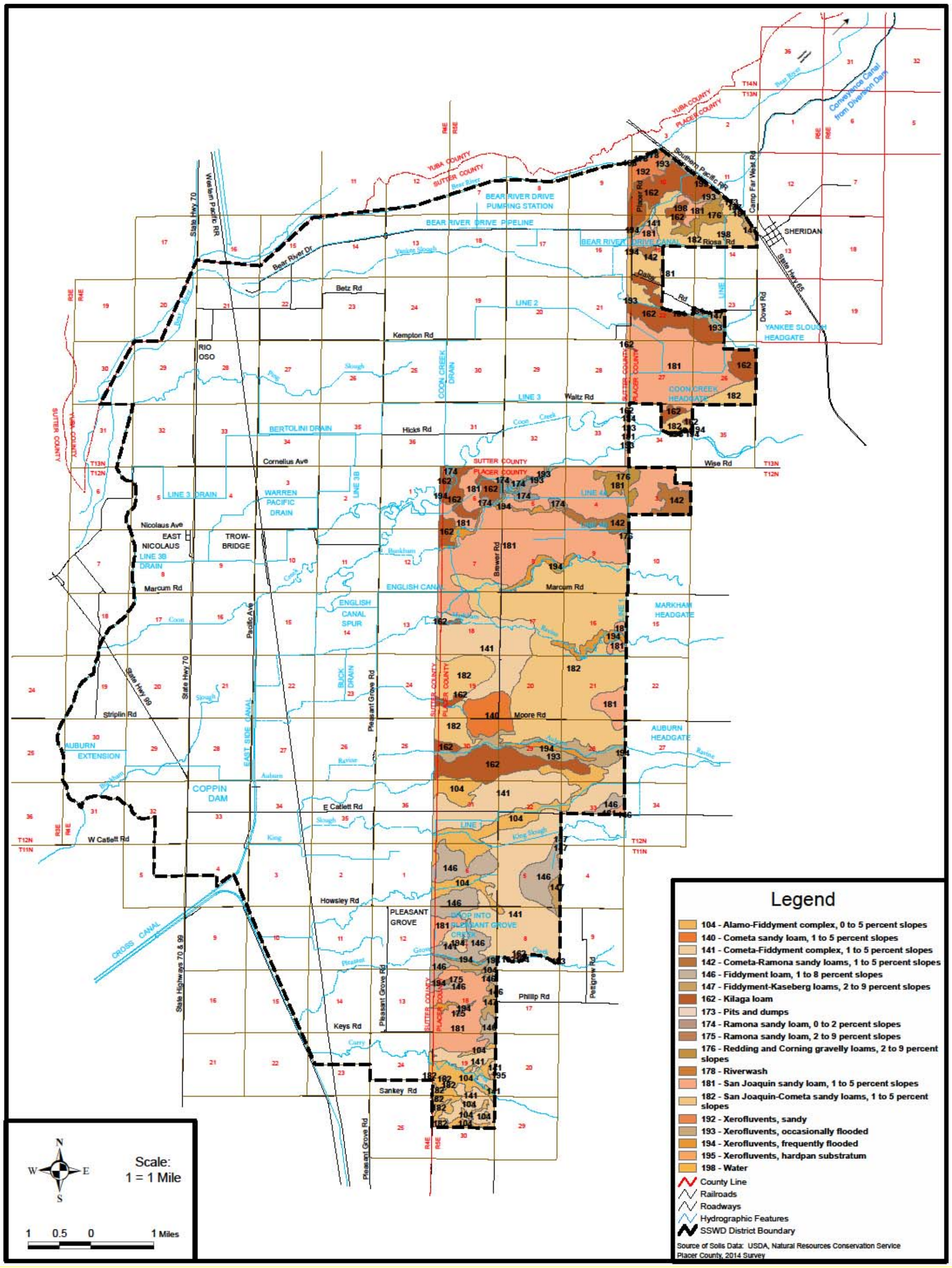

Figure 8. NRCS Soil Classification Map for Lands within Placer County portion of SSWD.

E. Climate

The climate of the basin is typical of the Sacramento Valley with a warm to hot dry season from May through October and a cool wet season usually from November through April. Historic precipitation data was obtained through the National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI) website for the Nicholas 2 Station[11] located in the northwestern portion of the service area. The monthly average precipitation data for the 53-year period of record, 1963 through 2015, is provided in Table 3.

Table 3. Average Monthly Precipitation (inches) for 1963 - 2015

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
3.59	2.86	2.73	1.35	0.51	0.23	0.04	0.06	0.29	1.00	2.63	3.23	18.40

The majority of the precipitation, about 89 percent, falls during the six-month winter/spring season of November through April. Only 11 percent falls during the summer/fall months of May through October. Large variations in the quantity of annual precipitation and the normally small quantity of precipitation in the summer/fall months make irrigation mandatory. Precipitation that falls during the summer/fall months is available to help meet the crop water demands. Variation in this precipitation directly affects the quantity of water required from other sources to meet crop demands.

The following historical temperature data (1998 - 2015) was obtained through the NOAA, NCEI for the nearest representative temperature recording gauge located at the Sacramento International Airport[12].

[11] Station Network Id: GHCND: USC00046194. http://www.ncdc.noaa.gov/cdo-web/datasets/GHCNDMS/stations/GHCND:USC00046194/detail

[12] The NOAA gauge at the Sacramento International Airport is now referred to as the *Sacramento Metropolitan Airport, CA US GHCND: USW00093225. http://www.ncdc.noaa.gov/cdo-web/datasets/GHCNDMS/stations/GHCND:USW00093225/detail*

Table 4. Average Monthly Temperature Data for 1998 - 2015

Average Monthly Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Min. Temp. (°F)	29.7	35.1	39.0	41.0	47.3	54.1	56.3	55.4	53.2	44.8	36.3	29.1	46.1
Avg. Max. Temp. (°F)	65.7	64.6	73.8	78.1	90.1	93.0	97.5	95.4	91.9	83.7	68.0	60.4	77.6
Avg. Temp. (°F)	46.3	50.2	54.7	58.4	66.6	72.9	76.3	75.1	71.9	63.5	52.8	47.0	61.3

There are no microclimates within the basin.

4. SOUTH SUTTER WATER DISTRICT OPERATIONS

A. Operating Rules and Regulations

Prior to February 15 of each year, water users submit applications to SSWD indicating the type and acreage of crops they intend to irrigate during the full irrigation season under their application. By April 1, when a reasonable water availability forecast can be made on the anticipated yield from CFW Reservoir, SSWD provides a preliminary estimate of the total amount of water that will be available per acre (i.e., preliminary landowner allocation). Depending upon the anticipated reservoir yield, the preliminary landowner allocation may range from 0 acre-foot per acre during an extreme drought year to as much as 2½ acre-feet per acre during a wet year when precipitation has been well above average. Following the preliminary landowner allocation, SSWD confirms or potentially increases the allocation based on hydrological conditions (i.e., potential increased inflow to CFW Reservoir as a result of wetter than expected hydrology). The final landowner allocation for the irrigation season is effective (i.e., deliveries are being charged to the landowners allocation) beginning on the date in which CFW Reservoir ceases spilling or June 1, whichever is earlier.

Requests for delivery of water during the irrigation season (approximately April 1 to October 1) may be made during regularly scheduled working hours. The District's modified demand system requires requests water deliveries be placed no later than 3pm the preceding day. Requests for delivery changes are made strictly on a time of water travel and when available to provide a steady flow to other users within the District.

A copy of SSWD's current Rules and Regulations for the Distribution and Use of Water, as revised and adopted August 31, 1993 is provided in Appendix E. Appendix E also includes a

sample notice of water allocation and applicable rates, as well as examples of invoices to landowners within the service area.

B. Water Delivery Measurements and Calculations

SSWD measures and records deliveries to each customer using McCrometer propeller meters which are calibrated at installation. The majority of these devices are permanently installed and are factory calibrated for the size of the pipe to provide flow rate and volumes. There are some areas of the District that are subject to debris which can interfere or clog propeller meters. This debris can result in damage to the meter, impaired delivery of water, or inaccurate meter readings. In these locations, SSWD uses the propeller meters to set the gate at the necessary flow rate which is checked daily to obtain instantaneous flow rate and ensure consistent deliveries. The instantaneous flow rate is then used to calculate the volume of water delivered at the turnout each day.

C. Water Rate Schedules and Billings

Surface water users within SSWD are allocated water on an acre-foot per acre basis and are billed accordingly by the amount of water delivered in acre-feet. The price of water delivered depends upon if the water is: (1) delivered by gravity, (2) delivered through the Bear River pipeline system, or (3) pumped by the owner from one of the drains, sloughs, or canals. Invoices are provided to each of the landowners on a measured $/acre-foot basis, a standby charge, and a possible surcharge to help defray the cost of supplemental water should it become available. Updated water use reports are provided midway through the irrigation season to advice to water users of water use and applicable charges. A sample notice of water allocation and applicable rates distributed to customers in the SSWD availability area is provided in Appendix E.

D. Water Shortage Allocation and Drought Policy

As previously described, the quantity of water allocated each year to an individual landowner is based on the available water supplies. During periods of water shortage the allocation of water is reduced as there are reduced water supplies available. Perennial crops such as orchards and pasture receive a higher priority of allocation over seasonal crops with rice growers receiving the

lowest priority. The water shortage allocation policy is further described in the Rules and Regulations for the Distribution and Use of Water included in Appendix E.

5. WATER USES IN SOUTH SUTTER WATER DISTRICT SERVICE AREA

A. Agricultural

During the last 5 years, an average of approximately 42,000 acres within SSWD boundaries have been irrigated with a combination of surface and groundwater. Table 5 provides the recent cropping pattern within the District. On average approximately 35,500 acres (or 85 percent) of the District is planted for rice production, with the remaining crop acreage primarily planted to orchards (approximately 3,000 acres), irrigated pasture (approximately 1,800 acres), alfalfa and grass hay (approximately 600 acres), and wheat (approximately 500 acres). Miscellaneous row and field crops make up the remaining acreage (approximately 500 acres).

Table 5. Summary of Recent Cropping Pattern within SSWD (2011 – 2015).

Year	Rice	Orchards[1/]	Irrigated Pasture	Alfalfa and Grass Hay	Wheat	Miscellaneous Row and Field Crops[2/]	Total Irrigated Acreage
2011	34,911	3,136	1,847	551	797	612	41,853
2012	35,244	3,213	1,870	606	34	647	41,614
2013	36,007	2,987	1,870	658	388	475	42,385
2014	36,007	2,987	1,870	658	388	475	42,385
2015	36,007	2,987	1,870	658	388	475	42,385
Minimum	34,911	2,987	1,847	551	34	475	41,614
Maximum	36,007	3,213	1,870	658	797	647	42,385
Average	35,635	3,062	1,865	627	399	537	42,124

[1/] Orchards consist of peaches, prunes, walnuts, and pecans.
[2/] Miscellaneous row and field crops consist of beans and corn.

B. Environmental

As previously identified, SSWD is required to release certain minimum flows to maintain fish life in the Bear River below the Camp Far West Diversion Dam. Licenses 11118 and 11120 (Applications 14804 and 10221, respectively) require SSWD to maintain minimum flows of 25 cfs during the spring months of April through June, and 10 cfs during the months of July through March of each succeeding year, or the inflow to the reservoir, whichever is less.

C. Recreational

CFW Reservoir has two recreational facilities along the shoreline. The north facility is larger and is open to the public year round for day and overnight use. The south facility is open for day and overnight use during the months of April through October. SSWD operates the recreation facilities through a concessionaire under the administration of the DWR. The recreational area located on the north side of the reservoir consists of 253 acres and the south recreational area comprises 110 acres. These two areas collectively consisted of 92 overnight campsites, plus one group overnight campsite, 108 day-use picnic sites, two day-use group picnic sites, 10 RV vehicle sites, two boat ramps, two beaches, one water treatment plant, and two sewage lagoons. Recreational activities include camping, swimming, boating, water sports, and fishing. Hunting is prohibited.

Recreation use at the CFW Reservoir is influenced by the water surface elevation of the reservoir created by the Camp Far West Dam. Historically, CFW Reservoir is full during the spring and is drawn down throughout the summer for irrigation demands and then refills during the late fall and winter. In recent years the recreation facilities at CFW Reservoir have experienced as many as 100,000 overnight visitors and over 60,000 day-use visitors.

Aside from the public recreational facilities at CFW Reservoir, no other public recreational facilities exist at or near SSWD's associated water conveyance facilities. The public has some limited access for fishing and other activities along the Bear River and the local streams where public roads run adjacent to or intersect the natural or improved watercourses.

D. Municipal and Industrial

The District does not deliver water for municipal or industrial uses.

E. Groundwater Recharge

The District and its facilities were developed as a conjunctive use program to provide a reliable source of surface water in most years when a full reservoir is available and reduce the landowner's dependence on groundwater. Landowners are encouraged to first purchase and use available surface water and to use groundwater supplies to augment surface water supplies. District operations with CFW Reservoir in place have assisted in the replenishment and recovery

of the groundwater basin by providing in-lieu recharge to the groundwater basin through the District's conveyance facilities and displacement of groundwater irrigation with surface water irrigation. SSWD does not currently have any additional recharge facilities other than its existing reservoir and conveyance facilities. A copy of the District's 2009 Groundwater Management Plan Update is attached as Appendix F.

F. Transfers and Exchanges

SSWD facilitates the transfer of surface supply allocations between landowners within its boundaries. Water users are also allowed to move water amongst their land holdings within the District's boundaries.

SSWD and CFWID entered into an Agreement in 1957 (and Supplemental Agreement in 1973) relative to the construction and subsequent enlargement of CFW Reservoir. Under the Agreement SSWD provides CFWID the first 13,000 acre-feet of water from CFW Reservoir each year to satisfy CFWID's senior water rights along the Bear River.

As previously described, the District entered into the BDSA with DWR and CFWID in February of 2000. The BDSA requires SSWD to release an additional 4,400 AF of water into the Bear River during dry and critical years, if requested by the DWR, to help meet water quality objectives in the Sacramento/San Joaquin Bay Delta.

In 2008, the District began participating in temporary (1-year) water transfers to various State Water Contractors (SWCs) in addition to releases pursuant to the BDSA. The 2008 Pilot Water Transfer resulted in the release of 6,909 acre-feet of previously stored water from CFW Reservoir. Similar temporary transfers between the District and participating SWCs occurred in 2009, 2010, and 2014 resulting in the transfer of 10,000 acre-feet of previously stored water each year. As a result of dry hydrologic conditions, the District reduced the water transfer quantity in 2015 to 6,000 acre-feet.

The BDSA and temporary water transfers have resulted in a small decrease in surface water deliveries to District landowners. During years when these releases and temporary transfers occur, landowners pump an incremental amount of groundwater to offset the reduction in the available surface water supply.

G. Other Uses

Irrigation water routed through the CFW Reservoir passes through a 6.8 MW hydroelectric power plant located at the base of the Camp Far West Dam. Releases through the dam are for hydroelectric generation are primarily dependent upon irrigation demands and downstream fish maintenance flows and are incidental to energy production. However, efforts are made to optimize energy production through the power plant. In addition, the District maintains and operates a small hydroelectric power plant located along the Main Canal which is incidental to irrigation operations.

6. QUANTIFICATION OF AVAILABLE WATER RESOURCES

For the purposes of this AWMP, water use and supply data for the years 2011 through 2015 has been included. Executive Order B-29-15 requires quantification of water demand for 2013, 2014, and 2015 to the extent data is available. Preliminary data for 2015 have been obtained and are included in this AWMP, where available.

A. Surface Water

Table 6 provides a summary of available surface water supplies for delivery to landowners within SSWD during the irrigation season, typically April through October)[13], for years 2010 through 2015. The available surface water supplies from the Bear River are measured at the District's Main Canal (for water supplies from the Bear River). Additional surface water supplies are available for delivery within the District from natural flow within perennial streams located within SSWD and from return flows (from operational spills upstream of the District, within the District and/or tailwater from individual landowners).

The volumes identified in Table 6 for the smaller local streams include available water supplies attributed to natural flow and return flows outside the District and do not include quantities that were redistributed and conveyed from the Bear River through the SSWD conveyance system from CFW Reservoir.

[13] Although the irrigation season typically includes April through October, in some instances deliveries in March and November may occur. These instances are minimal and represent a small quantity of deliveries and thus are not included in the inventory of surface water supplies.

Table 6. Summary of South Sutter Water District's Available Water Supplies by Water Source during April through October (acre-feet).

Year	Bear River[1/]		Supplemental Water Supplies from NID		Supply Available from Small Streams [2/]		Total Available Surface Water Supplies
	Acre-feet	% of Total	Acre-feet	% of Total	Acre-feet	% of Total	Acre-feet
2011	106,360	89.4%	12,581	10.6%	249	0.2%	118,941
2012	77,005	92.4%	6,196	7.4%	144	0.2%	83,345
2013	49,570	88.8%	6,233	11.2%	232	0.4%	55,849
2014	62,186	100.0%	0	0.0%	25	0.0%	62,186
2015	54,062	100.0%	0	0.0%	716	1.3%	54,062
Minimum	49,570	88.8%	0	0.0%	25	0.0%	54,062
Maximum	106,360	100.0%	12,581	11.2%	716	1.3%	118,941
Average	69,837	94.1%	5,002	5.8%	273	0.4%	74,877

[1/] Measured at the District's Main Canal.
[2/] Available natural and abandoned flow from Auburn Ravine, Markham Ravine, Coon Creek Yankee Slough and East Side Canal. These quantities do not include quantities that were redistributed and conveyed from the Bear River through the SSWD conveyance system from the CFW Reservoir.

As shown in Table 6, during the 2010 - 2015 period, the Bear River accounts for 93.1 percent of the available surface water supply within the District. Approximately 6.8 percent of the total surface water supply was obtained from NID while the remaining 0.4 percent was made up from local water supplies.

B. Groundwater

As SSWD does not own or operate any groundwater wells and individual groundwater users do not quantify pumping, groundwater extraction volumes are not available within the District. In order to estimate groundwater use, it is assumed that groundwater pumping is used to make up the difference between the available surface water, effective precipitation, and the agricultural water cropping needs as further described below.

C. Other Water Supplies

Effective Precipitation

Table 7 summarizes the effective precipitation for lands within the District that received surface water deliveries from the District during 2010-2015[14]. The table includes the estimated effective precipitation calculated for the months that irrigation deliveries are typically made, April through October.

Table 7. Estimated Effective Precipitation (acre-feet).

Month	2011	2012	2013	2014	2015
April	0	3,585	866	1,709	2,420
May	2,683	0	0	0	0
Jun	2,210	0	164	0	0
Jul	0	0	0	0	0
Aug	0	0	0	0	0
Sep	0	0	345	0	0
Oct	1,924	1,167	0	0	0
Total	6,818	4,752	1,375	1,709	2,420

Spills

Spills that occur as a result of SSWD operations are recaptured by the conveyance system and are utilized to meet demands within the District. These operational spills are not measured and are dependent upon hydrology and surface water allocation. District observations indicate that during drier years, operational spills are reduced as surface water deliveries are limited.

Additional operational spills occur within the District as a result of individual landowner operations. The majority of these spills are associated with the agronomic practices to grow the predominant crop within the District, rice. These spills (originating from both surface water and groundwater pumping) are not controlled or measured by the District; however, they flow into the District's conveyance facilities and are recirculated providing additional water supplies for delivery to landowners. District observations indicate that during drier years, landowner spills are reduced, as surface water deliveries are limited and landowners may change their cropping

[14] Effective Precipitation is estimated as 60% of the monthly growing season precipitation greater than 0.5 inch as recorded at the Nicholas 2 Station (from the National Climatic Data Center) multiplied by the total crop acreage.

pattern to a lower water use crop if sufficient groundwater pumping capacity is not available to meet crop water needs.

D. Drainage from South Sutter Water District's Service Area

SSWD attempts to operate its water delivery system with minimal spills (i.e., minimal outflow) during the irrigation season. Temporary check structures are installed during the irrigation season to minimize spills at many of the natural channels and/or drains within the District. These check structures maintain water levels to facilitate upstream diversions and facilitate operation of the system to minimize outflow. Operational spills, although minimal, are available downstream and contribute to the water supply of downstream irrigation districts and mutual water companies. Once the irrigation season is completed, the temporary check structures are removed, allowing drainage from the District and natural flow from the perennial streams to flow through the District.

7. WATER QUALITY

A. Surface Water

As previously described, the main source of surface water available for delivery within the District originates from the Bear River. Additional water supplies are available from smaller localized streams and which convey both natural flow and return flows from upstream operations. For example, upstream dischargers, such as the City of Auburn's Ophir Sewage Plant and city of Lincoln's water treatment plant, contribute to the flows diverted out of the Auburn Ravine. The unincorporated area of Sheridan releases sewage effluent into Yankee Slough; the city of Lincoln sprinkles effluent on ground whose rainfall runoff reaches SSWD; and the city of Roseville releases treated water into Pleasant Grove Creek. Coon Creek flows also consist of return flows from upstream entities. SSWD has not experienced any known surface water quality problems, and currently does not have a surface water quality monitoring program.

B. Groundwater

Groundwater in the greater North American Subbasin has localized areas or, in some cases, individual wells where concentrations of certain water quality constituents are elevated relative

to water quality standards and guidelines for drinking water and irrigation supply. These constituents include total dissolved solids (TDS), specific conductance, chloride, sodium, nitrate, boron, iron, manganese, arsenic, and fluoride (DWR, 2006). For all practical purposes, however, none of these constituents is a constraint or major concern within the District due to the low concentrations of each of the constituents observed during water quality monitoring. This is evident in Figure 9 which depicts the maximum TDS concentrations for wells with TDS data between 1961 and 2008 (Luhdorff et al, 2009).

Groundwater quality data is maintained by the USGS and the DWR; however, there is no regular groundwater quality monitoring program in the District and as such limited groundwater quality data exists. The District's temporary water transfers in 2008, and 2009 included a cooperative monitoring effort by the District and the DWR to collect water quality data. Data included field parameters in five wells, as well as laboratory analysis of one sampled well for general minerals and some heavy metals. During the temporary transfers in 2010, 2014, and 2015 specific conductance data was collected in pumping wells located within the District. This data is available on DWR's CASGEM website[15]. The recent data collected during the 2010, 2014 and 2015 water transfers does not indicate changes in specific conductance, and are within the tolerance for crops grown within the District. The District is not aware of any localized water quality concerns within the District.

C. Other Water Supplies

The District does not have a surface water quality monitoring program for operational spills and/or return flows that occur as a result of District or individual landowner operations

D. Drainage from South Sutter Water District Service Area

The District does not have a surface drain water quality monitoring program in place that monitors water quality levels discharged from the service area.

[15] https://www.casgem.water.ca.gov/OSS/%28S%28puscizk3y1biczs3tow5ompq%29%29/Public/ApplicationHome.aspx

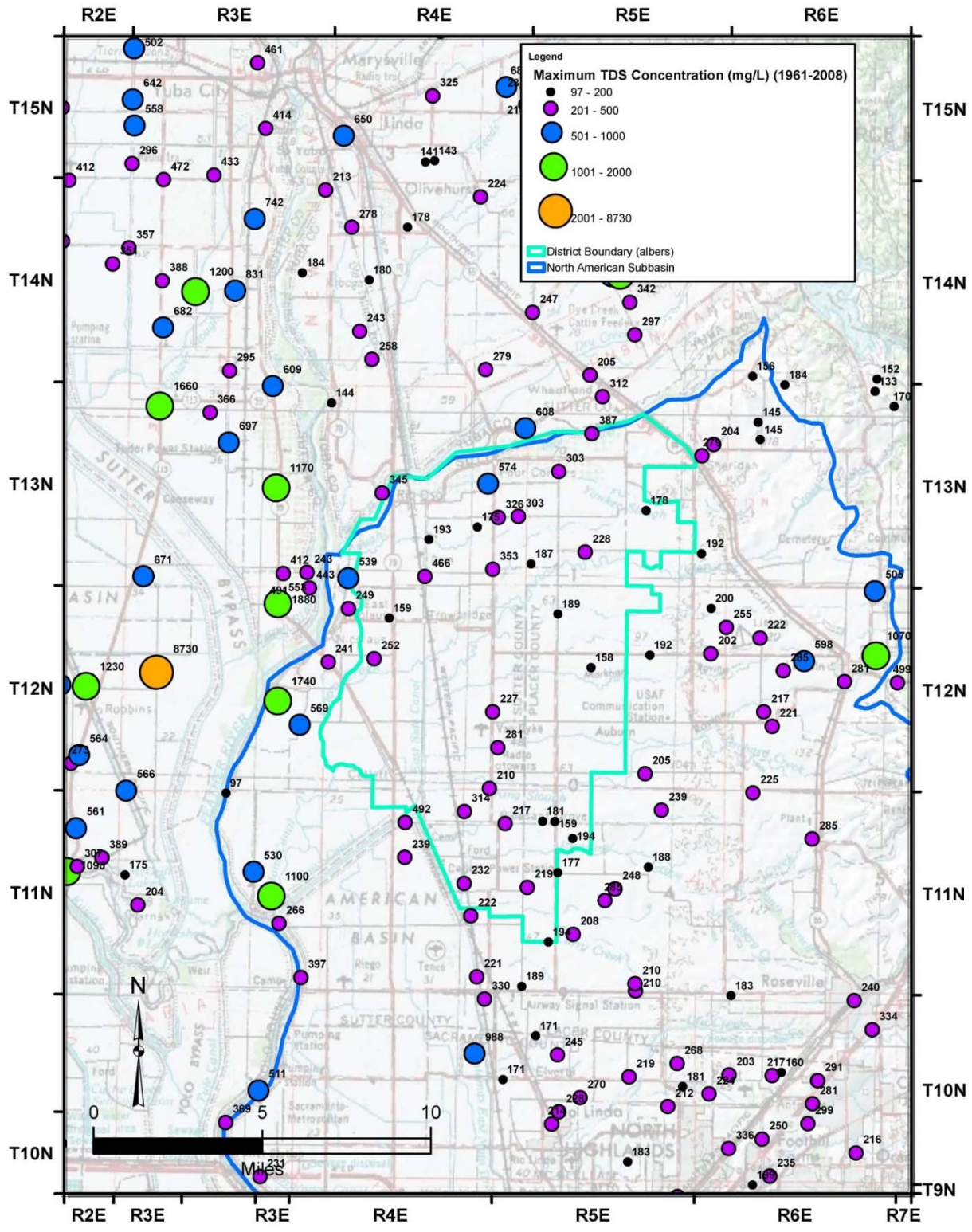

Figure 9. Maximum Total Dissolved Solids (TDS) Concentration for Wells within and Near South Sutter Water District, 1961-2008.

8. WATER BUDGET

As previously described, SSWD is a conjunctive use irrigation district where landowners pump groundwater and receive a supplemental water supply from CFW Reservoir. Approximately 2/3 of crop demand is typically provided by groundwater pumping whereas 1/3 is provided by surface water deliveries. In order to complete a water balance and estimate the quantity of groundwater pumping by landowners within the District an estimate of the total crop water requirements is needed. It is assumed that groundwater pumping is used to make up the difference between the available surface water and effective precipitation, and crop demand.

A. Crop Water Needs

Crops have been grouped by crop type for the purposes of estimating crop water needs for this AWMP. Table 8 through Table 11 show the crop water needs for the major crop categories grown within the District. The water requirements to meet crop ET (ETc), cultural practices, and leaching requirements were determined for each crop based on data from CIMIS and information developed by the Irrigation Training and Research Center (ITRC), California Polytechnic State University, San Luis Obispo. Reference Evapotranspiration (ETo) is based on the average monthly ETo published by CIMIS for the stations at Browns Valley, Verona, and Colusa.

Crop Coefficients (Kc values) were developed based on the ETc data for Zone 14 contained in ITRC Report 03-001 - California Crop and Soil Evapotranspiration, January 2003, assuming surface irrigation in a typical year for 2012 and 2013 and assuming surface irrigation in a dry year for 2014 and 2015. All of the water requirement pursuant to cultural practices are assumed to be consumed. Leaching requirements are based on information contained in FAO Irrigation and Drainage Paper 29 Revision 1, 1994.

Table 8. Agricultural Crop Data and Total Crop Water Need 2011.

Crop Type	Total Acreage	ET Crop (AF)	Cultural Practices (AF)	Leaching Requirement (AF)	Total Crop Water Need (AF)
Walnuts	2,714	7,060	-	434	7,494
Rice	34,911	91,920	43,639	2,095	137,653
Pasture and Misc. Grasses	2,161	6,496	-	65	6,561
Prune Trees	321	867	-	58	924
Misc. field crops	360	528	-	65	593
Peach Trees	100	266	-	16	282
Corn	252	447	-	35	483
Wheat	797	513	-	24	537
Alfalfa Hay	237	612	-	26	638
Total	41,853	108,708	43,639	2,818	155,165

Table 9. Agricultural Crop Data and Total Crop Water Need 2012.

Crop Type	Total Acreage	ET Crop (AF)	Cultural Practices (AF)	Leaching Requirement (AF)	Total Crop Water Need (AF)
Walnuts	2,852	8,768	-	456	9,224
Rice	35,244	98,822	44,054	2,115	144,991
Pasture and Misc. Grasses	2,291	7,213	-	69	7,281
Prune Trees	262	750	-	47	797
Misc. field crops	373	570	-	67	637
Peach Trees	100	282	-	16	298
Corn	274	494	-	38	532
Wheat	34	18	-	1	19
Alfalfa Hay	185	509	-	20	529
Total	41,614	117,425	44,054	2,830	164,309

Table 10. Agricultural Crop Data and Total Crop Water Need 2013.

Crop Type	Total Acreage	ET Crop (AF)	Cultural Practices (AF)	Leaching Requirement (AF)	Total Crop Water Need (AF)
Walnuts	2,702	9,902	-	432	10,334
Rice	36,007	104,468	45,009	2,160	151,637
Pasture and Misc. Grasses	2,344	9,201	-	70	9,272
Prune Trees	185	641	-	33	674
Misc. field crops	362	600	-	65	665
Peach Trees	100	341	-	16	357
Corn	113	215	-	16	230
Wheat	388	319	-	12	331
Alfalfa Hay	185	561	-	20	582
Total	42,385	126,248	45,009	2,825	174,081

Table 11. Agricultural Crop Data and Total Crop Water Need 2014.

Crop Type	Total Acreage	ET Crop (AF)	Cultural Practices (AF)	Leaching Requirement (AF)	Total Crop Water Need (AF)
Walnuts	2,702	8,874	-	432	9,307
Rice	36,007	104,975	45,009	2,160	152,144
Pasture and Misc. Grasses	2,344	8,144	-	70	8,214
Prune Trees	185	571	-	33	605
Misc. field crops	362	600	-	65	666
Peach Trees	100	304	-	16	320
Corn	113	214	-	16	230
Wheat	388	292	-	12	303
Alfalfa Hay	185	551	-	20	571
Total	42,385	124,525	45,009	2,825	172,359

Table 12. Agricultural Crop Data and Total Crop Water Need 2015.

Crop Type	Total Acreage	ET Crop (AF)	Cultural Practices (AF)	Leaching Requirement (AF)	Total Crop Water Need (AF)
Walnuts	2,702	9,121	-	432	9,554
Rice	36,007	103,097	45,009	2,160	150,266
Pasture and Misc. Grasses	2,344	8,411	-	70	8,481
Prune Trees	185	588	-	33	621
Misc. field crops	362	582	-	65	647
Peach Trees	100	313	-	16	329
Corn	113	212	-	16	227
Wheat	388	288	-	12	299
Alfalfa Hay	185	551	-	20	571
Total	42,385	123,162	45,009	2,825	170,996

B. Quantification of Water Uses

Landowner Deliveries

Deliveries to landowners within the District are measured and are limited by the surface water allocation to each individual landowner. Deliveries are dependent on hydrology and available surface water supplies vary based on hydrologic conditions. Table 13 provides a summary of the total surface water deliveries to landowners within the District during April through October during 2011 to 2015.

Table 13. Summary of Total Surface Water Deliveries within South Sutter Water District during April through October for 2010 through 2015.

Year	Water Deliveries (AF)	Acreage Irrigated (Acres)
2011	118,987	41,853
2012	85,881	41,614
2013	51,310	42,385
2014	49,154	42,385
2015	41,524	42,385
Minimum	41,524	41,614
Maximum	118,987	42,385
Average	69,371	42,059

As shown in Table 13 deliveries have ranged between approximately 49,000 to 119,000 acre-feet. It is important to note that when comparing Table 6 and Table 13 in some cases the total water deliveries are close to the measured total surface water supplies available for delivery within the District. This is due to the contribution from recapture of operational spills (from the District) and tailwater from landowner operations (from both surface water and groundwater pumping) that is discharged and reused within the District boundary.

Table 14. Summary of Water Uses within South Sutter Water District.

Water Uses	2011	2012	2013	2014	2015
Crop Water Use (from *Table 8* and *Table 12*)					
Crop evapotranspiration	108,708	117,425	126,248	124,525	123,162
Leaching	2,818	2,830	2,825	2,825	2,825
Cultural practices	43,639	44,054	45,009	45,009	45,009
Conveyance System and Environmental Use					
Estimated percolation to groundwater and evaporation from conveyance system[1/]	6,656	4,764	3,482	3,594	3,879
Subtotal	161,821	169,073	177,564	175,953	174,876

[1/] Estimated percolation to groundwater and evaporation from conveyance system are estimated based on a conveyance system seepage of 5% of the available surface water supply and an assumed evaporation rate of 3.0 acre-feet per acre.

As shown in Table 15 and Table 16 there is minimal water leaving the District and there are no irrecoverable losses from the District.

Table 15. Water Leaving the District

Drain Water	2011 – 2015
Surface drain water leaving the service area	Minimal
Sub-surface drain water leaving the service area	Minimal

Table 16. Water Irrecoverable Losses

Description	2011 – 2015
Flows to saline sink	None
Flows to perched water table	None

C. Overall Water Budget

Table 17 summarizes the District's water budget for 2011 – 2015. Water uses are described in Section 5, Water Uses in South Sutter Water District Service Area of this AWMP. The effective precipitation is based on data from the Nicholas 2 Station (from the National Climatic Data Center).

Table 17. Quantification of Water Supplies for 2011 – 2015.

Water Supplies	2011	2012	2013	2014	2015
Surface water *(summary total from Table 6)*	*118,941*	83,345	55,849	62,186	54,062
District groundwater	0	0	0	0	0
Effective precipitation *(summary total from Table 7)*	6,818	4,752	1,375	1,709	2,420
Subtotal	**125,759**	**88,097**	**57,225**	**63,895**	**56,482**

Table 18 summarizes the District's water budget for the 2011-2015. Landowners pump an undetermined quantity of groundwater from privately owned wells to supplement surface water deliveries in order to meet crop water needs in any given year. The *"Estimated Groundwater Pumping from Privately Owned Wells"* includes percolation from farms, canals, and ditches within the District's service area and unaccounted for errors in assumptions and calculations used to estimate water demand. Negative values indicate insufficient surface supplies to meet crop water needs, which is consistent with the conjunctive use nature of the District.

Table 18. Water Budget Summary

Water Accounting	2011	2012	2013	2014	2015
Subtotal of Water Supplies *(Table 17)*	125,759	88,097	57,225	63,895	56,482
Subtotal of Water Uses *(Table 14)*	161,821	169,073	167,787	175,953	174,876
Drain Water Leaving Service Area *(Table 15)*	0	0	0	0	0
Estimated Groundwater Pumping at Privately Owned Wells[1]	**-36,062**	**-80,976**	**-110,563**	**-112,058**	**-118,394**

[1]*The Estimated Groundwater Pumping at Privately Owned Wells* in this table is the closure term in the mass water balance. As such, in addition to any estimated groundwater pumping, the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc. A positive value would indicate assumed percolation to groundwater greater than groundwater pumping. A negative value indicates insufficient surface water supplies and groundwater pumping from privately owned wells.

D. Water Supply Reliability

The surface water supply provided by SSWD is as reliable as the natural hydrologic conditions allow. The development of the surface water supply has provided increased reliability of groundwater resources available to individual water users. Therefore, the overall water supply provided jointly by SSWD and individual groundwater wells is considered to be reliable. A summary of the available surface water supplies and deliveries during 2011 and 2015 are provided in Table 19.

Table 19. Summary of Available Surface Water Supplies and deliveries during 2011-2015 (acre-feet).

Year	Available Surface Water Supplies (acre-feet)								April through October Deliveries (acre-feet)
	Apr	May	Jun	Jul	Aug	Sep	Oct	Total	
2011	2,259	22,189	18,087	26,080	32,014	15,751	2,561	118,941	118,987
2012	69	20,363	14,350	18,851	18,580	7,714	3,418	83,345	85,881
2013	3,996	12,013	7,985	11,417	13,558	5,642	1,237	55,849	51,310
2014	2,549	13,273	11,677	15,316	13,137	4,796	1,438	62,186	49,154
2015	4,153	9,818	8,166	14,410	12,248	4,312	954	54,062	41,524
Min	69	9,818	7,985	11,417	12,248	4,312	954	54,062	41,524
Max	4,153	22,189	18,087	26,080	32,014	15,751	3,418	118,941	118,987
Avg.	2,605	15,531	12,053	17,215	17,907	7,643	1,922	74,877	69,371

9. CLIMATE CHANGE

Based on a recent report by the U.S. Bureau of Reclamation, titled *West-Wide Climate Risk Assessment Sacramento and San Joaquin Basins Climate Impact Assessment* dated September 2014, projected climate change exhibited a trend of higher temperatures in the winter, resulting in more precipitation as rainfall. This would produce more runoff in the winter and less snowpack, reducing the spring runoff. Therefore, reservoirs that rely heavily on snow melt may fill earlier in the year. As CFW Reservoir is primarily filled by rainfall, SSWD's surface water supply will likely be less affected by climate change than other Districts that rely on spring runoff from a snowpack. Therefore, potential effects of climate change on SSWD's future surface water supplies are projected to be minimal.

10. WATER USE EFFICIENCY INFORMATION

The overall implementation of conjunctive use through the development and enlargement of CFW Reservoir is considered as a previously implemented water management practice by SSWD that has improved overall system reliability in order to optimize water supplies for agricultural purposes within its service area. The District operates to minimize outflow from the District and recirculates tailwater (both from District operations and landowner operations) to maximize the quantity of surface water available for delivery to landowners. In addition, SSWD has continued with many maintenance and ongoing management practices to maintain the overall system integrity to continue to deliver water efficiently. These water management practices include maintenance of existing facilities by SSWD personnel and through contracts.

SSWD's objective is to optimize the management of the available resources through short and long-term planning efforts described in this AWMP. SSWD has reviewed and adopted this AWMP with the intent to use it as a tool in accomplishing this objective. SSWD is committed to update the AWMP in accordance with Water Code Section 10826, thereby continuing its commitment to successfully implement all appropriate EWMPs.

A. EWMP Implementation and Reporting

Critical EWMPs are identified in Water Code Section 10608.48(b) and requires agriculture water suppliers to measure the volume of water delivered to customers with sufficient accuracy to

comply with subdivision (a) Section 531.10 and to adopt a pricing structure for water customers based at least in part on quantity delivered. Conditions EWMPs are identified in Water Code Section 10608.48 (c) which identifies that agricultural water suppliers shall implement additional EWMPs (i.e., Conditional EWMPs), if the measures are locally cost effective and technically feasible. These Conditional EWMPs are further described in this section along with the implementation status.

Critical Efficient Water Management Practices

SSWD currently measures deliveries to all customers and bills each customer for the volume delivered. Therefore, SSWD believes that it is in compliance with the provisions of Section 10608.48(b). California Code of Regulation (CCR) §597 approved on July 11, 2012, defines how agriculture suppliers comply with Water Code Section 10601.48(a). SSWD intends to comply with the measurement certification requirements of CCR §597 as described below.

Critical EWMP No. 1 – Water Measurement (Implemented/Planned/On-going)

SSWD measures and records deliveries to each customer using standardized flow measurement devices. SSWD believes the current flow measurement devices can be verified to the required accuracy level of ±12% by volume. Deliveries within the SSWD service area are made either by gravity or pump. All deliveries are measured by McCrometer propeller meters which are laboratory certified to be accurate to within ±2% of the reading.

As further described in the District's Water Measurement Certification Program (Appendix G), SSWD intends to certify its existing measurement devices in accordance with CCR §597.4(a)(1)(A), using field-testing and analysis completed on a random and statistically representative sample of existing measurement devices. In addition to verifying that the existing measurement devices meet the accuracy standards required under CCR §597, the Water Measurement Certification Program includes a review of installation, operation and maintenance protocols to confirm the existing devices are installed and maintained to industry approved standards or manufacture's specifications.

Although the 2012 Progress Report Addendum identified implementation of the Water Measurement Certification Program to certify the District's existing measurement devices during

2013 through 2015, on-going drought conditions and reduced available surface water supplies (and deliveries) did not provide optimal conditions to complete the certification. A revised estimate of the cost to develop and implement the Water Measurement Certification Program and to prepare the report required pursuant to CCR §597 was completed resulting in an approximate total cost of $110,000. The District intends to complete the certification over the next few years and projects full implementation of the Water Measurement Certification Program prior to the next Plan Cycle.

Critical EWMP No. 2 – Volume-Based Pricing (Implemented)

SSWD bills its customers based on the quantity of water delivered.

This EWMP is fully implemented.

Conditional Efficient Water Management Practices

Conditional EWMP No. 1 – Facilitate Alternative Land Use (Technically Infeasible)

As defined in the 2015 Guidebook, the facilitation of alternative land use is for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including of problem drainage. Section II.A.3 Topography and Soils of this AWMP indicate that the soils within SSWD are generally well drained, and therefore do not exhibit areas of inadequate drainage. District lands do not include drainage problem areas or crops grown on inappropriate soil types.

Therefore, this EWMP is not technically feasible for implementation by the District.

In addition, it is outside of SSWD's authority to take action to facilitate alternative land uses. Land use changes are made by individual landowners. SSWD provides surface water to users within its boundaries that are in good standing through compliance with rules and regulations. SSWD does nothing to deter land use changes. SSWD would deliver water to lands that make alternative uses if it was compliant with existing rules and regulations.

Conditional EWMP No. 2 – Facilitate Use of Available Recycled Water (Implemented)

Upstream M & I water users release treated effluent into local channels that flow through SSWD. This water is diverted by SSWD pursuant to its water rights as part of the overall water supply. There is no recycled water generated within SSWD boundaries.

Therefore, all available recycled water is used by SSWD, and this EWMP is fully implemented.

Conditional EWMP No. 3 – Facilitate the Financing of Capital Improvements for On-Farm Irrigation Systems (Implemented/On-Going)

To facilitate the transition of landowners to micro/drip irrigation systems within the northern portion of the District, the District installed the Bear River pipeline and retro-fitted field turnouts in 1962-1963. Approximately 2,800 acreage within the District, consisting of permanent crops and orchards, have transitioned to micro/drip irrigation systems. The District continues to look for opportunities for financing capital improvements for on-farm irrigation systems.

This EWMP is implemented and on-going.

Conditional EWMP No. 4 – Incentive Pricing Structure (*Implemented*)

SSWD establishes prices based on available surface water supplies in a manner to cover its costs and provide an appropriate operational reserve fund. CFW Reservoir was constructed to SSWD surface water allocations provide only partial water supplies to its users and as desires to maximize surface water deliveries in order to maintain groundwater conditions, price incentives to minimize surface water use are not appropriate. In essence, SSWD prices its water at the minimum price to facilitate maximum surface water use, and thereby reducing groundwater pumping and providing in lieu recharge.

This EWMP is fully implemented.

Conditional EWMP No. 5. – Infrastructure Improvements (*Implemented/Planned/On-Going*)

The District has developed a capital improvement program to address the sustainability and modernization of its water delivery system. This capital improvement program includes both major structures (auxillary spillway on the dam) and minor infrastructure related to its distribution system (canals, laterals, check structures, field turnouts, and siphons, bridges and

crossings). Following is a list of some of the improvements to District facilities conducted over the past 10-years:

- Phase 1 and Phase 2 of the conveyance canal improvement plan (approximately $2,100,000),
    - Increasing capacity of Main Canal
    - Replacement/enlargement of siphon under Highway 65,
    - Replacement and automation of radial headgates on Main Canal
- Rehabilitate facilities including corrugated metal pipe siphons under canals, roads and railways and outlets/delivery facilities (approximately $60,000),
- Installation of overflow pipeline at Yankee Slough to improve distribution system flexibility and avoid potential maintenance issues and delivery outages (approximately $13,000), and
- On-going maintenance and replacement of District facilities including but not limited to turnouts, meters, canals, pumps, etc.

Upcoming Major Infrastructure Improvements

The District is in the process of modifying the spillway at CFW Reservoir in accordance with the new flow capacities identified in the Probable Maximal Flood (PMF) hydrograph. This project will increase the potential flow at the spillway and potentially allow the District to store an additional 10,000 acre-feet of water under its existing water rights for delivery to landowners within its service area. The cost for this project is approximately $12 million.

Upcoming Minor Infrastructure Improvements

The District plans to continue to make minor infrastructure improvements related to its distribution system (canals, laterals, check structures, field turnouts, and siphons, bridges and crossings) for maintenance and to improve overall delivery system efficiency. In addition, the District plans on installing a variable frequency drive on the Bear River Pipeline booster pump station to automate maintaining pressure within the pipeline to facilitate deliveries at a cost of $10,000. For the 2016 budget, the District estimates approximately $40,000 for upcoming minor infrastructure improvements (not including the installation of the variable frequency drive, as it is included in the costs for EWMP No. 9).

It is not appropriate for the canal lining portion of this EWMP to be implemented extensively as the surface water delivery system provides in-lieu groundwater recharge to facilitate the conjunctive use system. The conveyance losses as a result of this in-lieu recharge is estimated to account for approximately 3,500 to 6,700 AF per year of recharge, depending on available surface water supplies. Additional infrastructure improvements, including the implementation of Phase 3 including of the conveyance canal improvement program will increasing the maximum capacity of the secondary and tertiary laterals, and are intended to increase in-lieu groundwater recharge and further support the District's successful conjunctive use program. Implementation of Phase 3 of the conveyance canal improvement plan will occur based on available funding.

This EWMP is currently being implemented and on-going maintenance and improvements to facilities are evaluated each year pursuant to the District's capital improvement program.

Conditional EWMP No. 6 – Increase Flexibility in Water Ordering/Delivery (*Implemented*)

SSWD surface water allocations provide only a partial water supply to its water users; and because of the delivery system characteristics, it is believed flexibility is optimal. Water ordering for the subsequent day has proven satisfactory for its water users for many years. This daily requirement provides SSWD the necessary time to make adjustments at its diversion facilities and to assure the changes are effective throughout the system.

This EWMP is fully implemented.

Conditional EWMP No. 7 – Construct and Operate Spill and Tail Water Recovery Systems (*Implemented*)

SSWD operates to minimize spills from the District during the irrigation season. Currently, there are two spill sites identified within SSWD that occasionally spill during the season. One of these sites is on Auburn Extension; where the owner now pumps water to minimize the amount of spill at this location. The other potential spill site identified is Coppin Dam; however, this is also minimal and usually end of season drainage due to upstream operations that are not managed by SSWD.

This EWMP is fully implemented and there is no additional opportunity to capture water leaving SSWD boundaries for delivery during the irrigation season.

Conditional EWMP No. 8 – Optimize Conjunctive Use (*Implemented/On-Going*)

The objective behind the construction of CFW Reservoir was to reduce groundwater extraction and to provide in-lieu groundwater recharge by supplying water users with a partial supply of surface water. As a whole, the groundwater basin underlying the SSWD service area has operated well as a conjunctive supply with the surface water; and the underlying basin has proven to be an important and reliable supply in times of surface water shortages. Surface water supplies are utilized as much as possible during all years; but during drier years surface water supplies are interrupted, and irrigation demands are met by increasing groundwater extraction and cropping changes. Although the increased use of the groundwater resource may result in periods of declines during drier hydrologic conditions, in general the groundwater basin continues to recover during periods of wetter hydrology (MBK, 2015)[16].

In 2009, SSWD updated its GWMP. The objectives of the GWMP are to develop groundwater as a supplemental water source, avoid overdraft and the associated effects within the groundwater basin, preserve groundwater quality, and preserve interrelated surface water resources. These goals are to be achieved through extensive monitoring and management of groundwater within SSWD; as well as communication and cooperation with groundwater well owners, local agencies pumping groundwater within the basin, and Federal and State agencies. The implementation of the GWMP is an on-going EWMP to further optimize conjunctive use. In addition, SSWD plans to be involved in the Sustainable Groundwater Management Act (SGMA) as a Sustainable Groundwater Management Agency, and/or partner with other interested irrigation district/mutual water companies to develop a Sustainable Groundwater Management Plan (SGMP). The development of a SGMP for the portion of the North American Subbasin underlying SSWD will incorporate the objectives of the District's existing GWMP to optimize conjunctive use in a sustainable manner.

SSWD continues to seek opportunities to increase surface water deliveries to offset potential adverse impacts to the groundwater basin and reduce overall water supply costs for water users.

The EWMP is implemented and on-going.

[16] MBK Engineers, *2015 South Sutter Water District Groundwater Monitoring Report*. Jan 2015.

Conditional EWMP No. 9 – Automate Canal Control Structures (*Implemented/On-Going*)

The District installed automated radial gates on the Main Canal to maintain water levels as a part of the Phase 1 and 2 conveyance canal improvement plan. In addition, the District automated releases into Auburn Ravine from Line 1.

The District intends to automate the booster pumping station for the Bear River pipeline by installing a variable frequency drive controller on a pump. This will allow for automation of the facility to maintain a constant pressure (and flow) facilitating delivery to landowners. The estimated cost for installation of the variable frequency drive controller is approximately $10,000.

Through the evaluation of facilities and spill sites within SSWD during the development of the conveyance canal improvement plan and subsequent efforts, staff determined that it was not locally cost effective to proceed with further implementation of automation of additional canal control structures. This evaluation determined that there would be no significant benefit (i.e., water savings) from automating the canal structures, as the District successfully operates to minimize spills outside the District utilizing current facilities.

This EWMP is implemented and is on-going.

Conditional EWMP No. 10 – Facilitate Customer Pump Testing and Evaluation (*Planned)*

The District will coordinate with landowners to identify opportunities for pump testing and evaluation including but not limited to Pacific Gas and Electric (PG&E) Energy Management Solutions for Pumps and Pump Systems[17].

This EWMP is planned for implementation prior to the next AWMP cycle.

Conditional EWMP No. 11 – Water Conservation Coordinator (*Implemented*)

SSWD's has named Mr. Brad Arnold, General Manager as Water Conservation Coordinator.

This EWMP is fully implemented.

[17] http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/agriculture/pge2001mo_collateral_factsheets_pumpsandpumpingsystems.pdf

Conditional EWMP No. 12 – Provide for the Availability of Water Management Services to Water Users (*Implemented/Ongoing*)

SSWD staff assists customers with managing on-farm water by monitoring tailwater and suggesting improvements for farm-gate deliveries; staff also monitor ditch growth and will instruct users to clean the ditch of debris and water-consuming vegetation. SSWD believes it is important to provide information on the available resources growers can utilize in daily farm operations. This includes facilitating opportunities for on-farm system evaluations, providing resources on improved irrigation scheduling techniques, and informing water users as to the programs available for increasing energy efficiency, such as through the incentives offered for pump efficiency testing and repair. SSWD currently assembles general information on a regular basis that is available at the SSWD office. SSWD is committed to support the exchange of materials related to these topics and intends to provide growers with additional materials and coordinate with third parties as appropriate, through the efforts of the water conservation coordinator, to accomplish this EWMP.

This EWMP is implemented and on-going.

Conditional EWMP No. 13 – Identify Institutional Changes (*Implemented/Ongoing*)

SSWD understands that there are three basic components to a water delivery service including equity, reliability, and flexibility. When considering modifications to District policies and facilities, SSWD is aware of the significance to optimize these components. SSWD believes that it is also important to recognize the evolving demands of the water users based on improved water management practices and to incorporate the means to meet the demands by updating and enhancing District policies as necessary.

This EWMP is implemented and on-going.

Conditional EWMP No. 14 – Evaluate and Improve Supplier Pump Efficiencies (*Implemented/Ongoing*)

As mentioned previously, SSWD owns and operates three booster/lift pumps that are tested/maintained on an as needed basis. In 2011, the District rebuilt the booster/lift pumps to improve overall pumping efficiencies. SSWD intends to conduct pump efficiency tests in the

future to evaluate pump efficiencies on its booster/lift pumps. SSWD believes that optimizing energy use efficiency may be best accomplished by evaluating and improving operational efficiency, such as with a variable frequency drive, in conjunction with pump efficiency testing. As a result pump evaluations, the District is installing a variable frequency drive controller on one of the Bear River pipeline booster pumps.

This EWMP is implemented and on-going.

B. Report of EWMP Efficiency Improvements

As described above in each individual EWMP, the District has made many efficiency improvements to address the EWMPs in recent years. The two critical EWMPs are considered fully implemented, as the District currently measures water delivered and charged landowners based on volume. In addition, Conditional EWMPs 2, 4, 6, 7, 11 are considered fully implemented. A summary of the Conditional EWMPs implemented within the last 10 years is provided in Table 20.

Table 20. Summary of Conditional EWMPs Implemented within the last 10 years.

Conditional EWMPs	Description of EWMPs Implemented
5 – Infrastructure Improvements	▪ Phase 1 and Phase 2 of the conveyance canal improvement plan, ▪ Rehabilitate facilities including corrugated metal pipe siphons under canals, roads and railways and outlets/delivery facilities, ▪ Installation of overflow pipeline at Yankee Slough to improve distribution system flexibility and avoid potential maintenance issues and delivery outages, ▪ On-going maintenance and replacement of District facilities including but not limited to turnouts, meters, canals, pumps, etc.
8 – Conjunctive Use	▪ Completion of Phase 1 and Phase 2 of the conveyance canal improvement plan to increase capacity of delivery system to optimize delivery of surface water, and facilitate recharge, ▪ On-going measurement and monitoring of groundwater elevations, ▪ 2009 Update to GWMP.
9 – Automated Canal Controls	▪ The District installed automated radial gates on the Main Canal to maintain water levels as a part of the Phase 1 and 2 conveyance canal improvement plan, ▪ Automated releases into Auburn Ravine from Line 1.
14 – Supplier Pump Improved Efficiency	▪ Rebuilding of booster/lift pumps to improve efficiency

A summary of the additional EWMP the District intends to implement within the next 10 years is provided in Table 21.

Table 21. Summary of Conditional EWMPs to be Implemented within the Next 5-10 years.

Conditional Efficient Water Management Practice	Description of EWMP Implemented
1 – Water Measurement*	▪ Measurement Certification Program
5 – Infrastructure Improvements	▪ Auxiliary Spill structure at Camp Far West Dam (if funding available). ▪ The District plans to continue to make minor infrastructure improvements related to its distribution system (canals, laterals, check structures, field turnouts, and siphons, bridges and crossings) for maintenance and to improve overall delivery system efficiency. ▪ Install variable frequency drive on the Bear River Pipeline booster pump station to automate maintaining pressure within the pipeline to facilitate deliveries
8 – Conjunctive Use	▪ On-going measurement and monitoring of groundwater elevations, ▪ Become Sustainable Groundwater Management Agency and develop Sustainable Groundwater Management Plan.
9 – Automated Canal Controls	▪ Install variable frequency drive on the Bear River Pipeline booster pump station to automate maintaining pressure within the pipeline to facilitate deliveries.
10 – Facilitate Customer Pump Testing and Evaluation	▪ Transmit letter and materials to landowners within District identifying programs for pumps testing and pumping systems evaluations including but not limited to PG&E's energy management program.
14 – Supplier Pump Improved Efficiency	▪ On-going pump testing at pumps within District, as necessary.

C. Documentation for Non-Implemented EWMPs

As described in this section, the District is not implementing Conditional EWMP No. 1, Facilitate Alternative Land Use. District lands do not include drainage problem areas or crops grown on inappropriate soil types. Therefore, this EWMP is technically infeasible for implementation by the District.

11. SCHEDULES, BUDGETS, AND PROJECTED RESULTS

The following section provides an updated schedule, and budget for the EWMPs identified in Section 10. Table 22 provides a summary table of the EWMPs and identifies the implementation schedule.

Table 22. Schedule and Budget to Implement EWMPs.

EWMP	Implementation Schedule	Finance Plan	Annual Budget Allotment[1/]
Critical			
1 – Water Measurement[2/]	Implemented/Planned/ On-Going	Annual Capital Budget	$110,000
2 - Volume-Based Pricing	Fully Implemented	N/A	N/A
Conditional			
1 – Alternate Land Use	Not Technically Feasible		
2 – Recycled Water Use	Fully Implemented	N/A	N/A
3 – On-Farm Irrigation Capital Improvements	Implemented	N/A	N/A
4 – Incentive Pricing Structure	Fully Implemented	N/A	N/A
5 – Infrastructure Improvements	Implemented/On-Going	Annual Capital Budget	$40,000[3/]
6 – Order/Delivery Flexibility	Fully Implemented	N/A	N/A
7 – Supplier Spill and Tailwater Systems	Fully Implemented	N/A	N/A
8 – Conjunctive Use	Implemented/On-Going	Annual Capital Budget	$9,000
9 – Automated Canal Controls	Implemented/On-Going	Annual Capital Budget	$10,000
10 – Customer Pump Test/Eval.	Planned	Annual Capital Budget	Incidental District Expenses
11 – Water Conservation Coordinator	Fully Implemented	Annual Capital Budget	Incidental District Expenses
12 – Water Management Services to Customers	Implemented/On-Going	Annual Capital Budget	Incidental District Expenses
13 – Identify Institutional Changes	Implemented/On-Going	Annual Capital Budget	Incidental District Expenses
14 – Supplier Pump Improved Efficiency	Implemented/On-Going	Annual Capital Budget	Incidental District Expenses
Grand Total all EWMPs			**$169,000**

[1/] Budget allotment amounts are approximate and vary from year to year.
[2/]Critical EWMPs 1 and 2 are considered fully implemented. The Implementation Schedule, Finance Plan, and the Budget Allotment costs refer to the Measurement Certification Program required in accordance with the Measurement Regulation.
[3/]Major infrastructure improvements including the auxiliary spillway improvement are not included in the Implementation Schedule, Finance Plan, and the Budget Allotment as funding has not been obtained to implement this project.

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Appendix A

Agricultural Water Management Plan Checklist

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2015 Agricultural Water Management Plan Checklist

AWMP* Location	Guidebook Location	Description	Water Code Section (or other, as identified)
X	1.4	AWMP Required?	10820, 10608.12 Executive Order B-29-15
X	1.4	At least 25,000 irrigated acres *At least 10,000 irrigated acres*	10853 *Executive Order B-29-15*
X	1.4	10,000 to 25,000 acres and funding provided	10853
X	1.4	December 31, 2015 update *July 1, 2016 2015 AWMP for agricultural water suppliers 10,000 to 25,000 irrigated acres*	10820 (a) *Executive Order B-29-15*
X	1.4	5-year cycle update	10820 (a)
X	1.4	New agricultural water supplier after December 31, 2012 - AWMP prepared and adopted within 1 year	10820 (b)
NA	1.5, 5	USBR water management/conservation plan:	10828(a) *Executive Order B-29-15*
NA	1.5, 5.1	Adopted and submitted to USBR within the previous four years, AND	10828(a)(1)
NA	1.5, 5.1	The USBR has accepted the water management/conservation plan as adequate	10828(a)(2)
NA	1.4	UWMP or participation in area wide, regional, watershed, or basin wide water management planning: does the plan meet requirements of SB X7-7 2.8 **(use checklist)**	10829
	3.1 A	Description of previous water management activities	10826(d)
2.A	3.1 B.1	Was each city or county within which supplier provides water supplies notified that the agricultural water supplier will be preparing or amending a plan?	10821(a)
2.B	3.2 B.2	Was the proposed plan available for public inspection prior to plan adoption?	10841
2.B	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
Appendix B	3.1 B.2	14 days notification for public hearing	GC 6066
Appendix B	3.1 B.2	Two publications in newspaper within those 14 days	GC 6066
Appendix B	3.1 B.2	At least 5 days between publications? (not including publication date)	GC 6066
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	10841
Yes	3.1 C.1	After hearing/equivalent notice, was the plan adopted as prepared or as modified during or after the hearing?	10841
Yes	3.1 C.2	Was a copy of the AWMP, amendments, or changes, submitted to the entities below, no later than 30 days after	10843(a)
Yes	3.1 C.2	The department.	10843(b)(1)
Yes	3.1 C.2	Any city, county, or city and county within which the agricultural water supplier provides water supplies.	10843(b)(2)
Yes	3.1 C.2	Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies.	10843(b)(3)
Yes	3.1 C.2	Any urban water supplier within which jurisdiction the agricultural water supplier provides water supplies.	10843(b)(4)
Yes	3.1 C.2	Any city or county library within which jurisdiction the agricultural water supplier provides water supplies.	10843(b)(5)
Yes	3.1 C.2	The California State Library.	10843(b)(6)
Yes	3.1 C.2	Any local agency formation commission serving a county within which the agricultural water supplier provides water supplies.	10843(b)(7)

AWMP* Location	Guidebook Location	Description	Water Code Section (or other, as identified)
Yes	3.1 C.3	Adopted AWMP availability	10844
NA	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)
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)
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
3	3.2	Description of the agricultural water supplier and service area including:	10826(a)
3.B	3.2 A.1	Size of the service area.	10826(a)(1)
3.B	3.2 A.2	Location of the service area and its water management facilities.	10826(a)(2)
3.D	3.2 A.3	Terrain and soils.	10826(a)(3)
3.E	3.2 A.4	Climate.	10826(a)(4)
4.A	3.2 B.1	Operating rules and regulations.	10826(a)(5)
4.B	3.2 B.2	Water delivery measurements or calculations.	10826(a)(6)
4.C	3.2 B.3	Water rate schedules and billing.	10826(a)(7)
4.D	3.2 B.4	Water shortage allocation policies. *Drought Management Plan*	10826(a)(8) *Executive Order B-29-15*
5	3.3	Water uses within the service area, including all of the	10826(b)(5)
5.A	3.3 A	Agricultural.	10826(b)(5)(A)
5.B	3.3 B	Environmental.	10826(b)(5)(B)
5.C	3.3 C	Recreational.	10826(b)(5)(C)
5.D	3.3 D	Municipal and industrial.	10826(b)(5)(D)
5.E	3.3 E	Groundwater recharge.	10826(b)(5)(E)
5.F	3.3 F	Transfers and exchanges.	10826(b)(5)(F)
5.G	3.3 G	Other water uses.	10826(b)(5)(G)
6	3.4 A	Description of the quantity of agricultural water supplier's supplies as:	10826(b)
6.A	3.4 A.1	Surface water supply.	10826(b)(1)
6.B	3.4 A.2	Groundwater supply.	10826(b)(2)
6.C	3.4 A.3	Other water supplies.	10826(b)(3)
6.D	3.4 A.4	Drainage from the water supplier's service area.	10826(b)(6)
7	3.4 B	Description of the quality of agricultural waters suppliers supplies as:	10826(b)
7.A	3.4 B.1	Surface water supply.	10826(b)(1)
7.B	3.4 B.2	Groundwater supply.	10826(b)(2)
7.C	3.4 B.3	Other water supplies.	10826(b)(3)
7.A-D	3.4 C	Source water quality monitoring practices.	10826(b)(4)
7.D	3.4 B.4	Drainage from the water supplier's service area.	10826(b)(6)
6 & 8	3.5	Description of water accounting, including all of the	10826(b)(7)
6.A	3.5 A	Quantifying the water supplier's water supplies.	10826(b)(7)(A)
8.B	3.5 B	Tabulating water uses.	10826(b)(7)(B)
8.C	3.5 C	Overall water budget.	10826(b)(7)(C)
8.D	3.5 D	Description of water supply reliability.	10826(b)(8)
9	3.6	Analysis of climate change effect on future water supplies analysis	10826(c)
10	3.7	Water use efficiency information required pursuant to Section 10608.48.	10826(e)
10.A	3.7 A	Implement efficient water management practices (EWMPs)	10608.48(a)
10.A	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)
10.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(b)
10.A	3.7 A.2	Implement additional locally cost-effective and technically feasible EWMPs	10608.48(c)

AWMP* Location	Guidebook Location	Description	Water Code Section (or other, as identified)
10.A & 10.C	3.7 B	If applicable, document (in the report) the determination that EWMPs are not locally cost- effective or technically feasible	10608.48(d)
10.A & 10.B	3.7 A	Include a report on which EWMPs have been implemented and planned to be implemented	10608.48(d)
10.A & 10.B	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)
NA	6 A	Lack of legal access certification (if water measuring not at farm gate or delivery point)	CCR §597.3(b)(2)(A)
NA	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)
NA	6 A, 6 B	Delivery apportioning methodology (if water measuring not at farm gate or delivery point)	CCR §597.3.b(2)(C),
10.A and Appendix G	6 C	Description of water measurement BPP	CCR §597.4(e)(2)
10.A and Appendix G	6 D	Conversion to measurement to volume	CCR §597.4(e)(3)
11	6 E	Existing water measurement device corrective action plan? (if applicable, including schedule, budget and finance plan)	CCR §597.4(e)(4))

ith this requirement is located in your AWMP

Source: A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2015 AWMP
Website: http://www.water.ca.gov/wateruseefficiency/sb7/

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Appendix B

Letters of Notification of Intention to Prepare AWMP

Newspaper Publication

Final Resolution to Adopt AWMP

Letter Transmitting Adopted AWMP to Entities

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SOUTH SUTTER WATER DISTRICT

2464 Pacific Avenue • Trowbridge, CA 95659 • Office (530) 656-2242 • FAX (530) 656-2416

Bradley J. Arnold
General Manager / Secretary
sswd@hughes.net

March 3, 2016

Placer County
Water Resources Division
175 Fulweiler Avenue
Auburn, CA 95603

Subject: Notice of Intent to Prepare an Agricultural Water Management Plan

South Sutter Water District (SSWD) in accordance with the provisions of California Water Code Section 10821 is providing notification of its intent to prepare a 2015 Agricultural Water Management Plan (2015 AWMP). This 2015 AWMP is being prepared in accordance with the requirements of the SB X7-7 Water Conservation Act, the associated Agricultural Water Management Planning Act, the Agricultural Water Measurement Regulation, and Executive Order B-29-15 and will update its prior Water Management Plan adopted by SSWD in December 2012. Opportunity for review and comment to the draft 2015 AWMP will be provided including a public notice and review period and a hearing prior to its adoption.

Please contact Sara Harper of MBK Engineers at (916) 456-4400 to obtain additional information relative to the preparation of the draft 2015 AWMP.

Sincerely,

Bradley J. Arnold
General Manager

SOUTH SUTTER WATER DISTRICT

2464 Pacific Avenue • Trowbridge, CA 95659 • Office (530) 656-2242 • FAX (530) 656-2416

Bradley J. Arnold
General Manager / Secretary
sswd@hughes.net

March 3, 2016

Sutter County
Water Resources Division
1130 Civic Center Blvd., Suite F
Yuba City, CA 95993

Subject: Notice of Intent to Prepare an Agricultural Water Management Plan

South Sutter Water District (SSWD) in accordance with the provisions of California Water Code Section 10821 is providing notification of its intent to prepare a 2015 Agricultural Water Management Plan (2015 AWMP). This 2015 AWMP is being prepared in accordance with the requirements of the SB X7-7 Water Conservation Act, the associated Agricultural Water Management Planning Act, the Agricultural Water Measurement Regulation, and Executive Order B-29-15 and will update its prior Water Management Plan adopted by SSWD in December 2012. Opportunity for review and comment to the draft 2015 AWMP will be provided including a public notice and review period and a hearing prior to its adoption.

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Sincerely,

Bradley J. Arnold
General Manager

SOUTH SUTTER WATER DISTRICT

2464 Pacific Avenue • Trowbridge, CA 95659 • Office (530) 656-2242 • FAX (530) 656-2416

Bradley J. Arnold
General Manager / Secretary
sswd@hughes.net

March 3, 2016

Sutter County
LAFCO
1130 Civic Center Blvd., Suite A
Yuba City, CA 95993

Subject: Notice of Intent to Prepare an Agricultural Water Management Plan

South Sutter Water District (SSWD) in accordance with the provisions of California Water Code Section 10821 is providing notification of its intent to prepare a 2015 Agricultural Water Management Plan (2015 AWMP). This 2015 AWMP is being prepared in accordance with the requirements of the SB X7-7 Water Conservation Act, the associated Agricultural Water Management Planning Act, the Agricultural Water Measurement Regulation, and Executive Order B-29-15 and will update its prior Water Management Plan adopted by SSWD in December 2012. Opportunity for review and comment to the draft 2015 AWMP will be provided including a public notice and review period and a hearing prior to its adoption.

Please contact Sara Harper of MBK Engineers at (916) 456-4400 to obtain additional information relative to the preparation of the draft 2015 AWMP.

Sincerely,

Bradley J. Arnold
General Manager

SOUTH SUTTER WATER DISTRICT

2464 Pacific Avenue • Trowbridge, CA 95659 • Office (530) 656-2242 • FAX (530) 656-2416

Bradley J. Arnold
General Manager / Secretary
sswd@hughes.net

March 3, 2016

Camp Far West Irrigation District
P. O. BOX 373
Wheatland, CA 95692

Subject: Notice of Intent to Prepare an Agricultural Water Management Plan

South Sutter Water District (SSWD) in accordance with the provisions of California Water Code Section 10821 is providing notification of its intent to prepare a 2015 Agricultural Water Management Plan (2015 AWMP). This 2015 AWMP is being prepared in accordance with the requirements of the SB X7-7 Water Conservation Act, the associated Agricultural Water Management Planning Act, the Agricultural Water Measurement Regulation, and Executive Order B-29-15 and will update its prior Water Management Plan adopted by SSWD in December 2012. Opportunity for review and comment to the draft 2015 AWMP will be provided including a public notice and review period and a hearing prior to its adoption.

Please contact Sara Harper of MBK Engineers at (916) 456-4400 to obtain additional information relative to the preparation of the draft 2015 AWMP.

Sincerely,

Bradley J. Arnold
General Manager

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

APPEAL-DEMOCRAT

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

STATE OF CALIFORNIA * Counties of Yuba and Sutter

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

March 16 & 23, 2016

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

March 23, 2016 Nancy Brown

Date Signature

South Sutter Water District **Notice of Public Hearing**

COPY:

Notice of Public Hearing

Notice is hereby given that, pursuant to Water Code § 10841 et seq. the South Sutter Water District has updated its Agricultural Water Management Plan (Plan). The District's Board of Directors will hold a public hearing to consider the Plan on March 31, 2016 at 9:00 am. The hearing will be held at the South Sutter Water District office, located at 2464 Pacific Ave. Trowbridge, CA 95659. The updated Plan is available for review at the District's office. For further information contact Brad Arnold at (530) 656-2242.

March 16 & 23, 2016 Ad #00189407

SOUTH SUTTER WATER DISTRICT

RESOLUTION NO. 2016-04

RESOLUTION OF INTENTION TO AMEND AGRICULTURAL MANAGEMENT PLAN

WHEREAS, pursuant to California Water Code § 10820 *et seq.* ("AB 3316") the District is authorized to amend its' agricultural water management plan in accordance with the procedures set forth therein; and

WHEREAS, the District adopted a agricultural management plan on January 27, 2004; and

WHEREAS, the District amended its agricultural management plan on December 19, 2012; and

WHEREAS, the District wishes to amend its agricultural water management plan in accordance with Water Code section 10608.48 in order to comply with new requirements for agricultural water management plans added by Senate Bill x7-7 (2012); and

WHEREAS, in accordance with California Water Code section 10753.2, the District published notice of its intent to hold a hearing on whether to adopt a resolution of intention to amend its agricultural water management plan, and a hearing was held on March 31, 2016; and

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of South Sutter Water District:

1. The District intends to amend its agricultural water management plan, pursuant to California Water Code § 10820 *et seq.*

2. The District's consulting engineers, MBK Engineers, are directed to prepare a final amended agricultural water management plan.

PASSED AND ADOPTED this 31st day of March, 2016, by the Board of South Sutter Water District by the following vote:

Ayes: 7

Noes: -0-

Absent: -0-

SOUTH SUTTER WATER DISTRICT
SUTTER AND PLACER COUNTIES
CALIFORNIA

CERTIFICATION

I, Bradley J. Arnold, hereby certify I am and at all times mentioned herein was the duly elected, qualified and acting Secretary of South Sutter Water District, organized and existing under and by virtue of the laws of the State of California; the foregoing is a full, true and correct copy of a Resolution duly and regularly adopted at a meeting of the District's Board of Directors duly held on March 31, 2016, a majority and quorum of the members of the Board being present and voting in favor of the Resolution; and the Resolution has not been modified, rescinded, altered or amended and is now in full force and effect.

Brad Arnold

Bradley J. Arnold
District Secretary

SOUTH SUTTER WATER DISTRICT

2464 Pacific Avenue • Trowbridge, CA 95659 • Office (530) 656-2242 • FAX (530) 656-2416

Bradley J. Arnold
General Manager / Secretary
sswd@hughes.net

April 30, 2016

Agricultural Water Use Efficiency
Department of Water Resources
Statewide Integrated Water Management
Water Use and Efficiency Branch
PO Box 942836
Sacramento, CA 94236-0001

Subject: Agricultural Water Management Plan Submission

Enclosed please find South Sutter Water District's Agricultural Water Management Plan and Attachments along with a CD containing the same information.

If you have any questions or need any additional information please contact Brad Arnold at 530-656-2242.

Sincerely,

Bradley J. Arnold
General Manager

Cc The California State Library (w/o CD)
Placer County Library (w/o CD)
Sutter County Library (w/o CD)
County of Sutter, Water Resources Division (w/o CD)
County of Placer, Water Resources Division (w/o CD)
County of Sutter Local Agency Formation Commission (w/o CD)
Camp Far West Irrigation District (w/o CD)

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Appendix C

Table C1. Summary of Historical Cropping Pattern, Acreage Irrigated, and Total Water Deliveries

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Table C1. Summary of Historical Cropping Pattern, Acreage Irrigated, and Total Water Deliveries.

Year	Rice		Orchards		Irrigated Pasture		Alfalfa and Grass Hay		Wheat		Miscellaneous Row and Field Crops		Total Irrigated Acreage	Total Water Deliveries (AF)	Calculated Are-foot per Acre Water Duty (AF/Acre)
1986	22,270	79.6%	3,196	11.4%	2,245	8.0%	200	0.7%	0	0.0%	80	0.3%	27,991	111,164	4.0
1987	19,900	75.3%	3,498	13.2%	2,355	8.9%	100	0.4%	0	0.0%	576	2.2%	26,429	81,125	3.1
1988	18,990	75.5%	3,550	14.1%	2,100	8.4%	200	0.8%	0	0.0%	300	1.2%	25,140	35,672	1.4
1989	20,000	76.7%	3,550	13.6%	2,100	8.1%	80	0.3%	0	0.0%	330	1.3%	26,060	115,747	4.4
1990	22,000	78.7%	3,490	12.5%	2,200	7.9%	0	0.0%	0	0.0%	270	1.0%	27,960	97,810	3.5
1991	25,000	81.6%	3,417	11.2%	1,864	6.1%	0	0.0%	0	0.0%	341	1.1%	30,622	98,853	3.2
1992	25,807	84.7%	2,692	8.8%	1,449	4.8%	0	0.0%	0	0.0%	512	1.7%	30,460	79,092	2.6
1993	25,829	83.1%	2,985	9.6%	1,448	4.7%	139	0.4%	0	0.0%	675	2.2%	31,076	108,668	3.5
1994	28,300	86.7%	2,660	8.1%	1,400	4.3%	0	0.0%	0	0.0%	300	0.9%	32,660	66,896	2.0
1995	29,391	83.4%	3,345	9.5%	2,177	6.2%	0	0.0%	0	0.0%	345	1.0%	35,258	106,619	3.0
1996	29,430	83.3%	3,345	9.5%	2,177	6.2%	0	0.0%	0	0.0%	384	1.1%	35,336	117,032	3.3
1997	29,179	81.9%	3,809	10.7%	2,177	6.1%	0	0.0%	0	0.0%	480	1.3%	35,645	113,189	3.2
1998	29,000	81.6%	3,811	10.7%	2,177	6.1%	40	0.1%	0	0.0%	500	1.4%	35,528	111,453	3.1
1999	29,000	81.6%	3,702	10.4%	2,177	6.1%	147	0.4%	0	0.0%	500	1.4%	35,526	137,267	3.9
2000	29,000	81.6%	3,702	10.4%	2,177	6.1%	147	0.4%	0	0.0%	500	1.4%	35,526	136,145	3.8
2001	29,000	81.6%	3,702	10.4%	2,177	6.1%	147	0.4%	0	0.0%	500	1.4%	35,526	50,393	1.4
2002	29,000	81.6%	3,702	10.4%	2,177	6.1%	147	0.4%	0	0.0%	500	1.4%	35,526	124,560	3.5
2003	29,000	81.6%	3,702	10.4%	2,177	6.1%	147	0.4%	0	0.0%	500	1.4%	35,526	120,956	3.4
2004	29,000	81.6%	3,702	10.4%	2,177	6.1%	147	0.4%	0	0.0%	500	1.4%	35,526	94,358	2.7
2005	29,000	82.2%	3,702	10.5%	2,177	6.2%	80	0.2%	0	0.0%	300	0.9%	35,259	117,908	3.3
2006	29,000	81.5%	3,702	10.4%	2,177	6.1%	222	0.6%	135	0.4%	357	1.0%	35,593	129,339	3.6
2007	35,052	84.1%	3,496	8.4%	1,572	3.8%	551	1.3%	685	1.6%	314	0.8%	41,669	73,665	1.8
2008	34,290	83.2%	3,101	7.5%	1,872	4.5%	682	1.7%	572	1.4%	694	1.7%	41,211	87,958	2.1
2009	34,441	83.4%	3,101	7.5%	1,893	4.6%	682	1.7%	540	1.3%	653	1.6%	41,310	119,226	2.9
Minimum	18,990	75%	2,660	8%	1,400	4%	0	0%	0	0%	80	0%	25,140	35,672	1.4
Maximum	35,052	87%	3,811	14%	2,355	9%	682	2%	685	2%	694	2%	41,669	137,267	4.4
Average	27,537	82%	3,444	10%	2,026	6%	161	0%	80	0%	434	1%	33,682	101,462	3.0

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Appendix D

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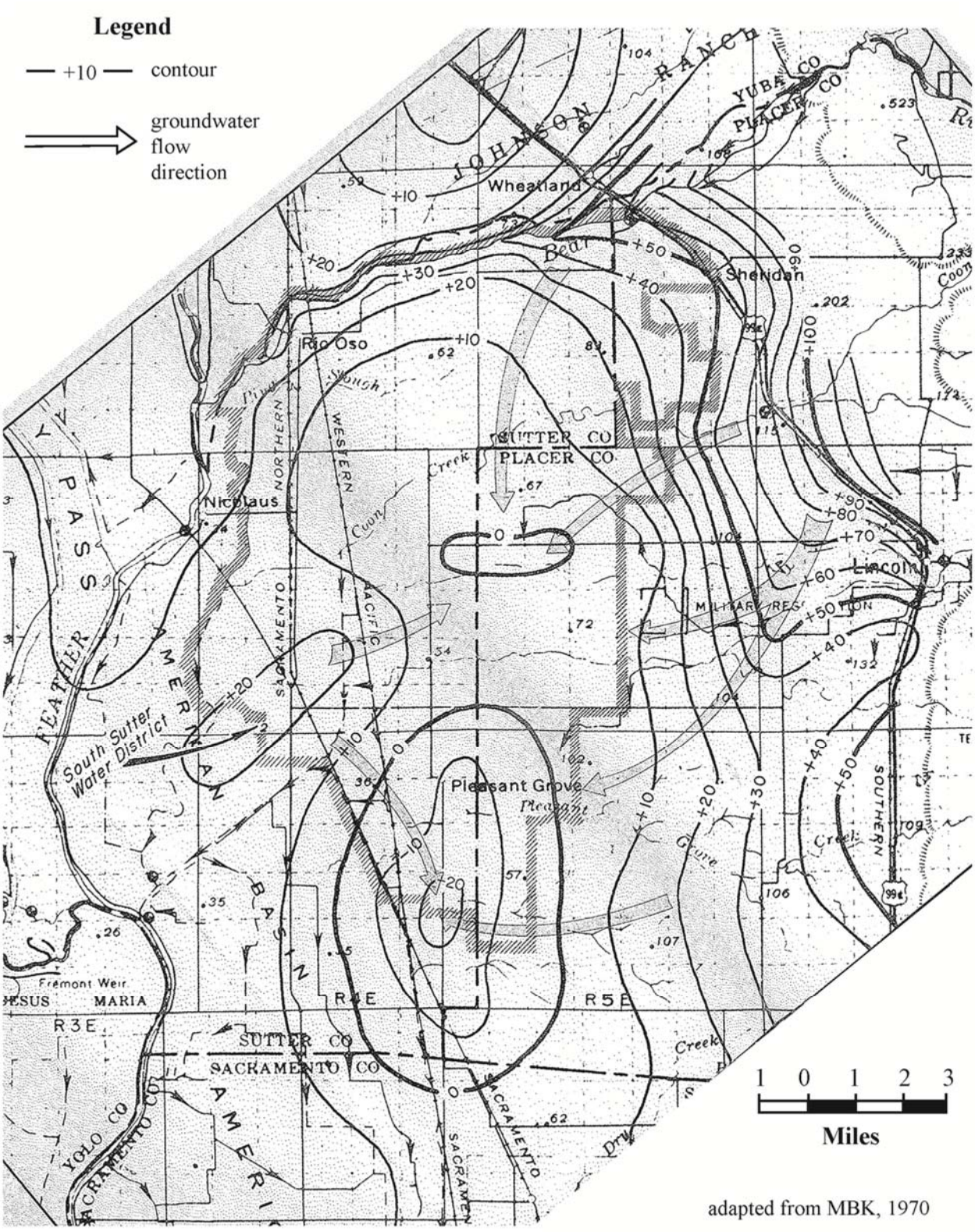

Figure D1. Contours of equal groundwater elevations – SSWD Spring, 1963.

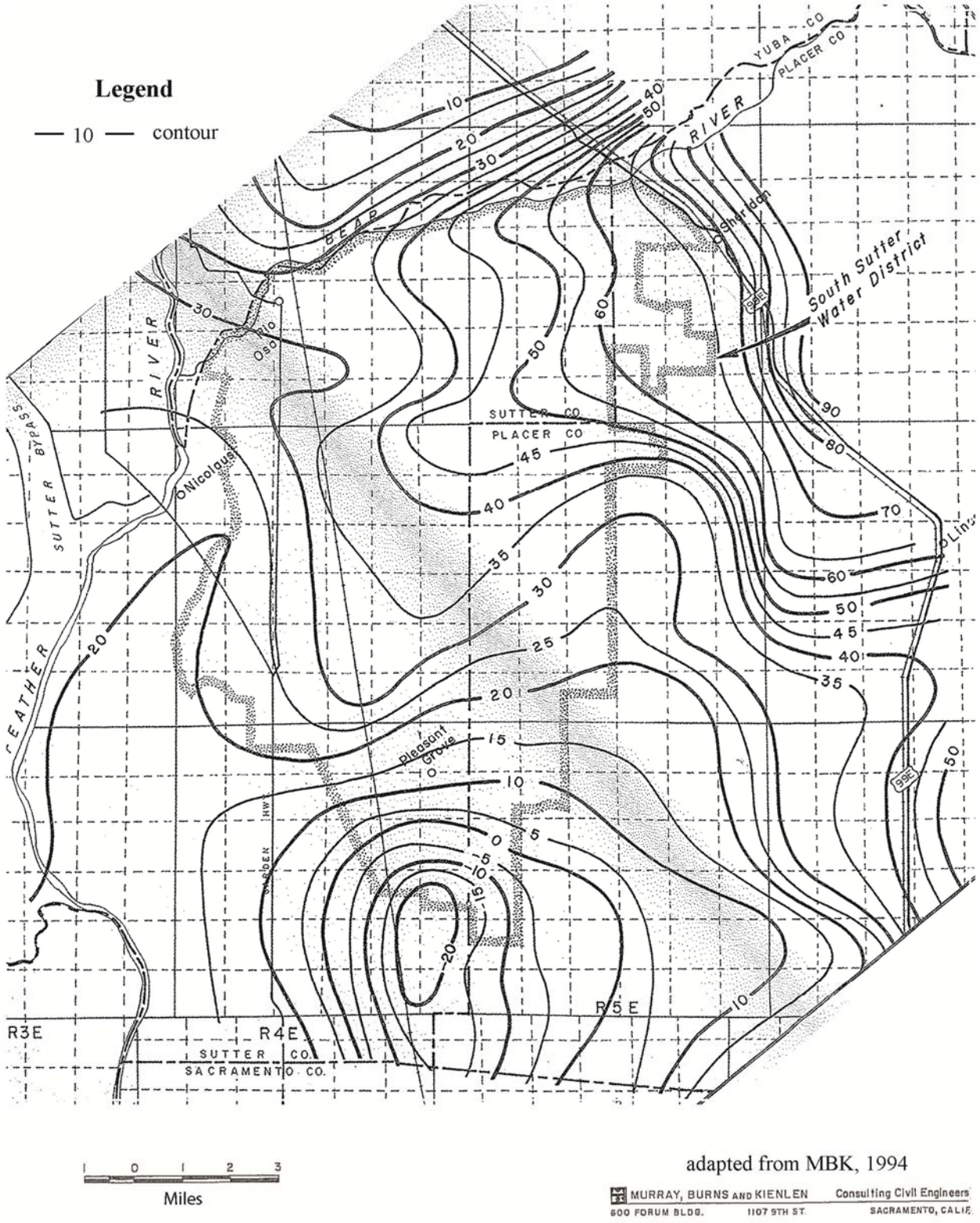

Figure D2. Contours of equal groundwater elevations – SSWD Spring, 1971.

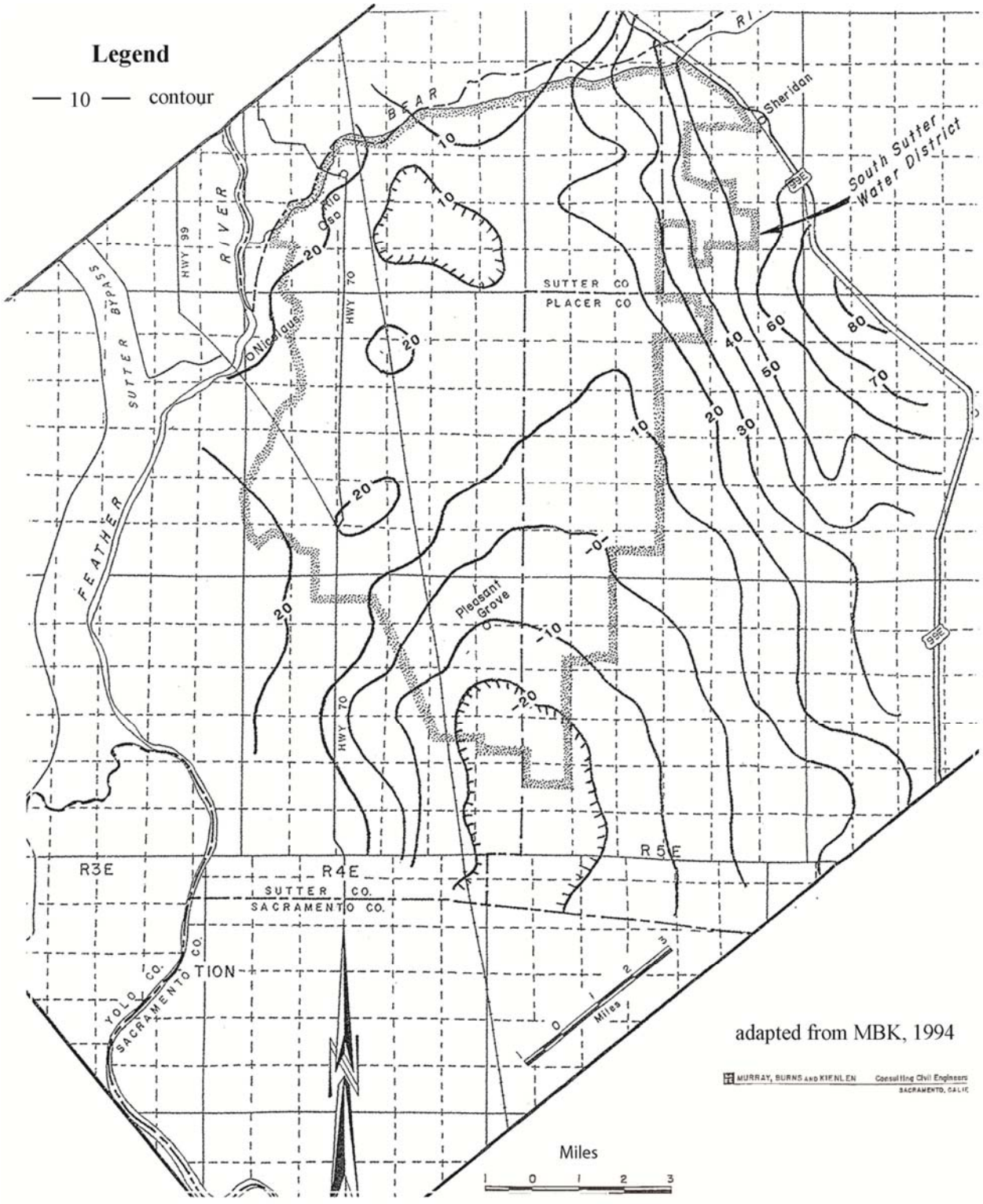

Figure D3. Contours of equal groundwater elevations – SSWD Spring, 1978.

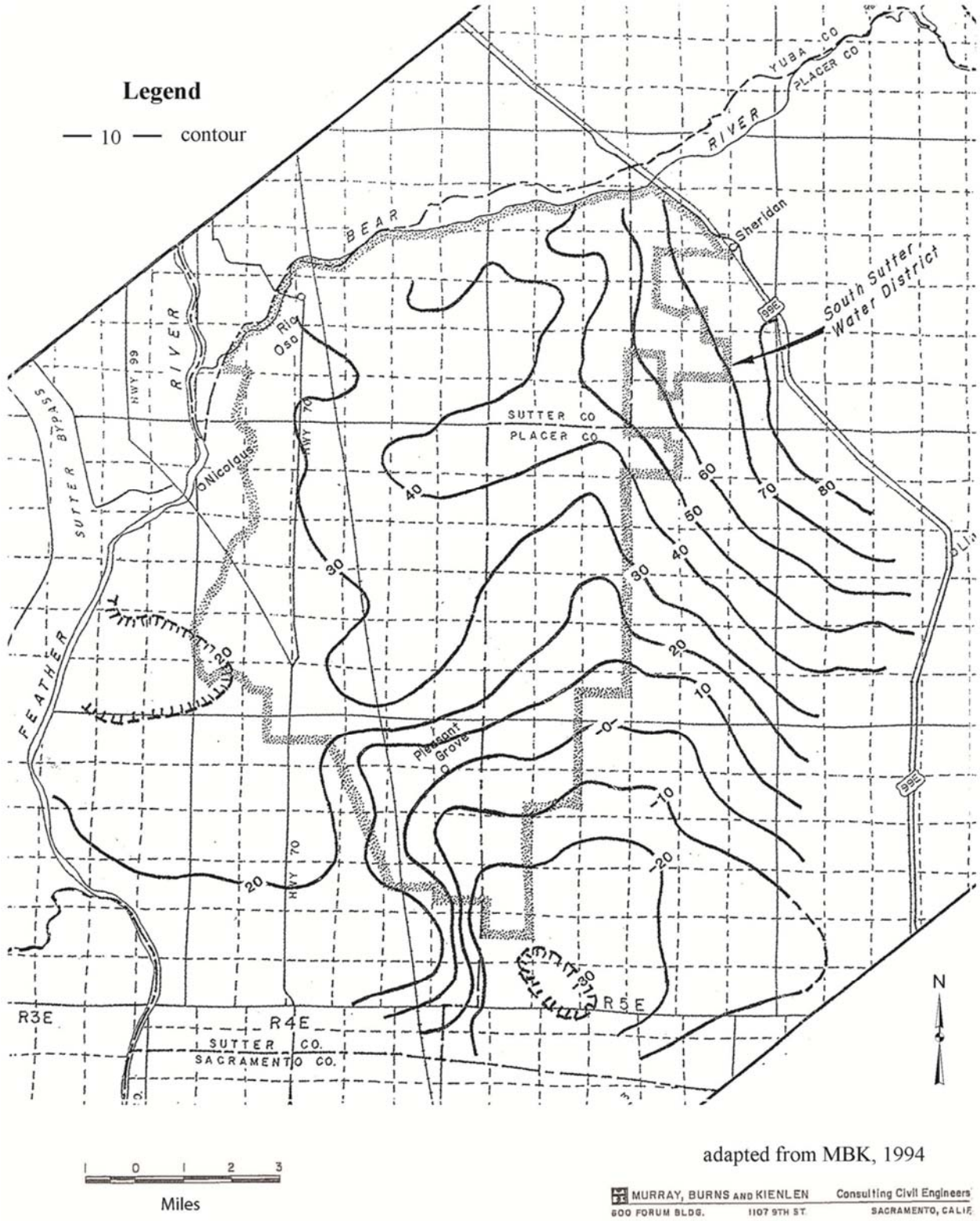

Figure D4. Contours of equal groundwater elevations – SSWD Spring, 1993.

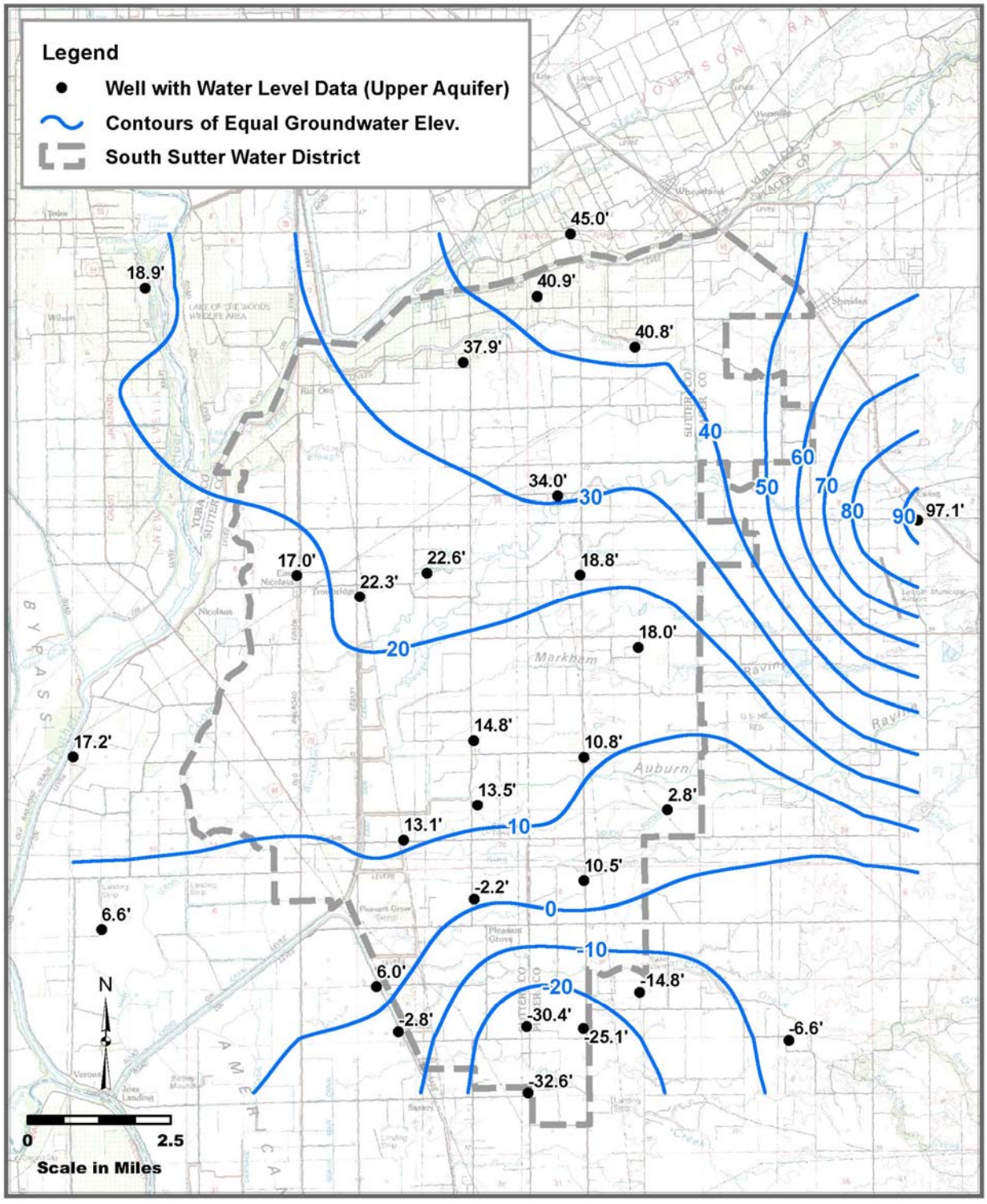

Figure D5. Contours of equal groundwater elevations – SSWD Spring, 2014.

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Appendix E

1993 Rules and Regulations for Distribution of Water

Example Rate Sheet

Example of Landowner Invoice

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RULES AND REGULATIONS
FOR THE DISTRIBUTION AND USE
OF WATER

AS REVISED AND ADOPTED

AUGUST 31, 1993

SOUTH SUTTER WATER DISTRICT

2464 PACIFIC AVENUE

TROWBRIDGE, CALIFORNIA

1. OPERATION AND CONTROL OF DISTRICT WORKS

All District works, including diversion works, canals, ditches, pipelines, pump diversions, farm turnouts and other structures belonging to the District will be operated and maintained by the District, and the operation and control of such facilities will be under the exclusive control of the District. All pumps owned by water users will be maintained by the owner, but the times and amounts of flow of such pumps will be under the control of the District. The location and number of turnouts from District canals or diversion pumps from natural water courses diverting District water and the time and manner of making deliveries therefrom shall be determined by the District so as to secure safe and efficient operation of such canals or water-courses, the proper measurement of water therefrom, and to provide a uniform flow to all users.

2. USE OF AND TAMPERING AND DAMAGING DISTRICT FACILITIES

Adjustment of flow of District water or manipulation of weirs, headgates, outlets, pumps, meters, or other structures is forbidden, unless permission is given by the watertender or other authorized employee of the District.

The District will not be responsible for any loss or damage resulting from open ditch or drainage cuts, or improperly closed ditch or drainage cuts made by the landowner or tenant.

Use of District rights-of-way for vehicle or equipment moving or any use otherwise shall in all instances be considered permissive and revocable by the District at any time. Any damage to District facilities occasioned by any such use shall be the responsibility of the user and the person on whose behalf the use is made.

In instances of farm tenancies, both the owner and the tenant shall be jointly and severally liable. Where unauthorized interference with the District's system occurs, the cost of restoring the system to its normal operating condition whether by repair, replacement, readjustment or otherwise shall be payable on demand to the District and in no event shall the amount so payable be less than Fifty Dollars ($50.00) in respect to any one violation.

3. DAMS AND DIVERSIONS IN CHANNELS OR DRAINS

All dams constructed within the boundaries of the District for the purpose of diverting water from stream channels for irrigation by gravity or pump diversion must be built in accordance with the specifications of the District Engineer at the sole expense of the landowner. The District shall have the right to remove or modify any dam or diversion structure which interferes with the steady and regular flow or diversion of District water in natural channels or drains and the owner of the installation agrees to such removal if interference occurs.

Diversion of District water from these sources by adjacent landowners will be permitted only as provided in these Rules and Regulations.

All landowner turbines pumping into canals or streams for credit or transporting by the District shall have automatic restarts in the event of a power failure.

4. FARM TURNOUT DIVERSION

Diversion of District water from the facilities of District canals, Bear River Drive Pipeline and lift pumps shall be made through metered turnouts. Such facilities to serve the adjacent lands will be controlled and operated by the District. Facilities, in addition to those initially installed, shall be added or change made in their location or service only with the approval of the District and at the sole expense of the landowner, including any checkdrop structure or other facilities required for such service.

Applications for water service requiring new installations must be submitted to the District prior to November 1st in order to enable water delivery to be made during the ensuing season.

All landowners with lowlift turbines or booster pumps shall have Pacific Gas & Electric contracts that shall run on a twenty four (24) hour basis until irrigation is complete.

5. PUMP LIFT DIVERSION

Pump lift diversions shall in all respects be subject to all District regulations governing the use of water.

Any lift pump installed for the purpose of diverting District water must have the approval of the District as to location for access, ability to meter, and must have a device installed to throttle or bypass enough water to allow the pump to run on a 24 hour basis, and enable the flow to be cut during periods of rationing on the particular facility.

The District will establish a reduced water charge to the water user utilizing low lift pumps to help offset the cost of pump ownership and/or electrical energy charges. The amount of such reduced charge will be set annually by the District in order to attempt to provide a greater equality between the cost of water to the user receiving a gravity supply and the user required to utilize a low lift pump.

6. LIABILITY FOR DAMAGE

The District will not be liable for any damage caused by the negligence or carelessness of any consumer in the use of water or failure on his part to maintain any ditch for which he is wholly or in part responsible.

Any claim for compensation resulting from District operations must be prepared and filed within the time and manner prescribed by Section 710ff of the California Government Code.

The District reserves the right to stop the flow in any stream, channel or ditch at any time that the District may determine it to be necessary.

7. OBSTRUCTIONS OF CANALS OR RIGHT-OF-WAY

No fences shall be built or trees planted or other obstructions or structures placed on any right-of-way or other property of the District.

Any person entering upon the property of the District does so at his own risk.

The District will not be responsible for any damage to machinery, equipment or motor vehicles which are either operated or stored on canal banks or rights-of-way.

8. ENCROACHMENT

An Encroachment Permit shall be required before any drains, crossings, fences and other encroachments from private sources will be permitted to be used or installed connecting with or traversing a District right-of-way.

All encroachments must first be approved by the District and works shall be constructed to District specifications at the sole expense of the applicant and maintained under the supervision and to the satisfaction of the District.

If a permit is granted, the applicant shall be solely responsible for and shall indemnify and save the District harmless from any and all liability for injuries to persons or damage to property caused or resulting in any manner from the applicant's exercise of the rights and privileges given in the granting of the Encroachment Permit.

An Encroachment Permit shall in no instance be construed as the grant of a permanent right, and if the District determines at a future date that the encroachment in fact interferes with its operations, the encroachment shall be removed and the District's facility restored to its original state at the sole expense of the permittee.

9. APPLICATION FOR SERVICE

All water users shall make applications for service and all applications received prior to February 15th shall be deemed timely. Applications filed subsequent to February 15th shall be approved by the Board of Directors after determination of the available water supply. All applications shall be made to the District office on forms provided by the District.

All applications shall be signed by both the landowner and the tenant and shall show the crops and true acreage of each crop that is intended to be irrigated under the application. In addition, each application shall include a description of the tract to be irrigated, the name and address of the party to be billed for irrigation service, and such other information as the District may require from time to time.

No application will be accepted and service will be refused unless all prior charges,upon all lands owned by the landowner applicant, including, but not limited to, water bills, standby charges and District assessments, including any penalties and interest thereon for all prior years have been paid.

Applications for service must be on a full seasonal basis by regular application. Payment for all water used shall be at regular District rates. Use of water shall be subject to the District Rules and Regulations, regardless

of any claim of existing water right which the user may assert to any portion of such flow. The District will not accept any application for service designed to fill out private claims of right for a portion of the irrigation season.

Service of water will not be made to any lands not covered by an application filed within the time and in the manner specified in these rules.

10. PAYMENTS

Bills for irrigation water, under application, shall be payable at the office of the District in advance in two (2) installments, in amounts to be set annually by the Board, the first installment due April 1, must be paid five (5) days prior to delivery of water, second installment due July 1, delinquent August 1. A ten (10) percent penalty will be added on delinquency. If additional payment is due after the irrigation season, it will become payable November 1, delinquent January 15, of the following year. A ten (10) percent penalty will be added on delinquency and one (1) percent per month interest charged until paid.

In no event will delivery of water be made to any land until the initial installment payment required by the application for water service covering such land is received by the District.

A penalty of ten (10) percent and interest of one (1) percent per month will be added to each delinquent charge from date of delinquency until paid or until the delinquency plus the accrued penalty is added to the Assessment Roll. Each delinquent charge plus the accrued penalty shall be added to the annual assessment and shall constitute a lien as a part of the assessment levied on the property upon which the water was used.

Normally, no service charge will be made by the District to offset the costs of providing and maintaining the facilities and turnouts necessary to the beneficial application of District water to land within the District. However, the District reserves the right to establish such service charge or remove the facilities in instances where protracted non-use becomes financially detrimental to the District.

If the water user should fail to pay the water bill prior to delinquency, the responsibility will be borne by the landowner.

11. DELIVERY AND MEASUREMENT

The time of initial and final deliveries of water each season shall be determined and fixed by the District. No water except District water shall be transported in or diverted from District canals or works without the written consent of the District. If such permit is given, facilities determined by the District to be necessary to insure the proper and safe diversion, transportation and measurement of non-District water shall be provided at the sole expense of the landowner.

Water delivery and measurement to the individual user will be on a 24 hour day use basis, and will be under the supervision and control of a watertender, who will be assigned to a specific area and be the authorized agent of the District.

In order to prevent commingling of water claimed by the landowner with that served by the District, the District will not deliver any water to any lands onto which the landowner also diverts and uses water under a claim of

right unless all water use on said lands, whether lifted from channels or released from District canals, is purchased by the water-user for the entire season of irrigation.

12. REQUESTS FOR DELIVERY

Requests for water service changes affecting any outlet or diversion will be placed in effect only during the watertender's normal working hours, and then only if the request for the change of service shall have been received and approved by the effected watertenders between the hours of 8:00 a.m. and 5:00 p.m. of the preceding day.

At 5:00 p.m. watertenders will compute their next days needs and transmit them to the damtender. All water distribution personnel will then be made aware of the next days change in relation to their areas. Changes of delivery requested by water users after this time will not be considered for next day delivery.

Water delivery will be made on a seven (7) day per week basis throughout the irrigation season April 1 to October 1.

At the beginning of each season several days notice may be necessary to enable the District's work force to fill and raise the effected canal to the necessary elevations for diversion.

Changes of delivery to water users will be made strictly on a time of water travel and when available basis to provide a steady flow to other users. If and when the amount of water available, through operating errors or other causes, is not sufficient to increase flows as requested by users, the first ordered, first served rule will apply.

13. TIME OF RESERVOIR DIVERSION

Diversions from the reservoir, including diversions for Camp Far West Irrigation District, will be made once daily at approximately 5:00 a.m. so that the changes of flow will insure a steady flow and canal safety overnight. This will further enable water distribution personnel to be aware of overages and shortages of water in sufficient time to include corrections in their requirements for the next day.

14. ALLOCATIONS OF WATER

Determination of the amount of water available for distribution during the irrigation season will be made at the Board meeting preceding March 1st of each year, and will be a conservative estimate of the maximum project yield based upon run-off forecasts and past records. If applications for the season exceed the amount of such estimate, allocation of water shall be made in a manner authorized by the California Water Code and as determined by the District.

If it is determined that sufficient water supply exists to serve late applications after supplying all timely applications in full, late applications will be filled in order of their receipt until the estimated amounts of use of such applications equal the amount of water available, as set by the Board. In no event shall the District be liable for any loss or damage arising directly or indirectly from a deficiency in water supply resulting from drought or other cases, or on account of any circumstances beyond the control of the District.

In the event the demand for water in a particular facility temporarily exceeds the capacity of the distribution facilities, water will be distributed on a first ready for delivery, first served basis with a maximum flooding head appropriate to the outlet capacity and irrigated acreage, as determined by the Watermaster. When more than one farm unit is awaiting service on a particular facility, the Watermaster's determination of priority will include first the date of order and second, the expected time of flooding, as determined by outlet capacity and irrigated acreage.

15. CANAL CAPACITIES

Water in canals will not be maintained above design, or safe, capacities or elevations as established by the Watermaster.

16. TWO OR MORE SERVICES AND FREQUENT CHANGES OF A SINGLE SERVICE

In the event a water user has two or more outlets in his farming operation on the Bear River Drive Pipeline, changes of service will be made from one to the other, if prior to 3:00 p.m., but the flow must continue on a 24 hour basis until the irrigation is completed, exactly as if the users operation was serviced by a single outlet.

When a service is discontinued to a users outlet or outlets on any distribution facility, service may not be resumed to that user within a period of 24 hours.

17. TURNOFFS AT OTHER THAN NORMAL TIME

If a turnoff is necessary at other than normal water travel time or other than normal work hours (8:00 a.m. to 5:00 p.m.) the amount of water that would have been used between turnoff and normal water travel time will be computed on the water record card and charged accordingly.

This charge will not apply if the facility is short of water and the water from turnoff is needed within the system, and:

1. Sufficient notice was given of the intended turnoff; and

   (a) The turnoff is made during normal work hours.

18. SPRINKLER SYSTEMS

Water-users employing sprinkler systems on the Bear River Drive Pipeline will utilize some method of changing their lines that will minimize the amount of water retained in the District's pipeline to avoid damages caused by changes of flow to other users.

19. WASTE OF WATER

Any water-user, who willfully, carelessly or otherwise wastes water on roads, vacant land or land previously irrigated, or who floods certain portions of the land to an unreasonable depth, or who uses an unreasonable amount of

water in order to irrigate properly other portions, or who irrigates land which has been improperly checked for the economical use of water, or who allows an unnecessary amount of water to escape from any tailgate, will be refused the use of water until such conditions are remedied or will have his use curtailed by the amount of water wasted, as the District may determine. This rule is for the sole purpose of preventing waste of irrigation water made available by District and is not for the purpose of controlling the time or the amount of drainage water resulting from such irrigation.

The District reserves the right to refuse delivery of water to any lands when it appears to the satisfaction of the District that its proposed use or method of use would require such excessive quantities of water as would constitute waste.

20. DRAINAGE OF IRRIGATION WATER

District assumes no responsibility for the disposition of drainage water within the District whether resulting from use of the District water supply or otherwise and District will not supervise or attempt to control the disposition or release of such drainage water. It shall be the responsibility of each landowner or irrigator to supervise or control the drainage water resulting from his irrigation practices to assure that releases are not made at such time or in such manner as to exceed the capacity of the drainage ditch, slough or creek into which such drainage water is released or discharged to the detriment of any downstream landowner adjoining such ditch, slough or creek.

21. ACCESS TO LANDS

The agents and employees of the District shall have free access at all times to all lands for the purpose of examining the ditches and the flow of water therein and for the purpose of verifying the acreage of crops on lands irrigated.

22. OWNERSHIP OF RETURN FLOWS

All deliveries of water by the District are made upon the condition that all return flows and drainage water resulting therefrom become the property of the District, for the purpose of resale, when the return flows and drainage waters flow off the parcel of land for which application has been made to the District for water service.

23. SUBDIVISION OF LANDS

Where a division of property is made creating smaller parcels requiring separate service by the District, the landowner is responsible for providing access to such smaller parcels as required for service by the District, and the cost of any additional facilities required to provide such service shall be borne by the landowner.

24. IDLE OR IMPROPERLY MAINTAINED PROPERTY

If a landowners property, due to but not limited to, government programs or rotation of planting is left idle and the property becomes a nuisance to the operation of the District facilities because of weed growth, i.e. witchgrass (common name tickle grass) it will be the responsibility of the landowner to work the acreage sufficiently to relieve the hazard or burn the acreage. Failure to remedy the hazard in a timely manner after notification by the

District will result in the District burning or working the acreage and charging the landowner for costs incurred.

Adopted: August 31, 1993

March 31, 2015

TO: LANDOWNERS WITHIN THE AVAILABILITY AREA
OF SOUTH SUTTER WATER DISTRICT

Based upon current water applications on hand and the amount of water estimated to be available from Camp Far West Reservoir, applications are in excess of the anticipated supply.

Therefore, based upon the anticipated reservoir yield, the total acres in the Availability Area and the total of all applications on file, your allocation of District water will be as follows: **AS OF MARCH 26, 2015 APPROXIMATELY 1.00 ACRE FEET** per acre for the 2015 season. ***Allocation will begin when the dam quits spilling or June 1, whichever is sooner, (the "Allocation Date"). Water used before the Allocation Date will not count against allocation. Full allocation, after the Allocation Date, may not be possible (because of ditch capacity). In that case, growers will be on ditch allocation as in the past.*** If additional water becomes available it will be distributed on a pro-rata acreage basis to all crop users. Re-flood water will be made available when water supply is sufficient as determined by the District.

HOWEVER, AS THE APPLICANT, IF YOU PLANT THE NUMBER OF ACRES UNDER APPLICATION, THE DEVELOPMENT OF ANY WATER OVER AND ABOVE THE APPROXIMATE ACRE FEET SUPPLIED BY THE DISTRICT WILL REMAIN YOUR RESPONSIBILITY. ALLOCATION USE CAN BE VERIFIED BY CALLING THE OFFICE AFTER THE 10TH OF EACH MONTH.

Accessibility and delivery of district water is governed by a set of Rules and Regulations and are on file at the District office. A copy may be obtained upon request.

The Board of Directors has established the following water rates and standby charge for the 2015 irrigation season:

Gravity water ---------- $12.25 per acre foot

Water diverted from drains, sloughs or canals through landowners own pumps ---------- $11.25 per acre foot

Water diverted through Bear River Drive pipeline ---------- $16.25 per acre foot

Payment of Water Tolls:

½ on April 1, 2015----------***Must be paid at least 5 days prior to delivery of water***

½ on July 1, 2015 ----------***Delinquent August 1, 2015, 10% penalty on delinquency***

Balance due November 1, 2015 -------- ***Delinquent February 1, 2016, 10% penalty on delinquency***

A Standby Charge of $1.20 per acre has been established, to be collected from each acre within the water availability area. The charge is payable July 1, 2015 and ***delinquent February 1, 2016***.

The Board will impose a surcharge to help defray the cost of supplemental water should it be available to the District from Nevada Irrigation District. The total surcharge shall not exceed $4.00 per acre foot.

Water delivery will be made on a seven (7) day per week basis throughout the irrigation season, April 15, to October 15. **Charging the canal system may take as much as two to three days before deliveries can be started.**

All weekend and holiday water orders will be taken at the District office by recorder. All water orders, including weekend and holidays, must be received before **3:00 p.m**. to be accepted for next day delivery. In the event of an **emergency (not water orders)** call (530) 633-9296 or (916) 645-1877.

BOARD OF DIRECTORS
SOUTH SUTTER WATER DISTRICT

SOUTH SUTTER WATER DISTRICT
Bradley J Arnold, General Manager / Secretary
2464 PACIFIC AVENUE TROWBRIDGE, CA 95659
(530) 656-2242

02/01/2015

TO: **Sample Customer Invoice**

For water supplied by South Sutter Water District for2014 season:

FINAL INVOICE

DATE	ITEM	CHARGES	CREDITS	BALANCE
4 /9 /2014	Ist Installment		-392.38	-392.38
4 /30/2014	8.2 AF @ $10.75	88.15		-304.23
5 /31/2014	16.4 AF @ $10.75	176.30		-127.93
6 /27/2014	Standby Charge	92.51		-35.42
6 /30/2014	7.7 AF @ $10.75	82.78		47.35
7 /7 /2014	Payment		-549.39	-502.04
7 /31/2014	18 AF @ $10.75	193.50		-308.54
8 /31/2014	14.3 AF @ $10.75	153.73		-154.81
9 /30/2014	12.9 AF @ $10.75	138.68		-16.14
10/15/2014	3.2 AF @ $10.75	34.40		18.26
11/10/2014	Payment		-18.26	0.00

Water Use Summary	
Total AF Allocated	**85.0**
Total AF Used	**80.7**

BALANCE DUE	**0.00**

NOTE: BALANCE DUE includes "Standby Charge"!!

Will become delinquent if not paid before February 1,2015 . A 10% penalty will be assessed and 1% interest per month until paid.

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Appendix F

2009 Groundwater Management Plan Update

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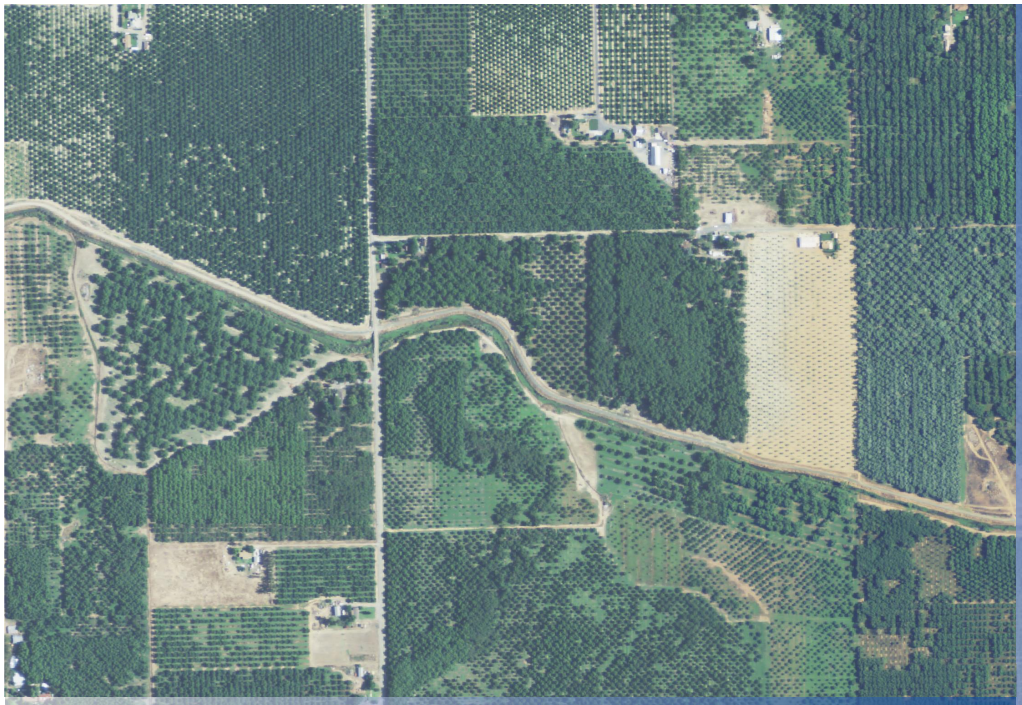

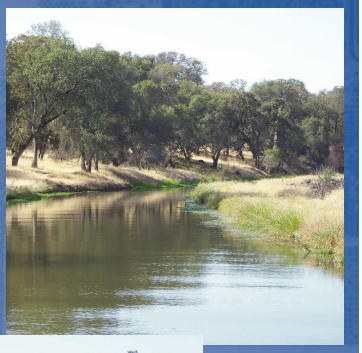

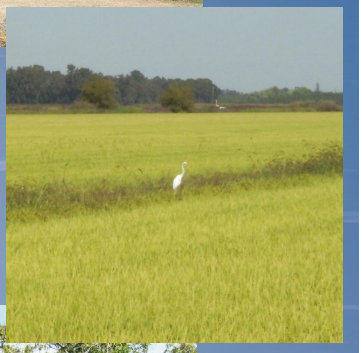

South Sutter Water District

Groundwater Management Plan

October, 2009

South Sutter Water District Groundwater Management Plan

prepared by

Luhdorff & Scalmanini
Consulting Engineers, Inc.

October, 2009

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List of Figures

1. Introduction

South Sutter Water District (District) originally adopted a resolution of intention to draft a Groundwater Management Plan (Plan) in 1993. The District's intention at that time was to consider all of the potential components of a groundwater management plan as set forth in Water Code Section 10750. The District subsequently adopted a Groundwater Management Plan and that Plan remains in place today.

In April, 2009, the District adopted a resolution of intention to update its Groundwater Management Plan to meet current legal requirements and reflect current groundwater conditions, since its original Plan was adopted and since local basin conditions were last reported in 1993.

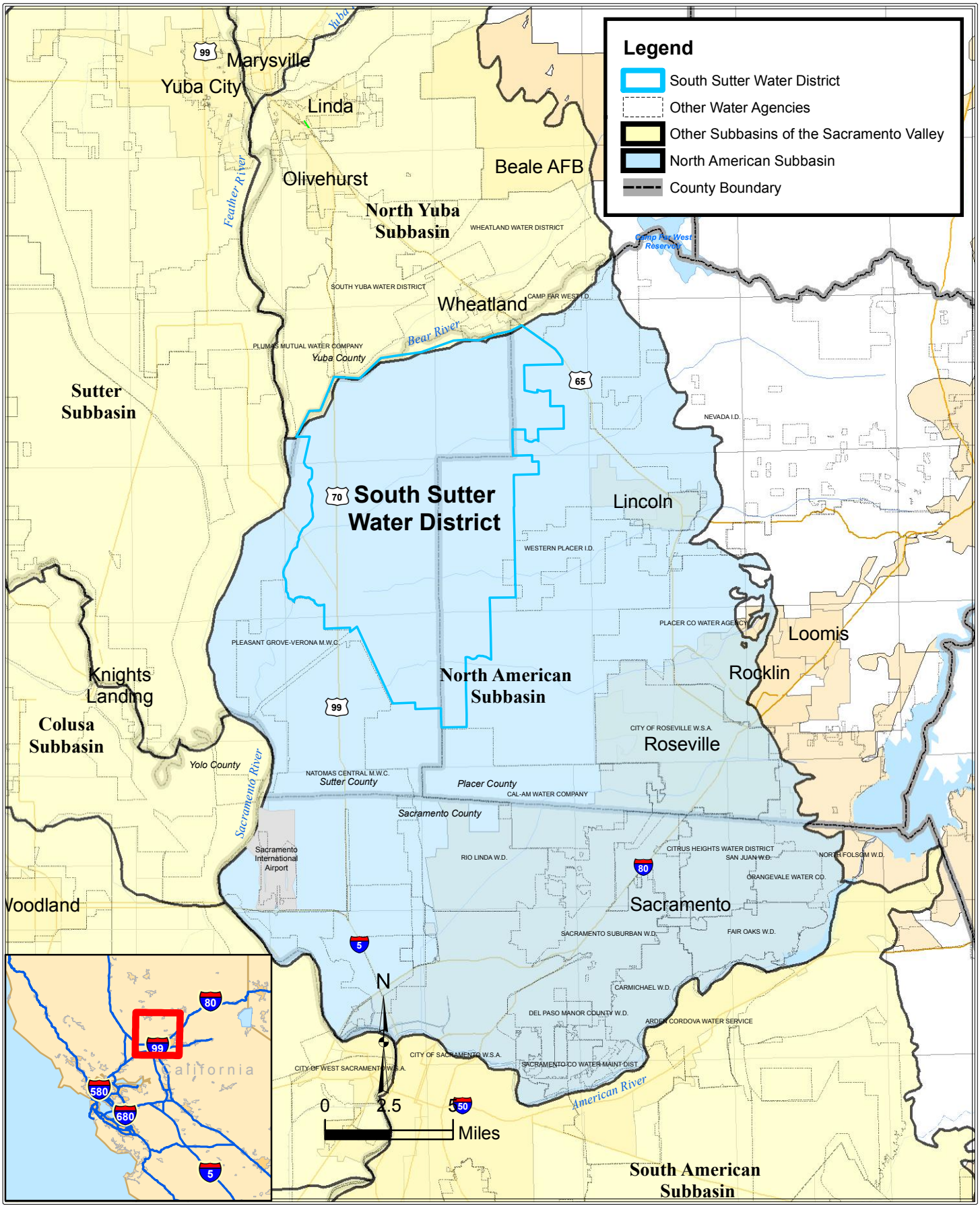
1.1 South Sutter Water District

The District is located in southern Sutter County and western Placer County, east of the Sacramento and Feather Rivers and south of the Bear River (Figure 1). The District was formed in May 1954 in order to develop, store, and distribute surface water supplies to augment and replenish local groundwater supplies. Prior to the development of surface water supplies in 1964, landowners within the District's service area had exclusively relied on groundwater to meet crop irrigation requirements; those rates of pumping had resulted in locally declining groundwater levels. As further discussed in this Plan, the use of surface water to supplement groundwater supplies restored and has maintained groundwater elevations above the depressed levels that preceded supplemental surface water availability.

The District encompasses approximately 66,000 gross acres, of which approximately 59,000 acres are irrigable. In recent years, approximately 45,000 acres within the District's Service Area have been planted to production agriculture and receive surface water from the District to supplement groundwater supplies. Another 7,000 acres within the overall boundaries of the District are irrigated solely with groundwater. Rice is the predominant crop planted within the District, comprising approximately 90% of the total acreage planted within any given year. Additional crops grown within the District include fruit and nut orchards, irrigated pasture, and row and field crops.

1.2 Water Requirements and Supplies

The District's main surface water supply originates from Camp Far West Reservoir on the Bear River. The reservoir was completed in 1963 and enlarged in 1964 to a storage capacity of 104,400 acre-feet (AF). Following a recent aerial and bathymetric survey preformed on Camp Far West Reservoir, the current storage capacity was determined to be approximately 93,740



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LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 1
Location Map - South Sutter Water District
North American Groundwater Subbasin
Sacramento Valley Groundwater Basin

acre-feet. The apparent decrease in storage capacity appears to be attributable to sedimentation and a combination of other factors including more accurate data collection and calculation procedures.

The District holds post-1914 appropriative water rights to store up to 102,100 acre-feet per year of water in the Camp Far West Reservoir, as well as direct diversion rights for the diversion and use of water from the Bear River. The District also holds direct diversion water right Licenses for small streams transecting the District service area.

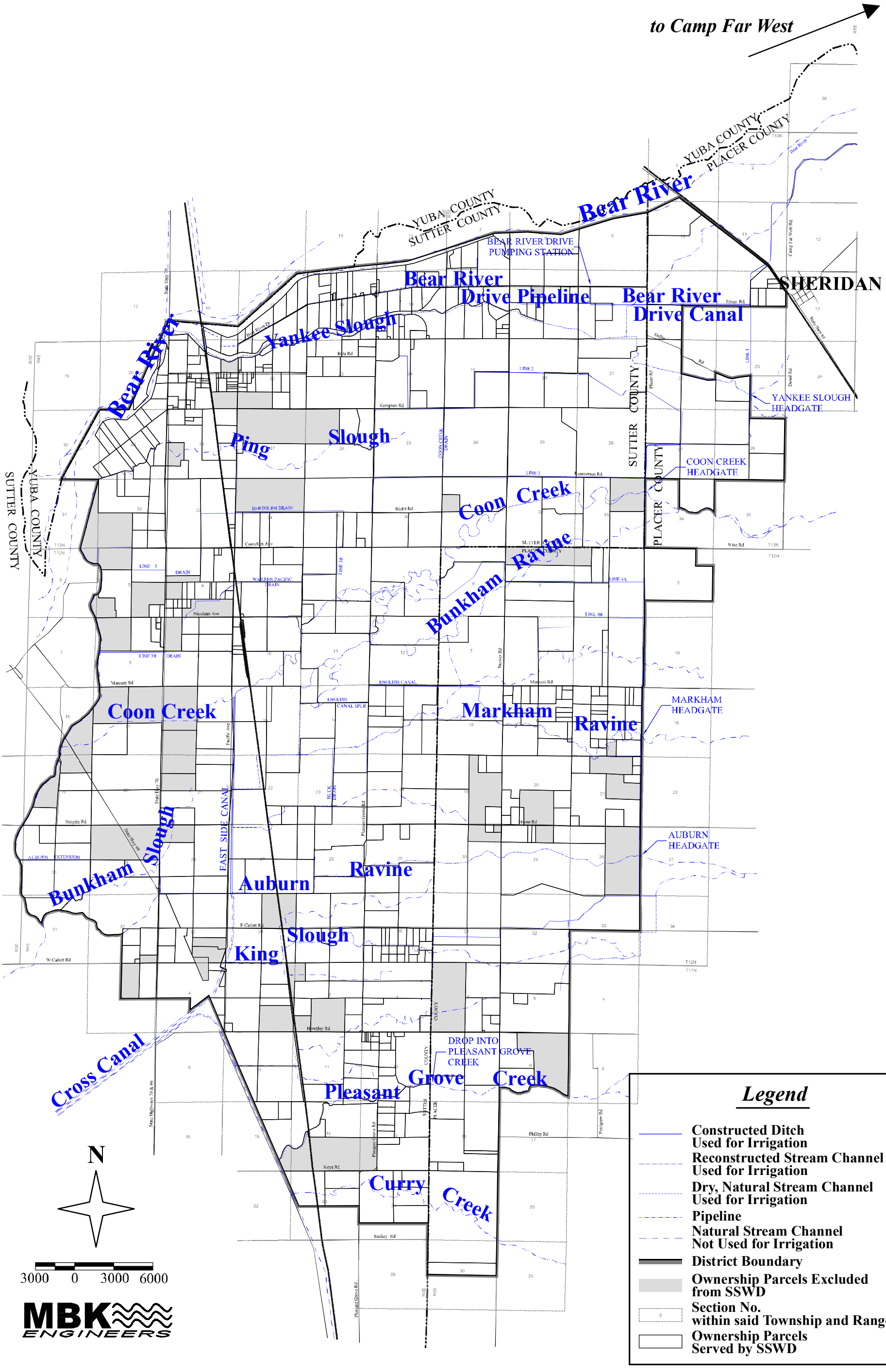
In addition to its rights and licenses on the Bear River and small streams, the District receives supplemental sources of surface water from Nevada Irrigation District (NID) except during the driest years. The amount of water received from NID ranges from zero to 20,000 acre-feet per year (AFY).

The Camp Far West Dam and Reservoir are located immediately northeast of the District, approximately six miles east-northeast of the town of Wheatland (Figure 1). The dam is owned and operated by the District, and is a 175 feet high earthfill embankment; the spillway crest elevation is +300 feet, mean sea level. The Reservoir fills nearly every year, except during drought periods such as occurred in 1976-1977, 1988, and 1991. Releases from the reservoir exceed its nominal storage capacity in many years. During periods of extreme drought, such as in 1977, little or no surface water is available from the system, resulting in some crop fallowing and increased groundwater extraction within the District by individual landowners. The Reservoir normally fills by early March, normally spills during December through March, and can continue spilling into June during wet years.

Pursuant to an agreement between Camp Far West Irrigation District (CFWID) and the District during the construction and enlargement of the Reservoir, CFWID is entitled to the first 13,000 AF released from the Reservoir each year to satisfy its senior water rights along the Bear River. Diversions of Reservoir releases to CFWID are made at the CFWID North Canal along the Diversion Dam pool and at the CFWID South Canal along the District's main conveyance canal.

Diversions of Reservoir releases to the District are directed into the District's main conveyance canal for delivery to the service area. A pipeline and manmade and natural conveyance channels including creeks, ravines and sloughs convey water from the main canal to points of delivery along the District's conveyance system. Natural conveyance channels utilized for conveyance include the lower reaches of Yankee Slough, Coon Creek, Markham Ravine, Auburn Ravine, King Slough, and Pleasant Grove Creek (Figure 2).

Water is used conjunctively within the District, meaning that both groundwater and surface water supplies are utilized to meet total water demand. However, not all landowners within the District



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CONSULTING ENGINEERS

Figure 2
Conveyance Map
South Sutter Water District

are District members; non-members do not receive surface water and thus irrigate solely with groundwater. While deliveries from the District have historically ranged between 0.0 and 2.5 AF of surface water per acre, deliveries to District members have averaged approximately 1.8 acre-feet of surface water per acre per year since the first year of full operation, 1964. Based on available records since 1968, the District has delivered an aggregate total of 3.4 to 4 million acre-feet of surface water to augment groundwater pumping by individual landowners. On average, approximately one-third of the total irrigation demand on those lands served by the District is met by surface water deliveries and approximately two-thirds of the total irrigation demand is met by individual landowner groundwater pumping.

1.3 Legislation and Water Code Provisions Related to Groundwater Management

In 1992, the California State Legislature adopted Assembly Bill 3030 (AB 3030) and in 2002 the Legislature enacted Senate Bill 1938 (SB 1938). These two pieces of legislation have been incorporated into the California Water Code, Section 10750 et seq., to encourage local public agencies/water purveyors to voluntarily adopt formal plans to manage groundwater resources within their jurisdictions. The District has prepared this update to the Plan to be compliant with AB 3030 and revisions to the Water Code pursuant to SB 1938.

The potential components of a groundwater management plan originally included in AB 3030 and now listed in Section 10753 of the Water Code include:

- control of saline water intrusion
- identification and management of wellhead protection areas and recharge areas
- regulation of the migration of contaminated groundwater
- administration of a well abandonment and well destruction program
- mitigation of conditions of overdraft
- replacement of groundwater extracted by water producers
- monitoring of groundwater levels and storage
- facilitating conjunctive use operations
- identification of well construction policies
- construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects
- development of relationships with state and federal regulatory agencies
- review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

Amendments to the Water Code regarding the implementation of local groundwater management plans as a result of SB 1938 did not alter the potential components of a local groundwater management plan, as listed above, but did add the following provisions:

- The local agency, in preparing a groundwater management plan, shall make available to the public a written statement describing how interested parties may participate in developing the plan. For that purpose, the local agency may appoint, and consult with, a technical advisory committee consisting of interested parties.
- In order to qualify for funding assistance for groundwater projects, for funds administered by DWR, a local agency must accomplish all the following relative to groundwater management:
    - prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan.
    - include groundwater management components that address monitoring and management of water levels, groundwater quality degradation, inelastic land subsidence, and changes in surface flows and quality that either affect groundwater or are affected by groundwater pumping
    - include provisions to cooperatively work with other public (and presumably private) entities whose service area or boundary overlies the groundwater basin.
    - include mapping of the groundwater basin, as defined in DWR's Bulletin 118, and the boundaries of the local agency subject to the plan, plus the boundaries of other local agencies that overlie the basin.
    - adopt monitoring protocols designed to detect changes in groundwater levels, groundwater quality, inelastic land subsidence (for basins where subsidence has been identified as a potential problem), and flow and quality of surface water that either directly affect groundwater, or are directly affected by groundwater pumping.

In summary, the District has prepared this updated Plan to be compliant with the AB 3030 and SB 1938 requirements embedded in the Water Code as part of its interest in developing and sustaining reliable water supplies. To ensure the reliability of groundwater supplies to meet part of existing and projected water requirements, this Plan establishes a set of objectives for groundwater and interrelated surface water in the Plan area, continues the originally adopted components of groundwater management, and expands those components as appropriate.

Of the potential groundwater management activities listed in the Water Code, those already being investigated and actively implemented by the District include mitigation of conditions of overdraft, replacement of groundwater extracted by water producers, monitoring of groundwater levels, facilitating conjunctive use programs, and development of relationships with state agencies. The historic focus of groundwater management in the District has been on water supply, quantity and quality, to avoid conditions of overdraft, primarily by developing a supplemental surface water supply to augment local groundwater supplies and thus contribute to recovery and subsequent maintenance of groundwater levels and storage. While that focus is

continued in this updated Plan, and others added as appropriate, the potential management provisions not implemented are more focused on groundwater quality and contamination issues that are not relevant to the Plan Area, e.g. control of saline water intrusion, and control or cleanup of groundwater contamination.

The balance of this Plan is organized to first establish a set of management objectives for the area; to then describe existing groundwater conditions; and to finally present a set of groundwater management elements which, in aggregate, comprise this overall groundwater management plan.

2. Management Objectives (Goals) for the Plan Area

The District's primary goal in preparing its initial groundwater management plan in 1993 was "to work cooperatively with landowners within the District to most efficiently manage groundwater resources and to continue with an efficient and effective conjunctive use program". That goal derived directly from recognition that development of a supplemental surface water supply by the District had led to the successful recovery and stabilization of groundwater levels via a conjunctive use program involving District deliveries of surface water and individual landowner pumping of groundwater. That original primary goal remains in place to continue the successful maintenance of groundwater levels as the balance of the original groundwater management plan is updated herein.

This Plan provides a management framework for maintaining a high quality, reliable, and sustainable supply of groundwater within the District, built on continuation of conjunctive use operations to meet local requirements while also providing opportunities to participate in other water supply programs within the sustainable yield of local surface water and groundwater resources. Management objectives intended to be achieved in the Plan area via implementation of this Plan thus include the following:

- Development of groundwater at a sustainable rate, in conjunction with supplemental surface water, to meet in-District water requirements and, as possible, to support dry-year or other out-of-District water supply programs.

- Avoidance of overdraft and associated undesirable effects such as declining groundwater levels, migration of poor groundwater quality, and land subsidence; in effect, continue the successful integrated use of groundwater with supplemental surface water that resulted in groundwater level recovery after introduction of surface water in the 1960's, followed by fluctuating but generally constant (not declining) groundwater levels over the last several decades.

- Preservation of groundwater quality for beneficial use in the Plan area, and for beneficial uses of surface water and groundwater discharges/outflows from the Plan area.

- Preservation of interrelated surface water resources through maintenance of surface water flows and non-degradation of surface water quality.

Quantitatively, the preceding goals translate into general preservation of groundwater levels and quality, including fluctuations in seasonal demands and varying local hydrologic conditions (wet and dry periods), to be confirmed by groundwater level and quality monitoring as included in

this Plan. Specific issues to be considered include evaluation of available groundwater storage capacity, determination of sustainable groundwater yield, assessment of river-aquifer interconnection, and avoidance of land subsidence.

Over the long-term, if in-District water requirements change, or as out-of-District water supply opportunities develop, the District will seek to respond by utilizing its conjunctive use operations to meet those opportunities while remaining within the sustainability of its surface water and groundwater supplies. For example, future water transfers may become possible through the DWR Drought Water Bank or other mechanisms, and the District will determine the feasibility of a water transfer within the overall context of this Plan, while maintaining a reliable water supply for its customers and minimizing any undesirable impacts that could potentially result.

3. Groundwater Basin Conditions

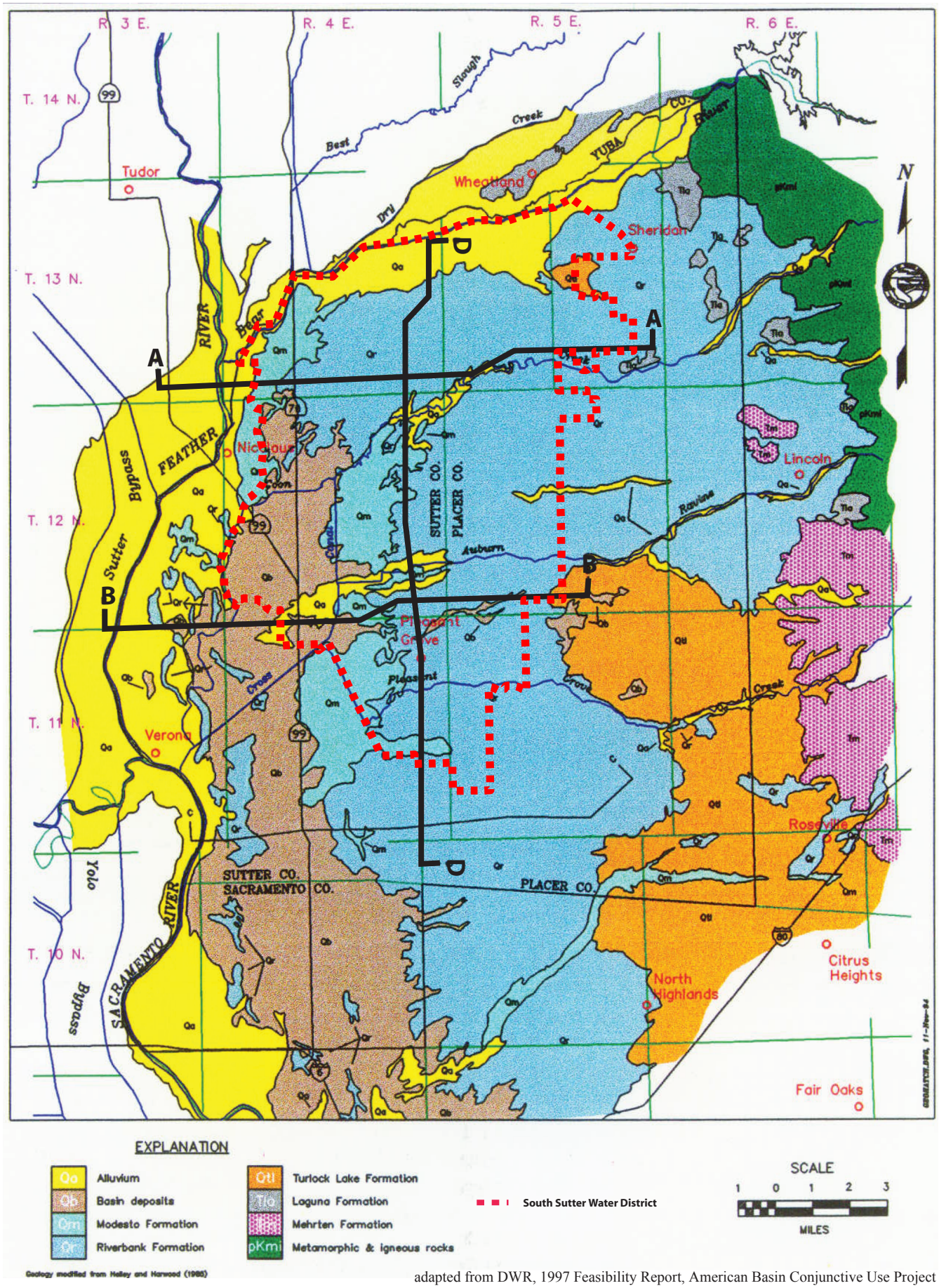
3.1 North American Groundwater Subbasin

The District, and thus the Plan Area, is located in the southeastern portion of the Sacramento Valley Groundwater Basin, at the northern end of the North American Groundwater Subbasin, (Basin No. 5-21.64 in DWR Bulletin 118-2003), which is one of eighteen subbasins in the Sacramento Valley Groundwater Basin. The North American Subbasin is bounded on the north by the Bear River, on the west by the Feather and Sacramento Rivers, on the south by the American River, and on the east by the approximate edge of the alluvial aquifer in the Sierra Nevada foothills (Figure 1). The western portion of the subbasin is a nearly flat flood basin for the Bear, Feather, Sacramento, and American rivers, and several small streams originating from the foothills that are tributaries to those rivers. The subbasin drains in a generally west-southwest direction at an average grade of about five percent. Precipitation in the subbasin ranges from 18 to 20 inches in the western half of the subbasin to 20 to 24 inches in the eastern half of the subbasin (DWR, 2006).

3.2 Geologic Setting – Water Bearing Formations

DWR's Bulletin 118 (2006) and Feasibility Report (1997) include descriptions of the subsurface water bearing materials in the North American Subbasin. From deepest/oldest to shallow/youngest, those materials are known as the Mehrtan Formation, the Laguna and Turlock Lake Formations, the Riverbank and Modesto Formations, and Flood Plain Deposits and Alluvium. Surface outcrop locations for those materials are illustrated in Figure 3. Within those water bearing materials, the base of fresh water deepens westward from about 400 feet below sea level near the Sierra Nevada foothills to over 1,200 feet below sea level at the axis of the Sacramento Valley (DWR, 1997).

Mehrten Formation – The oldest freshwater bearing sediments in the subbasin are known as the Mehrten Formation, a sequence of late Miocene through middle Pliocene fragmented volcanic rocks, that unconformably overlie marine and brackish-water sediments of Eocene age. The Mehrten Formation can be divided into two distinct units based on composition, and is exposed only on the eastern side of the subbasin, east of the District near Lincoln and south toward Roseville. One of these units is a sedimentary unit consisting of gray to black andesitic sands and gravels deposited by fluvial activity and originating from andesitic source rocks in the Sierra Nevada. The other distinct unit, which is interbedded with intervals of the previous unit, is composed of dense, hard, gray tuff breccia derived from volcanic eruptions in the Sierra Nevada. The Mehrten Formation provides highly permeable intervals of sand and gravel as well as confining layers composed of the tuff breccia intervals. Depending on location, the Mehrten



adapted from DWR, 1997 Feasibility Report, American Basin Conjunctive Use Project

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 3

Generalized Geologic Map with Cross-Section Locations

North American Subbasin

Formation is between 200 and 1,200 feet thick, and wells completed in the sand and gravel units have reported pumping capacities of over 3,000 gallons per minute (gpm).

Laguna and Turlock Lake Formations – The Pliocene-age Laguna Formation and the early Pleistocene-age Turlock Lake Formation unconformably overlie the Mehrten Formation. The Turlock Lake Formation can be distinguished from the Laguna Formation in outcrop due to the presence of a preserved clay soil horizon, which had been stripped by erosion in the Laguna Formation. The Laguna Formation outcrops very rarely in the subbasin, surfacing near Wheatland and towards the east and south of the North American Subbasin in small areas. The Turlock Lake Formation outcrops in the southeast of the subbasin, and in a small area just southwest of Sheridan. The Laguna and Turlock Lake formations are lithologically indistinguishable in the subsurface, both consisting of a heterogeneous mixture of tan to brown interbedded silt, clay, and sand with a few gravel lenses that are poorly sorted and have relatively low permeability. The two formations have a combined thickness of less than 200 feet. Due to the predominantly fine-grained character of these two formations, wells completed in them reportedly have low to moderate yields, usually less than 1000 gpm.

Riverbank and Modesto Formations – The Pleistocene-age Riverbank and Modesto formations are the most widely exposed geologic units in the study area; they unconformably overlie the Turlock Lake, Laguna, and Mehrten formations and pre-Cretaceous metamorphic and igneous rocks. The Riverbank and Modesto formations are lithologically indistinguishable in the subsurface, composed of mixtures of silt, sand, gravel, and clay that are very heterogeneous laterally and vertically. The combined thickness of these two formations can be up to 75 feet. As a whole, these two formations are moderately permeable, but include highly permeable coarse zones.

Flood Basin Deposits and Alluvium – These sediments are also known as the Younger Alluvium as they are the youngest geologic units in the subbasin. Laterally extensive outcrops of the Alluvium deposits occur along the Bear, Feather, and Sacramento Rivers, while the Flood Basin deposits outcrop on the western margin of the subbasin; immediately east of the Sacramento River. The Alluvium is composed of stream channel deposits, originating in the channels of active streams as well as overbank deposits of those streams, terraces, and local dredge tailings. Flood Basin deposits consist primarily of poorly drained silts and clays, although interbedded local lenses of sand and gravel may occur from the deposition of migrating ancestral river channels. The thickness of each of these units may be up to 100 feet. The sand and gravel zones of the Alluvium deposits are highly permeable and yield significant quantities of water to wells, whereas the Flood Basin deposits have low permeability and generally yield low quantities of water to wells.

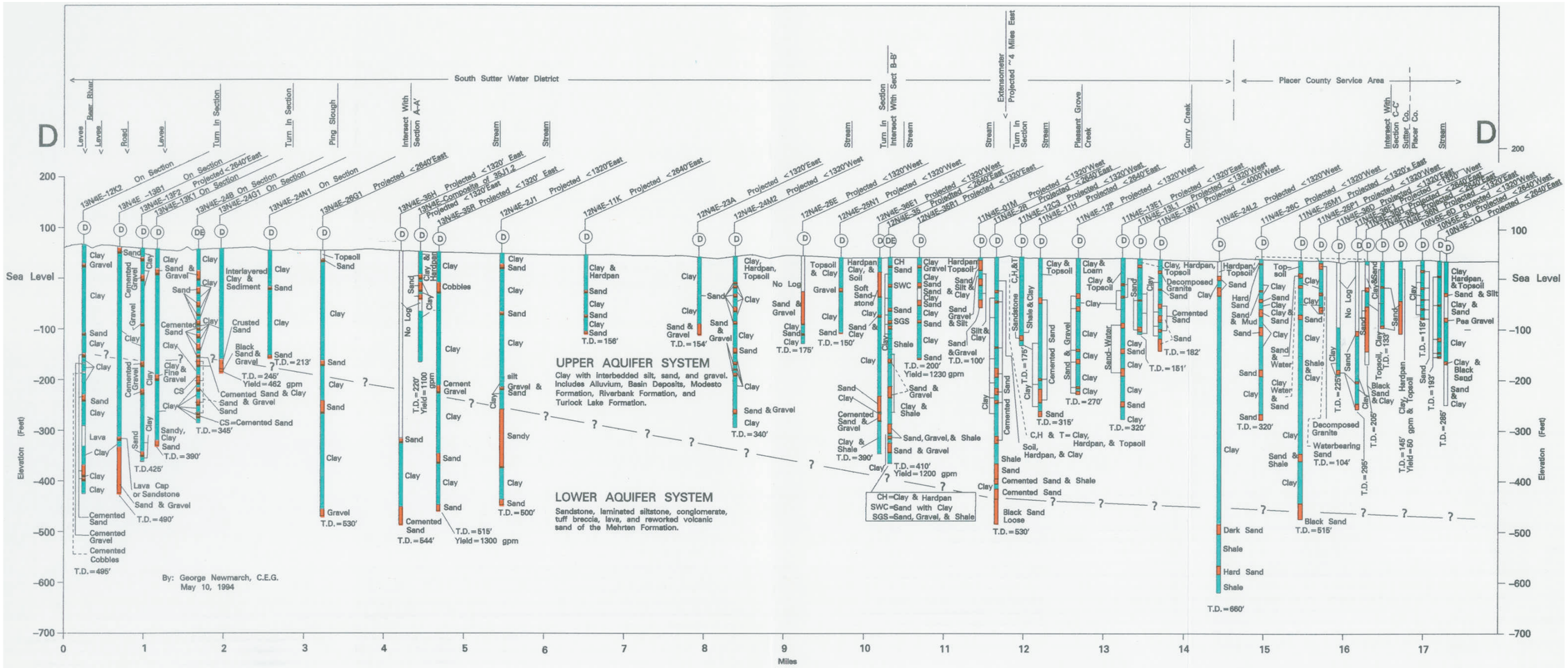
The geologic units described above have been grouped and separated into two aquifer units in the District area. The upper aquifer includes saturated Laguna Formation and younger unconfined sediments (Riverbank and Modesto Formations, and Flood Basin Deposits and Alluvium) consisting of generally thin and laterally discontinuous sands and gravels separated by thick sequences of clay strata. The lower aquifer consists of Mehrten Formation continental deposits, including a significant amount of fine-grained materials. Sand and gravel units are generally thicker than the upper aquifer, but are still laterally discontinuous. DWR has been monitoring a site near the southern border of the District with multiple completion monitoring wells, where water levels show a vertical gradient between the two aquifer units, and some hydraulic interconnection. Most of the production wells located throughout the District are thought to be completed in the upper aquifer. With time, implementation of this Plan is intended to produce a more thorough definition of well construction and completions throughout the District.

Three of the geologic cross-sections in DWR's American Basin Conjunctive Use Feasibility Report (1997) illustrate the approximate delineation of the upper and lower aquifer systems beneath the District. Cross-section D-D, oriented north-south shows the thickness of the upper aquifer ranging from about 200 feet in the north to about 500 feet at the southern border of the District (Figure 4). Cross-section A-A trends east-west in the northern portion of the District; it indicates that the thickness of the upper aquifer ranges from 250 feet to almost 300 feet (Figure 5). The other east-west trending cross-section, B-B, located in the southern part of the District, shows more of a dip in the depositional units, with the upper aquifer thickening to the west, from about 300 feet in the east to just over 500 feet in the west (Figure 6).

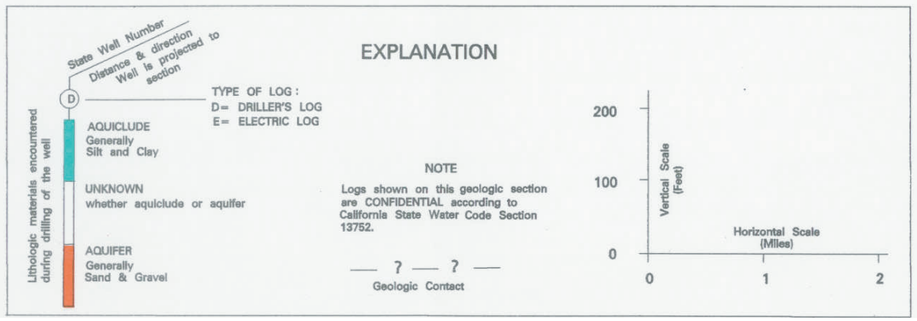
3.3 Groundwater Elevations

Prior to the 1960's, groundwater was the sole source of water supply in most parts of the North American Subbasin, including the District area. A strong dependence on groundwater existed in the southern central portion of the Subbasin, generally south of the District, resulting in groundwater declines at an average rate of up to about one and a half feet per year for about 50 years, through the 1980s to mid-1990s. The introduction of surface water sources has subsequently resulted in stabilization to some recovery of groundwater levels, although an elongated groundwater depression remains to the south of the District, in the McClellan Air Force Base area in northern Sacramento County where groundwater levels are tens of feet lower than in surrounding areas. Throughout the North American Subbasin, groundwater levels continue to fluctuate seasonally and through varying climatic conditions.

In the vicinity of the District, DWR has historically monitored over 150 wells for water level elevations. Approximately 79 of those wells are located within the District service area, with a composite period of record from 1932 to 2009. In and near the District, groundwater elevations



Geologic Section D–D



adapted from DWR, 1997 Feasibility Report, American Basin Conjunctive Use Project

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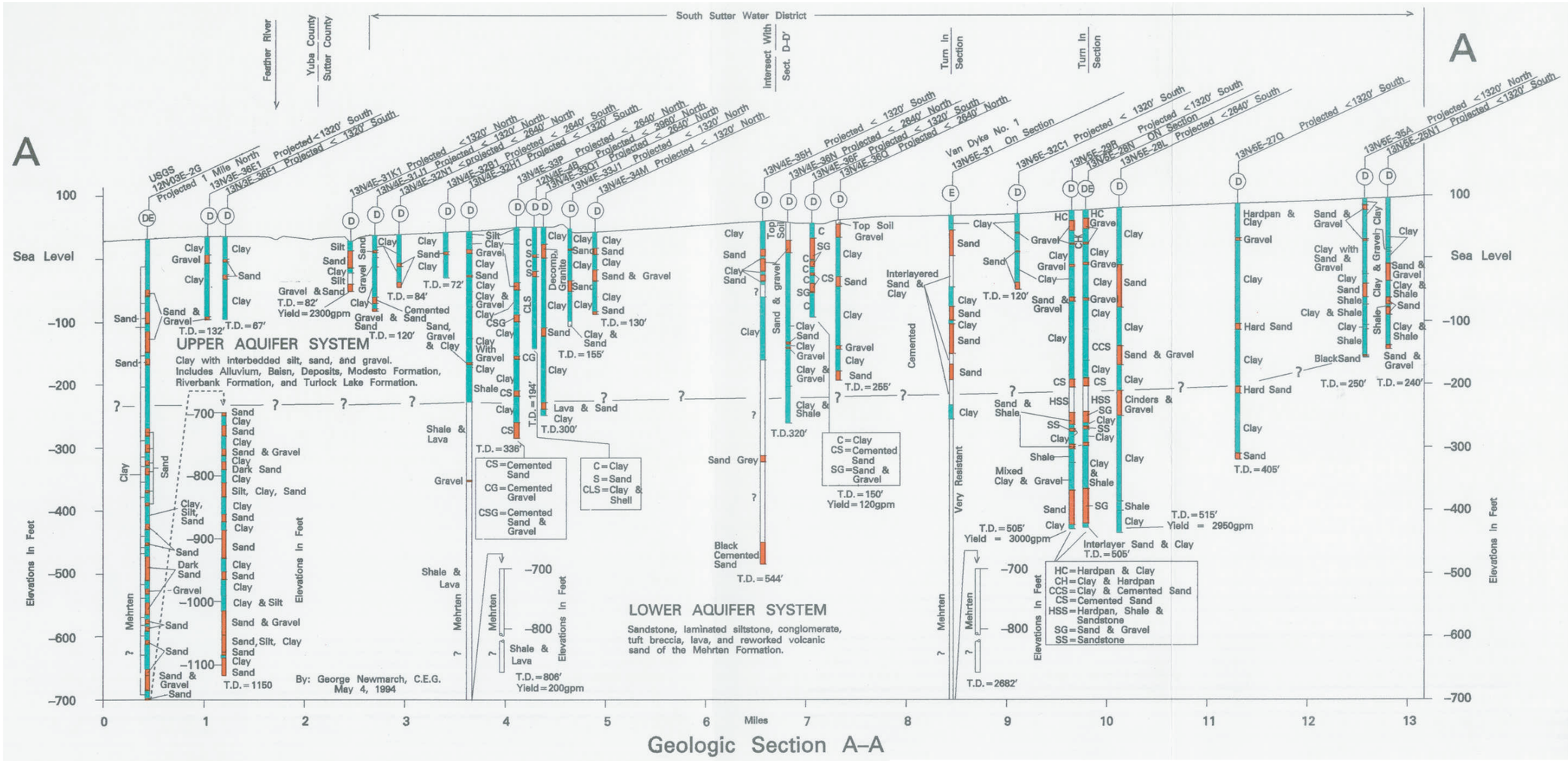
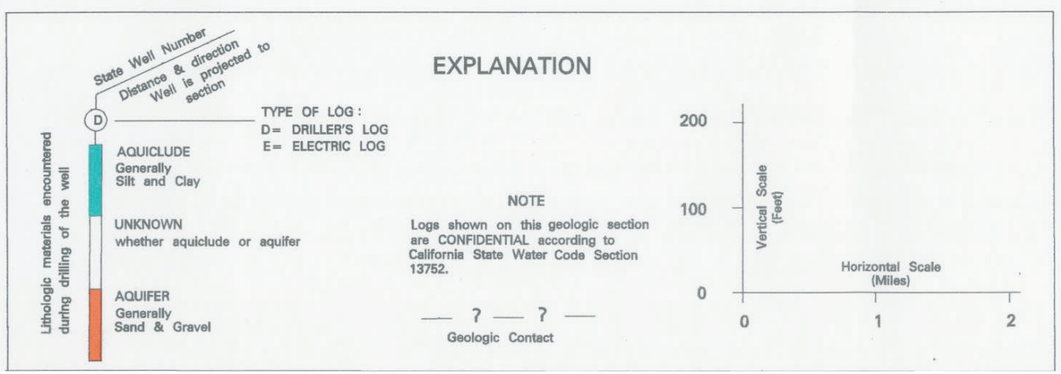
Figure 4
Cross-Section D
North American Subbasin



Geologic Section A–A



adapted from DWR, 1997 Feasibility Report, American Basin Conjunctive Use Project

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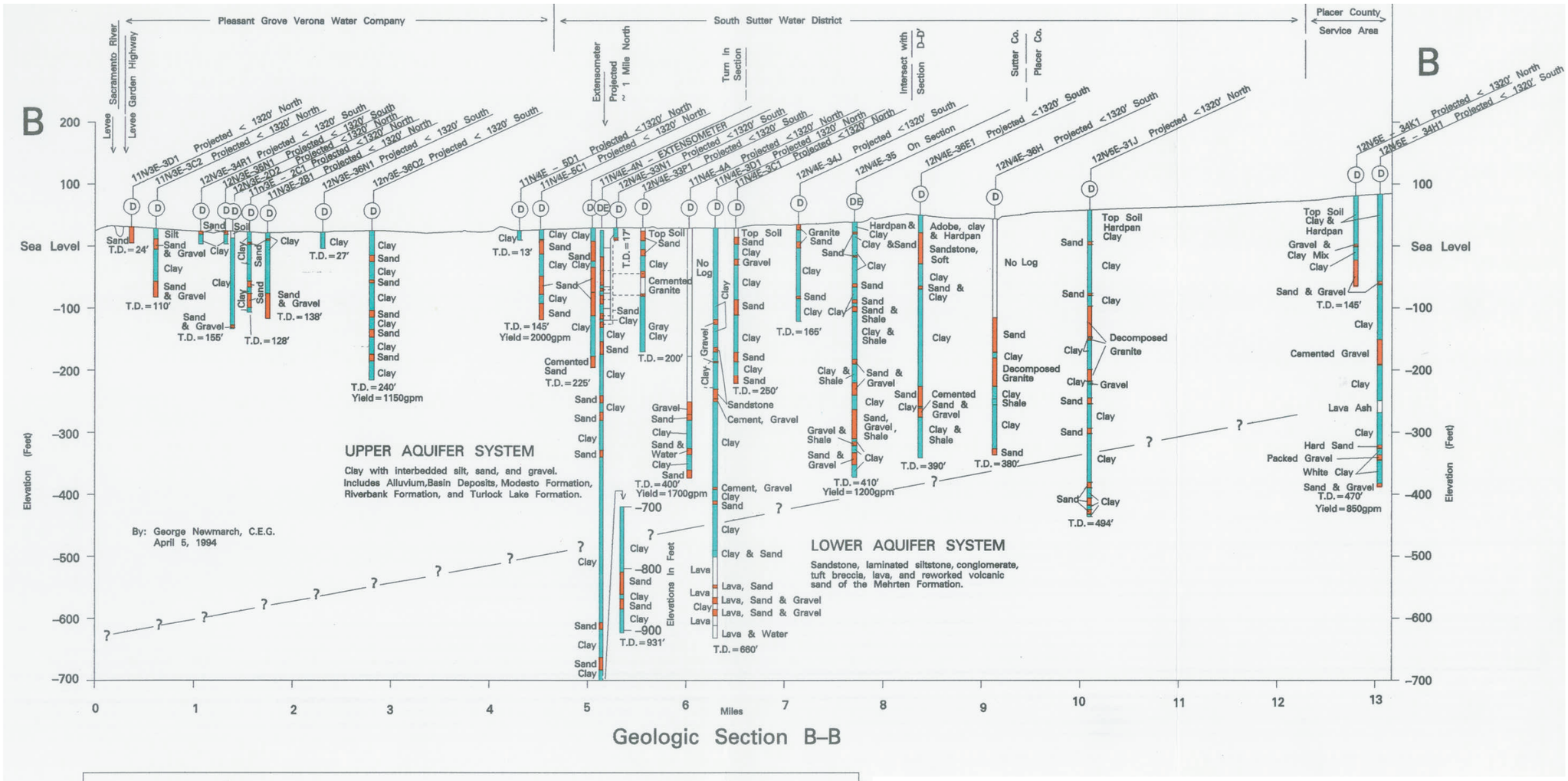
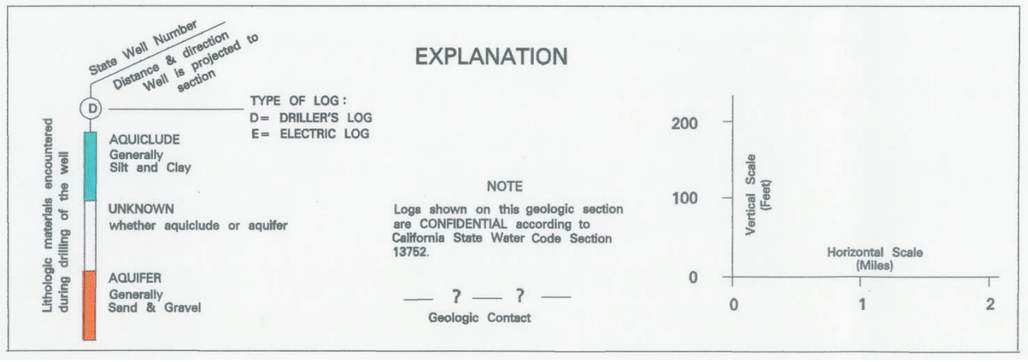
Figure 5
Cross-Section A
North American Subbasin



Geologic Section B–B



adapted from DWR, 1997 Feasibility Report, American Basin Conjunctive Use Project

Figure 6
Cross-Section B
North American Subbasin

are typically higher to the north and east, and lower to the south and west in both aquifer units. A collection of representative long-term hydrographs illustrates the history of groundwater level fluctuations in the District area (Figure 7). In general, groundwater levels had declined as much as 45 feet before construction of the Camp Far West Reservoir. Subsequent delivery of surface water resulted in recovery of groundwater levels by the early 1970s, to near recorded high elevations in the 1930s-1950s. Critically dry conditions in 1976 and 1977 curtailed the surface water supply, with no surface water delivered in 1977. The corresponding increase in groundwater pumping to meet irrigation requirements caused groundwater declines of as much as 40 feet, but subsequent wet conditions through the early to mid-1980s resulted in full groundwater level recovery. Despite dry conditions in the late 1980s through the early 1990s, the District maintained some deliveries of surface water, in turn contributing to generally stable groundwater conditions during that period. Since then, wet conditions through the mid-1990s, followed by dry conditions over the last couple of years, are reflected in rising and subsequent decrease in groundwater levels over that period.

The District's ability to maintain a successful conjunctive use policy has resulted in increased groundwater level stability in the area as seen in the representative hydrographs. Groundwater is typically stable throughout the District area, with small amounts of fluctuation (10 to 20 feet in the southwest, and 30 to 40 feet to the east and north) reflecting seasonal and climatic conditions. There is no indication of overdraft, as water levels are not continuously dropping in any part of the District.

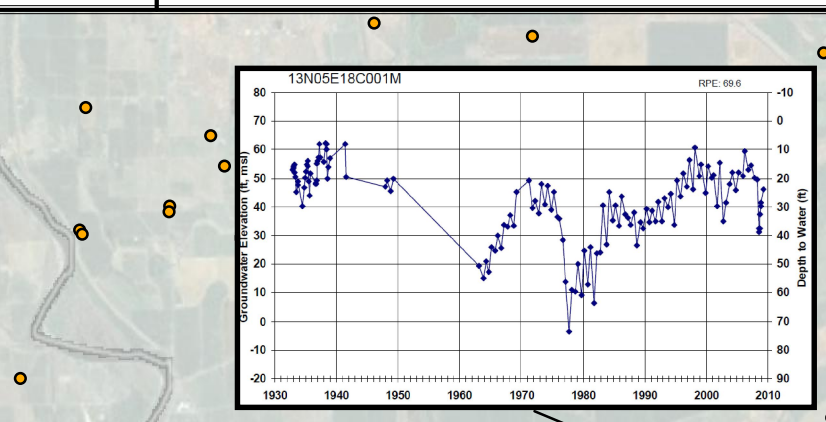
A set of contour maps of equal groundwater elevations illustrates historical changes in groundwater elevations and flow directions from pre-surface water (1963) through the recovery and subsequent fluctuations illustrated on Figure 7 and described above. Previously prepared contours of equal groundwater elevation for 1963, 1971, 1978, and 1993 are included from two Groundwater Conditions reports prepared for the District (MBK, 1970; MBK, 1994), and two additional maps were created for 2003 and 2008 to illustrate recent conditions for this Plan.

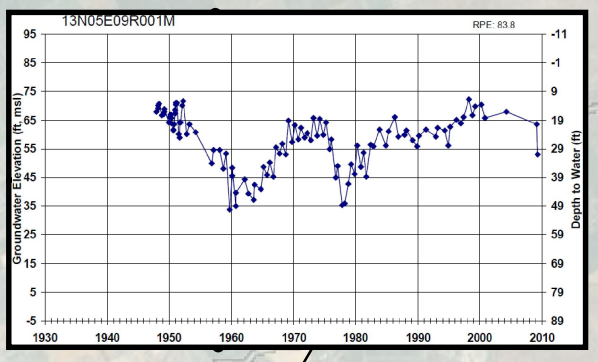
The first map displaying contours of equal groundwater elevation, for the spring of 1963, was based on water level data from wells completed in both the upper and lower aquifers (Figure 8). It reflects conditions in the year before the District started delivering surface water, which was the historic low point for groundwater levels in the District area. The direction of groundwater flow was toward two pumping depressions, one at the center of the District and the other to the south. Groundwater elevations ranged from as high as 120 feet above sea level immediately east of the District where groundwater was flowing toward the pumping depressions, the deeper of which was about 20 feet below sea level at the south end of the District.

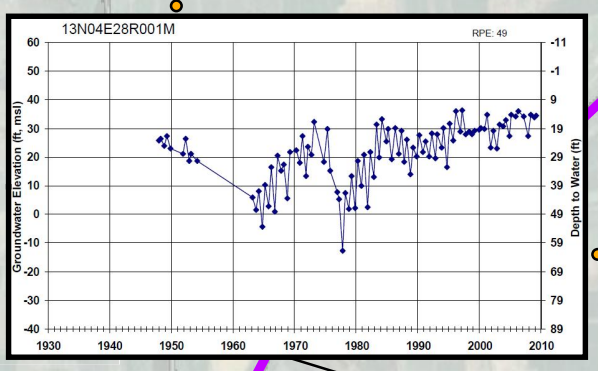
Contours of equal groundwater elevation for spring 1971 (Figure 9), again based on groundwater data from wells completed in the upper and lower aquifers, show groundwater conditions near

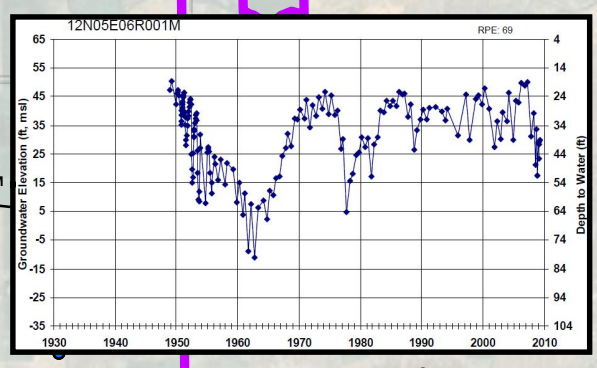
R3E R4E R5E R6E

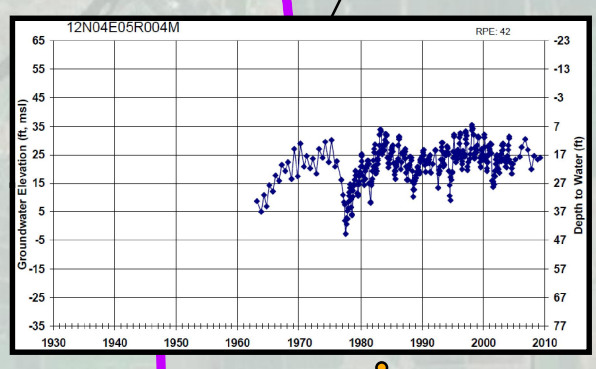
T14N T13N T12N T11N T10N

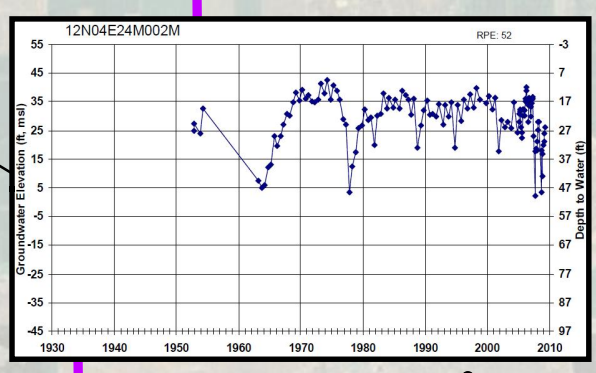


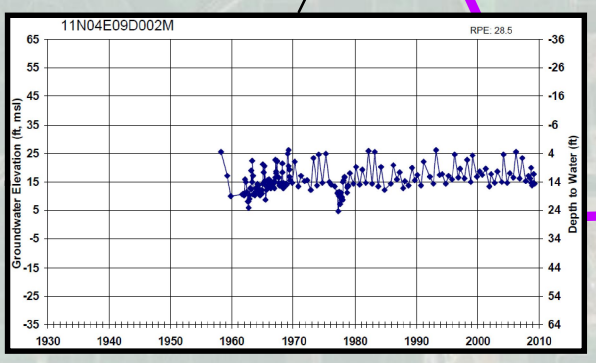


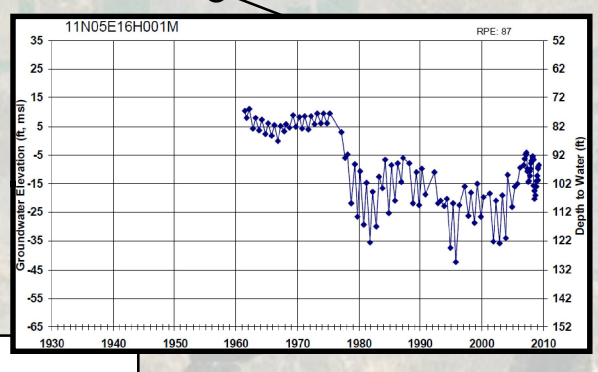












18C001M
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Sheridan
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Sutter County
Placer County
Pleasant Grove

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Miles

Legend

Well Locations

- South Sutter Water District
- DWR-GW Supply Assessment and Special Studies
- DWR Geology and GW Investigation Section
- Other Well Locations with WL Data (DWR)
- South Sutter Water District Boundary

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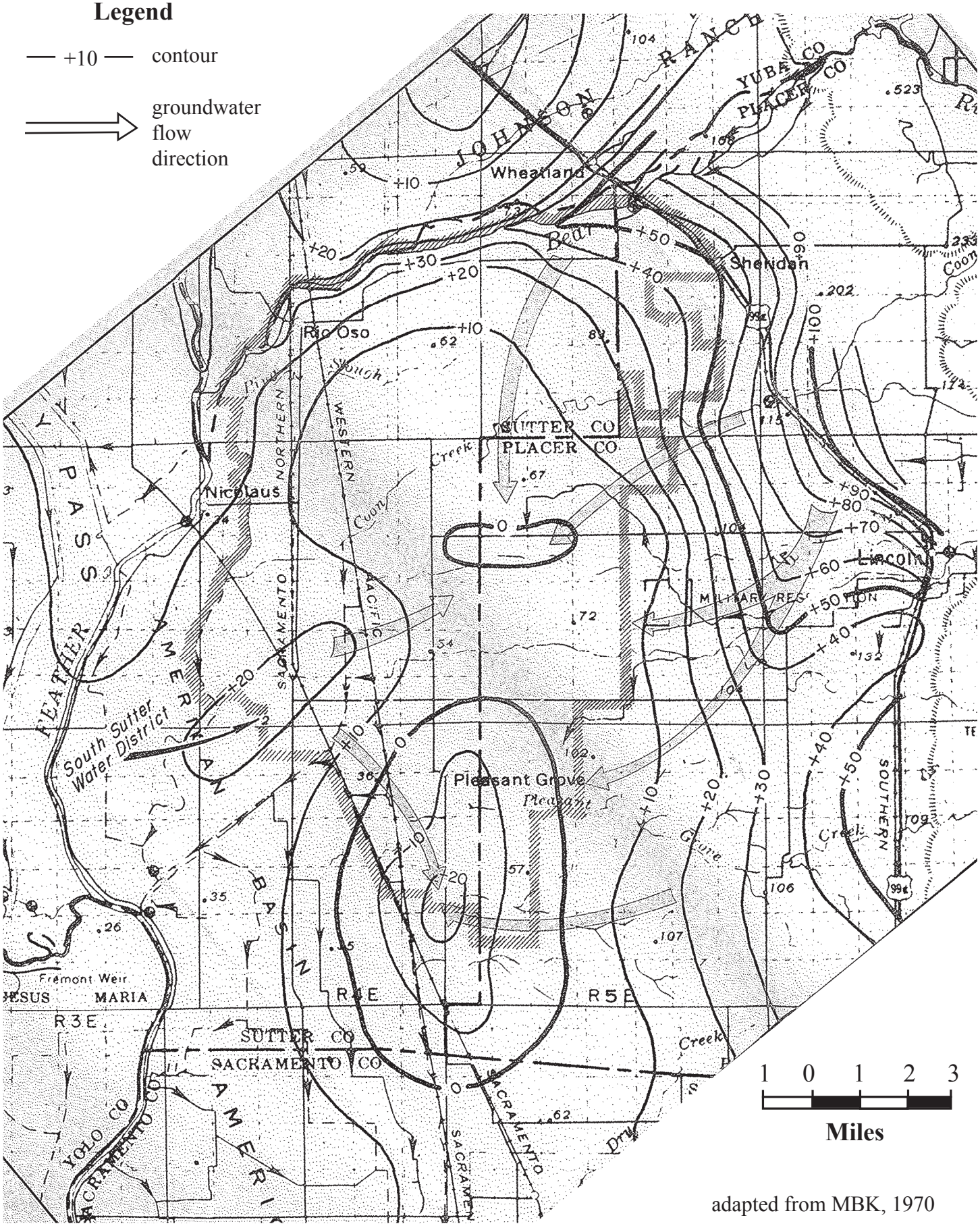
Figure 7
Groundwater Level Hydrographs
South Sutter Water District



adapted from MBK, 1970

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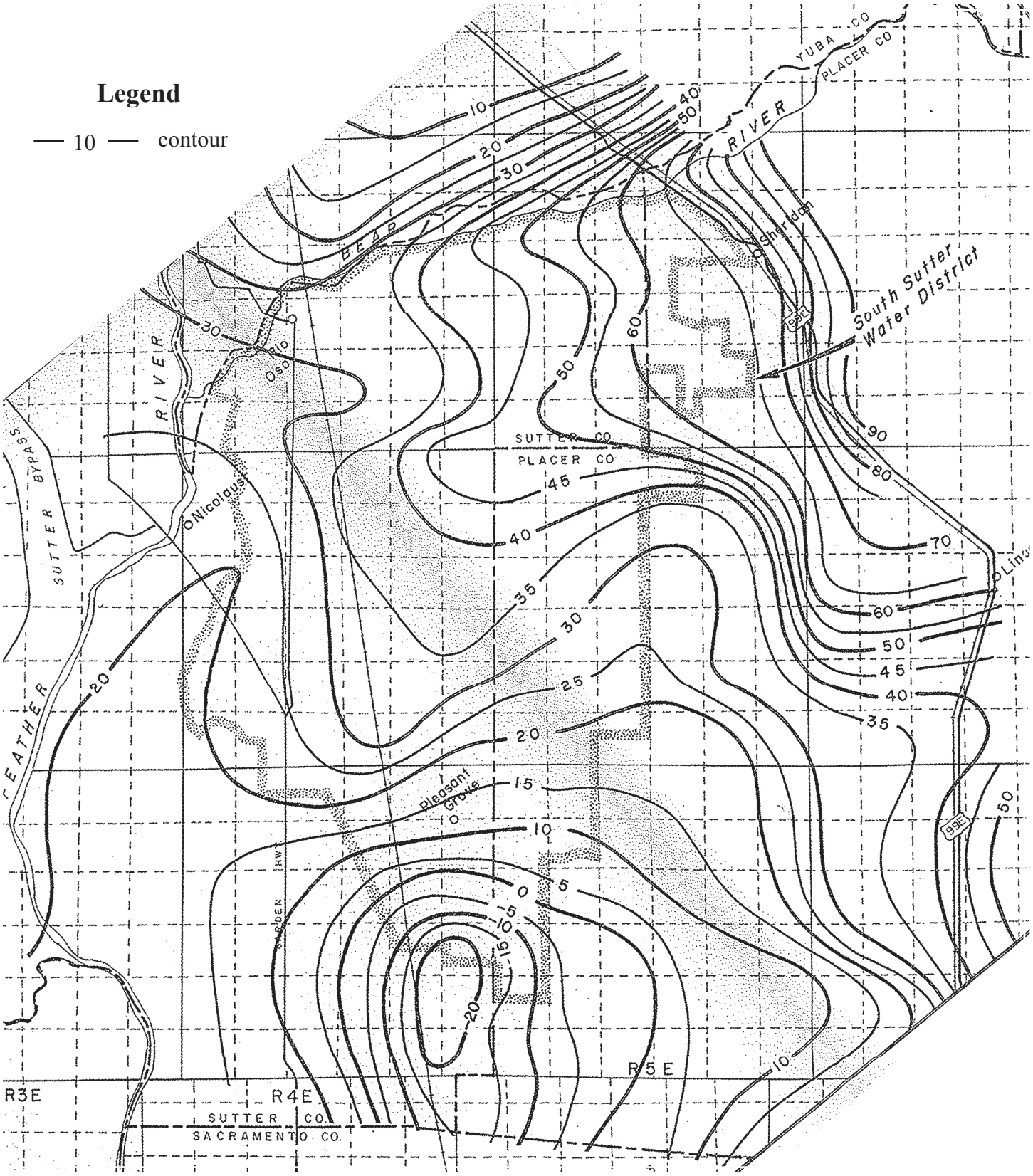
Figure 8
Contours of Equal Groundwater Elevation - SSWD
Spring 1963



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adapted from MBK, 1994

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CONSULTING ENGINEERS

Figure 9
Contours of Equal Groundwater Elevation - SSWD
Spring 1971

maximum historic levels after surface water deliveries from Camp Far West Reservoir. Groundwater in the north of the District generally flowed from the northeast to the southwest while groundwater in the southern part of the District flowed toward a remaining depression at the central southern edge of the District boundary. The prior pumping depression in the center of the District had largely recovered. Groundwater elevations ranged from about 90 feet above sea level northeast of the District boundary, to about 20 feet below sea level in the groundwater depression in the southernmost central part of the District.

Contours of equal groundwater elevation for spring 1978, based on data from wells completed in the upper and lower aquifers, show evidence of the 1976-77 drought reflected in lower overall groundwater elevations in the District (Figure 10); however, groundwater elevations were still generally five to ten feet higher than the historic low of 1963. Groundwater typically flowed from the northeast to the south and from the west to the southeast, towards two groundwater depressions (one continuing at the southern border of the District and a smaller one that had formed in the northwest corner of the District). Groundwater elevations ranged from over 80 feet above sea level in the northeast to less than 20 feet below sea level in the southern depression. The two groundwater depressions in this time period reflect dry conditions that resulted in little or no surface water deliveries in the two preceding years.

Figure 11 shows contours of equal groundwater elevation in the District area in spring 1993, based on data from wells completed in the upper and lower aquifers, after several consecutive dry years from 1987 to 1992. As noted above, the District was able to continue surface water deliveries so the drought conditions during that time period had little effect on groundwater elevations in the District area. Groundwater elevations ranged from over 80 feet above sea level in the northeast to 30 feet below sea level in the southern groundwater depression. A groundwater depression had formed adjacent to the Feather River, outside the western boundary of the District, but generally stable between less than 20 feet to 30 feet above sea level, similar to previous years, inside the District's western boundary. The groundwater depression to the south was still present at that time, with slightly lower groundwater elevations (30 feet below sea level) at its center.

The contours of equal groundwater elevation in the spring of 2003, based on data from wells completed in the upper aquifer, illustrate minimal effects of two consecutive dry years (2001 and 2002) on the water table surface (Figure 12). Groundwater flowed from the northeast to the southeast except in the central and southwestern portions of the District, where groundwater flow was to the south and southeast toward the enlarged groundwater depression beyond the southern end of the District. Groundwater elevations ranged from above 80 feet above sea level in the northeast to about 30 feet below sea level at the south end of the District.

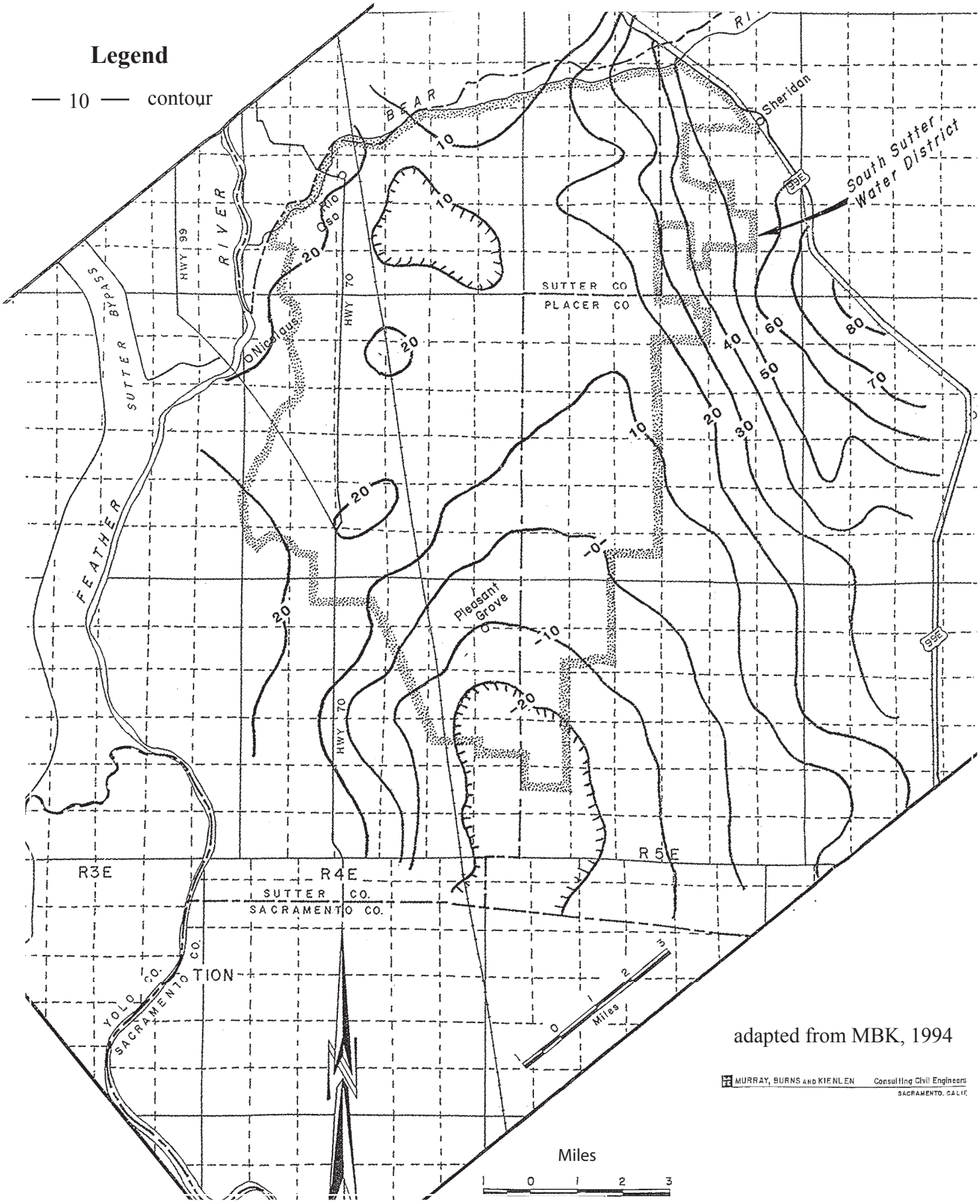

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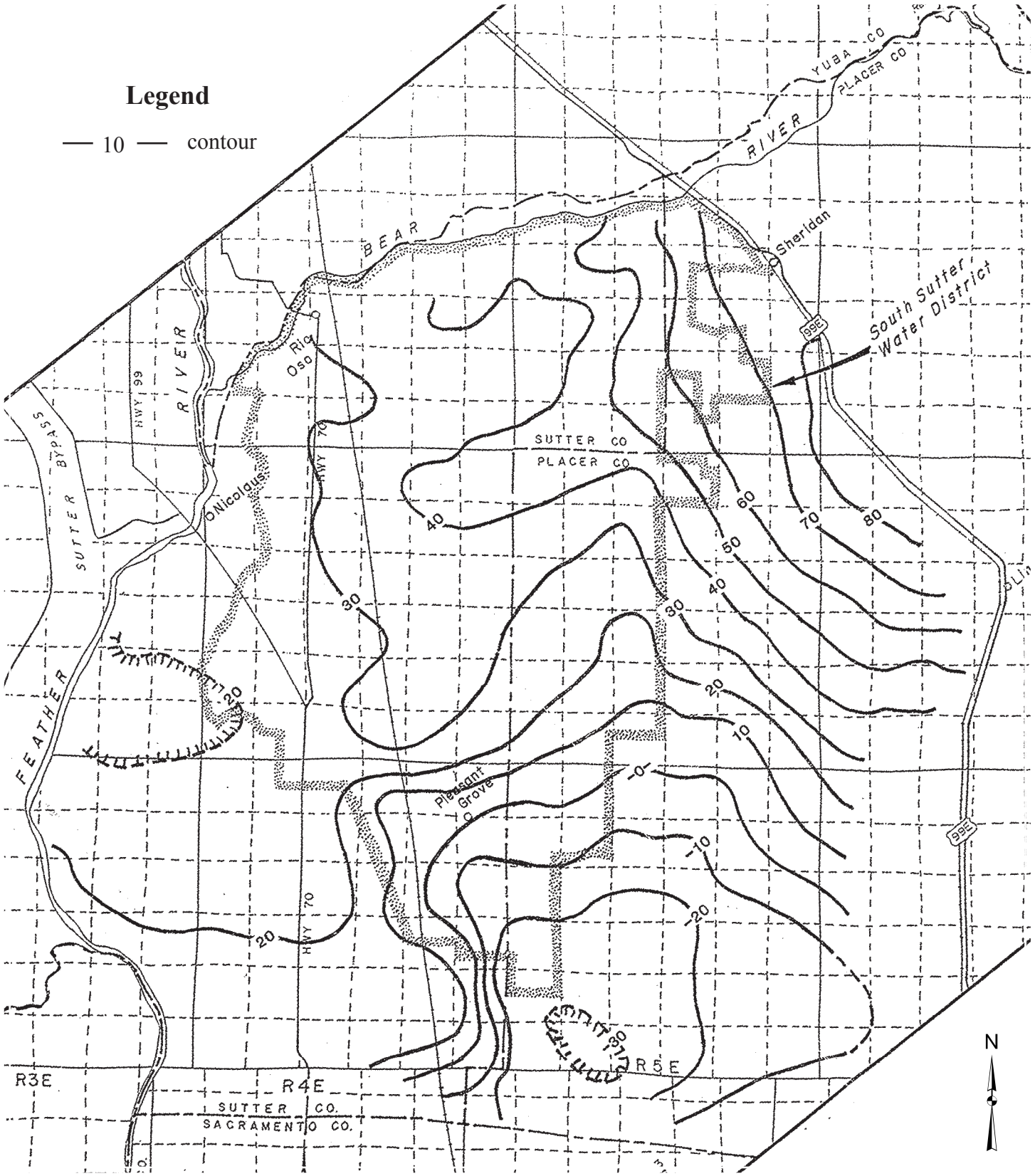
Figure 10
Contours of Equal Groundwater Elevation - SSWD
Spring 1978



adapted from MBK, 1994

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Figure 11
Contours of Equal Groundwater Elevation - SSWD
Spring 1993

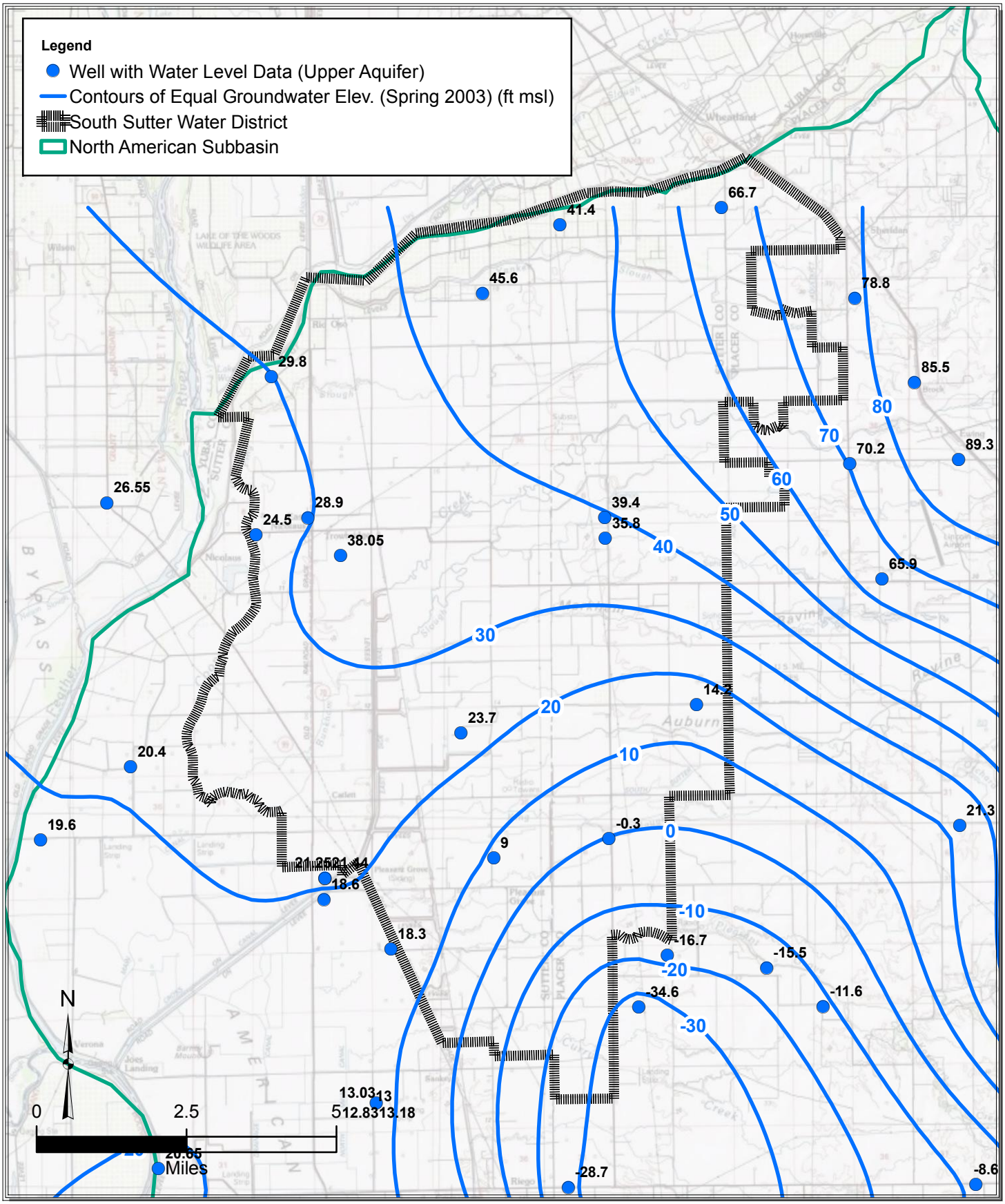

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Figure 12
Contours of Equal Groundwater Elevation - SSWD
Spring 2003, Upper Aquifer

Most recent groundwater conditions in the Plan area are illustrated by contours of equal groundwater elevation for spring 2008, based on data from wells completed in the upper aquifer (Figure 13). Groundwater flows generally from the northeast to the south and southwest, tracing the Bear, Feather, and Sacramento rivers, except at the southern end of the District where flows are drawn into the prevalent groundwater depression to the south. Groundwater elevations range from above 90 feet above sea level in the northeast to about 10 feet below sea level at the south end of the District.

3.4 Groundwater Quality

Groundwater in the greater North American Subbasin has localized areas or, in some cases, individual wells where concentrations of certain water quality constituents are elevated relative to water quality standards and guidelines for drinking water and irrigation supply, including total dissolved solids (TDS)/specific conductance, chloride, sodium, nitrate, boron, iron, manganese, arsenic, and fluoride (DWR, 2006). For all practical purposes, however, none of those is a constraint or major concern in the District's Plan area.

DWR and the USGS monitor groundwater quality in the subbasin, and groundwater quality data is mainly available from the USGS. In the vicinity of the District, about 110 wells have some water quality data between 1950 and 2008; approximately 30 of those wells are located within the District boundary. The following summary derives from that data.

Total Dissolved Solids (TDS) concentrations above 450 mg/L may be undesirable for crops under certain conditions. For drinking water supplies, the recommended and upper secondary MCLs are 500 and 1,000 mg/L respectively. Maximum TDS concentrations for wells with TDS data between 1961 and 2008 in the vicinity of the District are illustrated in Figure 14. All of the wells in the District have had a maximum TDS concentration below 600 mg/L; most are below 300 mg/L.

Chloride concentrations above 106 mg/L have been reported to be potentially undesirable for some crops, such as fruit orchards (CVRWQCB, 2008). For drinking water, the recommended and upper secondary MCLs are 250 and 500 mg/L, respectively. The maximum chloride concentrations in wells with water quality data between 1950 and 2008 in and around the District indicate that, with the exception of one anomalous well, where chloride was reported to be 120 mg/L, all other historical observations are less than 50 mg/L, and most are below 30 mg/L.

Sodium is naturally occurring in groundwater because most rocks and soils contain sodium compounds from which sodium is easily dissolved. The Central Valley Regional Water Quality Control Board published an Agricultural Water Quality Limit of 69 mg/L for sodium (CVRWQCB, 2008). There is no quantitative drinking water standard for sodium. The

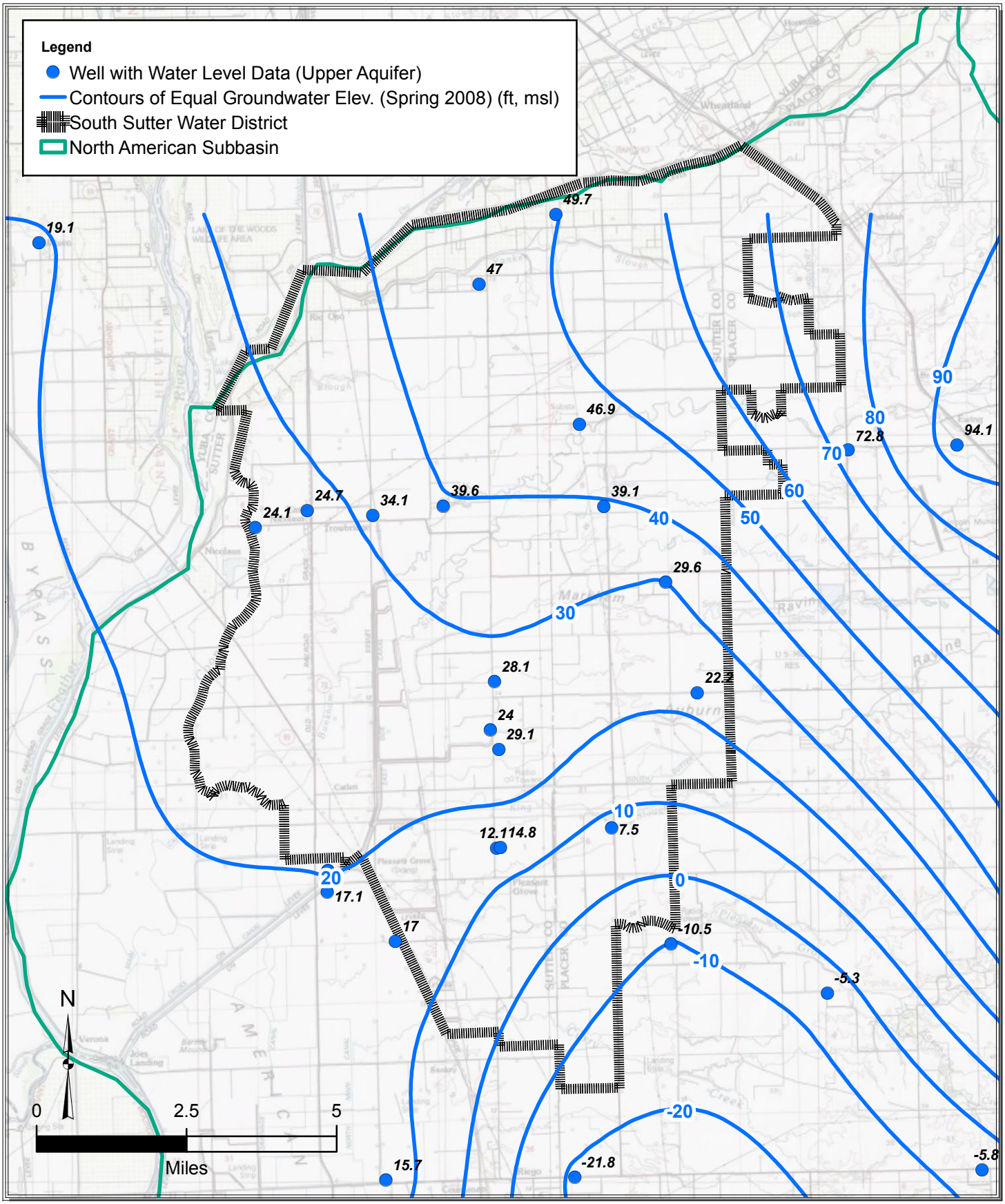

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Figure 13
Contours of Equal Groundwater Elevation - SSWD
Spring 2008, Upper Aquifer

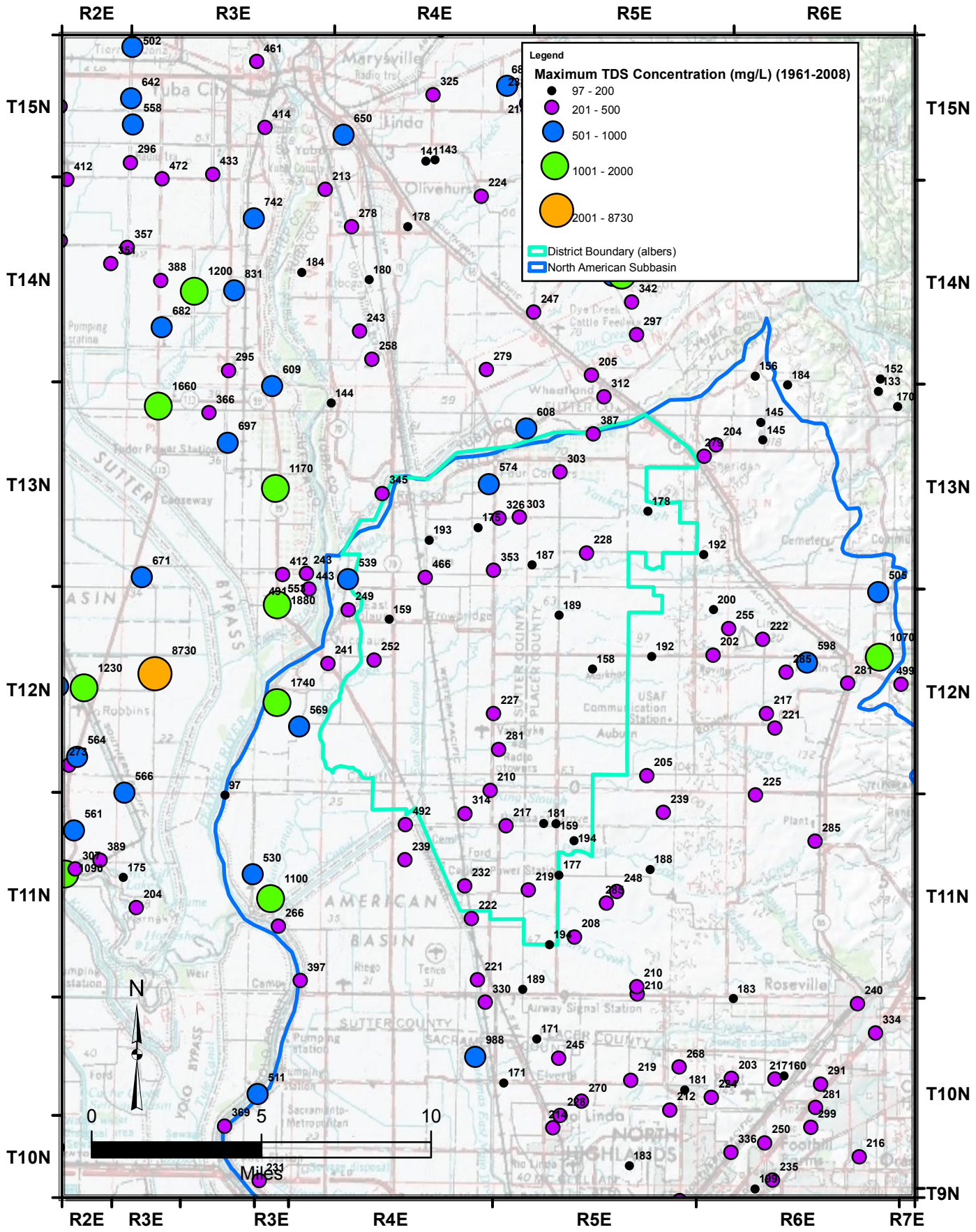

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Figure 14
Maximum Total Dissolved Solids (TDS) Concentration for Wells In and Near South Sutter Water District, 1961 to 2008

maximum concentrations of sodium for wells with water quality data in and around the District between 1953 and 2008 indicate that all of the wells within the District's boundary have sodium concentrations well below the agricultural limit; most concentrations are less than about 25 mg/L.

The primary drinking water MCL for ***nitrate*** (as nitrate) is 45 mg/L; there is no reported agricultural water quality limit (CVRWQCB, 2008). The maximum concentrations of nitrate in groundwater in the vicinity of the District between 1955 and 2008 show that except for some slightly elevated concentrations in one local area near the northern boundary of the District at the Bear River, where maximum reported concentrations are between 15 and 30 mg/L, reported nitrate concentrations throughout the District have all been below 13 mg/L, with most less than 10 mg/L.

The agricultural water quality limit for ***boron*** is 0.7 mg/L (CVRWQCB, 2008), and the Sacramento/San Joaquin Basin Plan objective for boron is 2.0 mg/L. Although boron concentrations to the southwest of the North American Subbasin have been reported to be slightly elevated (greater than 2 mg/L) (Fogelman, 1983), in and around the District, boron concentrations have historically been less than 0.5 mg/L. In fact no wells in the District have exceeded the lower agricultural water quality limit between the period of available data (1953-2008).

The agricultural water quality limit for ***iron*** is 5.0 mg/L, and the secondary MCL for drinking water is 0.3 mg/L. Maximum available iron concentrations for groundwater in the vicinity of the District between 1957 and 2008 show that although iron concentration data in the District are sparse (five wells), all of the measurements have been below the secondary MCL of 0.3 mg/L. The secondary drinking water MCL for ***manganese*** is 0.050 mg/L and the agricultural water quality limit is 0.20 mg/L. Similar to iron, manganese concentrations in groundwater in the District are sparse; six wells in the District have data ranging from 0.39 mg/L on the northwest edge to 0.001 mg/L in the northwest-central part of the District.

Elevated ***arsenic*** concentrations in water can be toxic to humans and can cause crop damage. The agricultural water quality limit for arsenic is 100 ug/L, and the primary MCL for drinking water is 10 ug/L (CVRWQCB, 2008). Maximum arsenic concentrations in available groundwater data between 1967 and 2008 are shown in Figure 15**.** While the data are sparse, most arsenic data in the District are below the drinking water standard and significantly below the agricultural water quality limit. There is some suggestion of an increasing trend from the north, where maximum concentrations have been on the order of 1 to 3 mg/L, toward the south where maximum concentrations have been in the range of 5 to 10 mg/L.

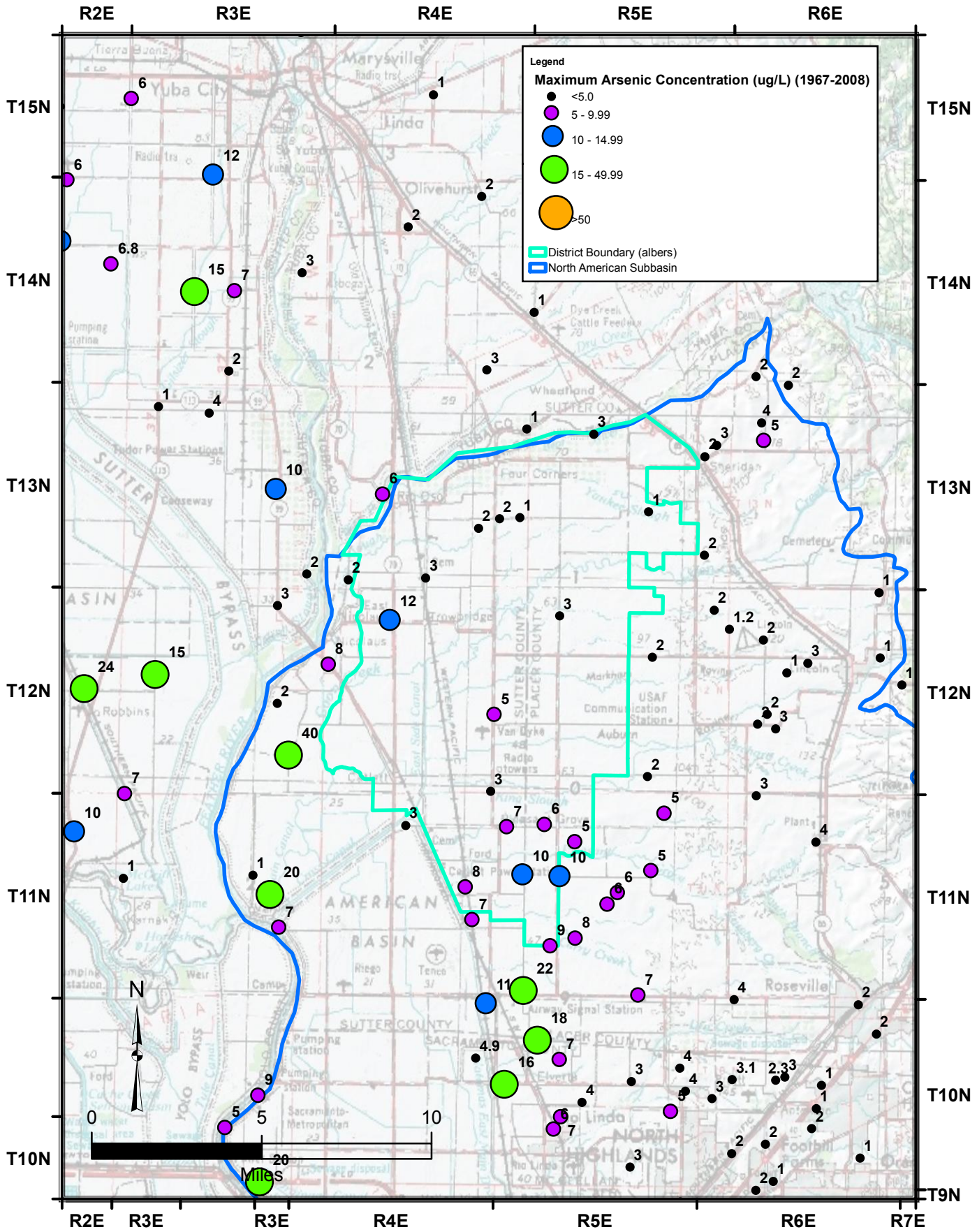

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Figure 15
Maximum Arsenic Concentration for Wells In and Near South Sutter Water District, 1967 to 2008

Fluoride is a naturally occurring chemical present in groundwater from the breakdown of rocks and soils or weathering and deposition of atmospheric volcanic particles, but may also originate from chemical fertilizers in agricultural areas. The CVRWQCB has set an agricultural water quality limit for fluoride of 1.0 mg/L, while the California Department of Public Health publishes a primary drinking water MCL of 2.0 mg/L (CVRWQCB, 2008). Maximum fluoride concentrations in wells with water quality data between 1955 and 2008 in and around the District indicate that the District and vicinity generally have low maximum fluoride levels. Except for two anomalous data points, all maximum concentrations are fractional, typically between 0.1 and 0.3 mg/L.

3.5 Groundwater Pumping

Groundwater supplies in the District are obtained from wells owned and operated by individual landowners; the District does not own or operate wells to augment its surface water supplies. The District makes annual estimates of total water supply available to lands within the District and allocates the surface water on an acre-foot per acre basis to augment groundwater pumping and fulfill total water demand. Consequently, there is no ongoing mechanism to estimate total groundwater pumping within the District, i.e. for a combination of those lands with access to supplemental surface water and those lands solely dependent on groundwater. Implementation of this Plan is intended to improve estimates of groundwater pumping by utilization of land uses (cropping patterns), applied water duties, and surface water delivery records.

3.6 Land Subsidence

Land subsidence is the lowering of the ground surface through compaction of compressible, fine-grained strata. In the greater Sacramento Valley, it is most commonly considered to be the result of groundwater pumping from unconsolidated, interbedded aquifer-aquitard systems. Compaction can be fully reversible (elastic) or permanent (inelastic). Elastic compaction and expansion generally occur in response to seasonal groundwater level fluctuations. Inelastic compaction is more likely to occur when prolonged dewatering of clay units occur during periods when pumping is not fully recharged and groundwater levels reach historic lows.

Monitoring of land subsidence has been limited in the North American Subbasin. Historically, land subsidence was monitored along transects by comparing periodic spirit level surveys conducted by the USGS and the National Geodetic Survey (NGS). In the mid-1980s, a transition was made from spirit level surveys to global positioning system (GPS) surveys. GPS surveys were conducted in the southern portion of the Sacramento Valley from 1985 through 1989 (Blodgett et al., 1990; Ikehara, 1994). Like spirit level transects, GPS monitoring of subsidence relies on periodic resurveying of a network of monuments. The accuracy of GPS surveys has

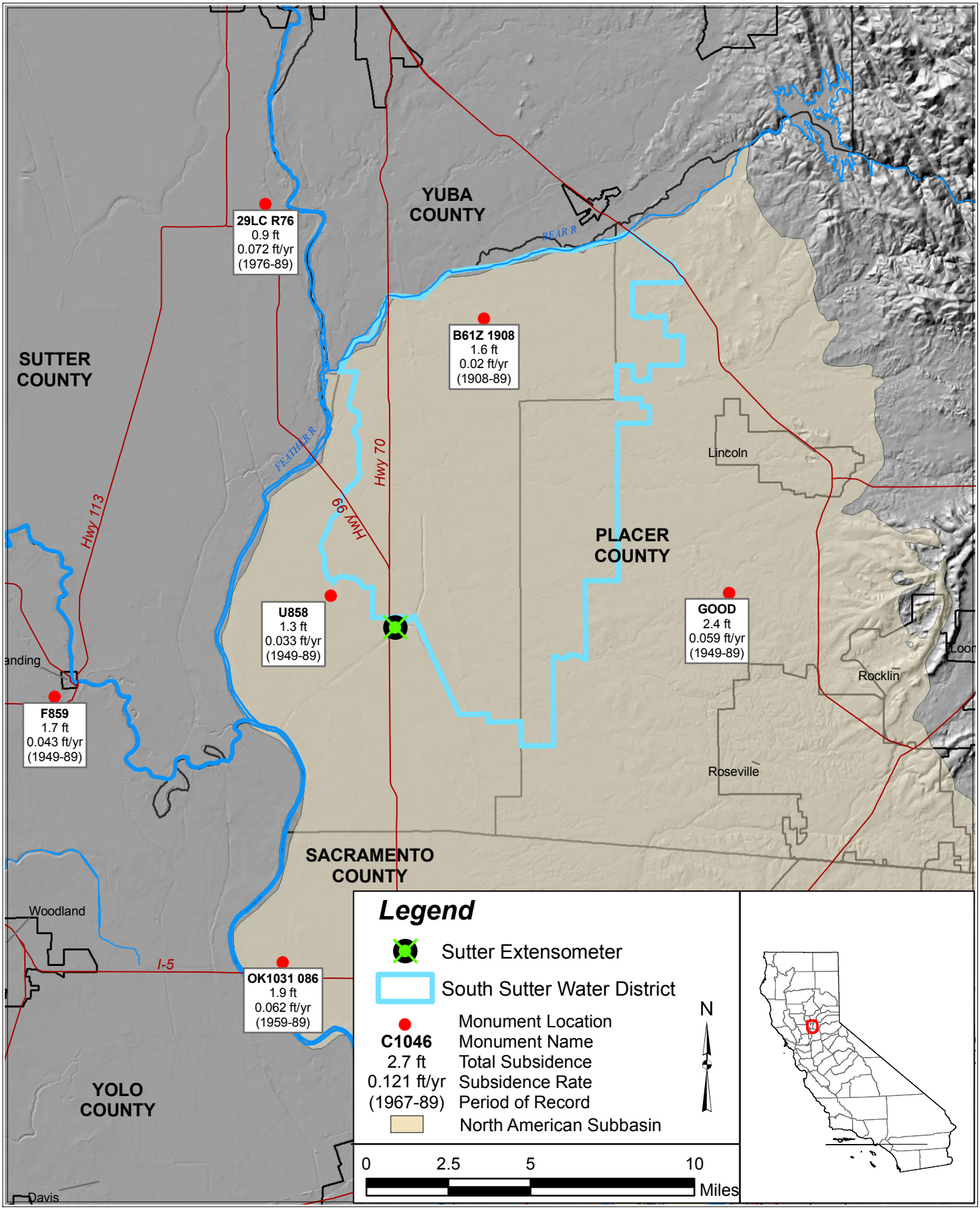
gradually improved and is currently on the order of plus or minus one centimeter (about 0.4 inch, or about 0.03 feet).

Ikehara (1994) estimated subsidence rates in the southern Sacramento Valley by comparing 1989 GPS survey data with historical data from spirit level transects. Although the accuracy of the 1989 survey (plus or minus 0.1 meter, or about 0.33 ft., or about 4 inches) was an order of magnitude less than more recent GPS surveys (Ikehara, 2004, pers. comm.), those are considered to be the best available data to estimate subsidence prior to 1989 at multiple locations. With those relative accuracies in mind, total subsidence over varying time periods prior to 1989 was reported as shown in Figure 16. Within and near the District, the monument location with the longest period of record is located near the north-central District boundary. At that location, total subsidence over an 81 year period (1908-89) was interpreted to be about 1.6 feet, or a long-term average rate of about 0.02 feet (about 0.25 inch) per year. Corresponding groundwater level data are not available prior to the 1930s; however, based on available data since then, it is logical that subsidence prior to 1989 was a result of the groundwater level declines that preceded surface water deliveries in the 1960s.

Land subsidence is also monitored at specific locations in the Sacramento Valley using borehole extensometers. Borehole extensometers are typically more accurate than GPS monitoring stations (detecting changes in land surface elevation to 0.001 foot, or about 0.01 inch). The nearest extensometer to the District, the Sutter Extensometer, is located just outside the southwestern border of the District (Figure 16); it is also the only borehole extensometer in the North American Subbasin. This extensometer is operated by DWR and is located adjacent to the DWR multiple-completion monitoring wells at 11N/04E-04N. The Sutter Extensometer is a pipe extensometer that measures compaction from the ground surface to its total depth of 780 feet.

The Sutter Extensometer began operation in April 1994, and has continuously tracked ground compaction/expansion since then. The complete record through February 2009 is plotted in Figure 17. Also plotted in Figure 17 are water levels for the deepest adjacent monitoring well (11N/04E-04N1), which is perforated from 880 to 890 feet. The compaction/expansion data show mostly elastic subsidence that corresponds to seasonal and longer periodic fluctuations in groundwater levels. The cumulative land subsidence from Spring 1995 to Spring 2008 shown on Figure 17 was 0.013 feet (0.16 inches).

Subsidence at the Sutter Extensometer has been relatively small as expected given high and relatively stable groundwater levels at this location. Subsidence throughout the District would also be expected to be small for the same reasons.



FILE: \\server_pe2900\Public\SouthSutterWD 08-1-074\GIS\Figure 4-11 Total estimated Subsidence Rates.mxd Date: 7/6/2009

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Figure 16
Total Estimated Subsidence and Subsidence Rates in Southern Sacramento Valley as of 1989

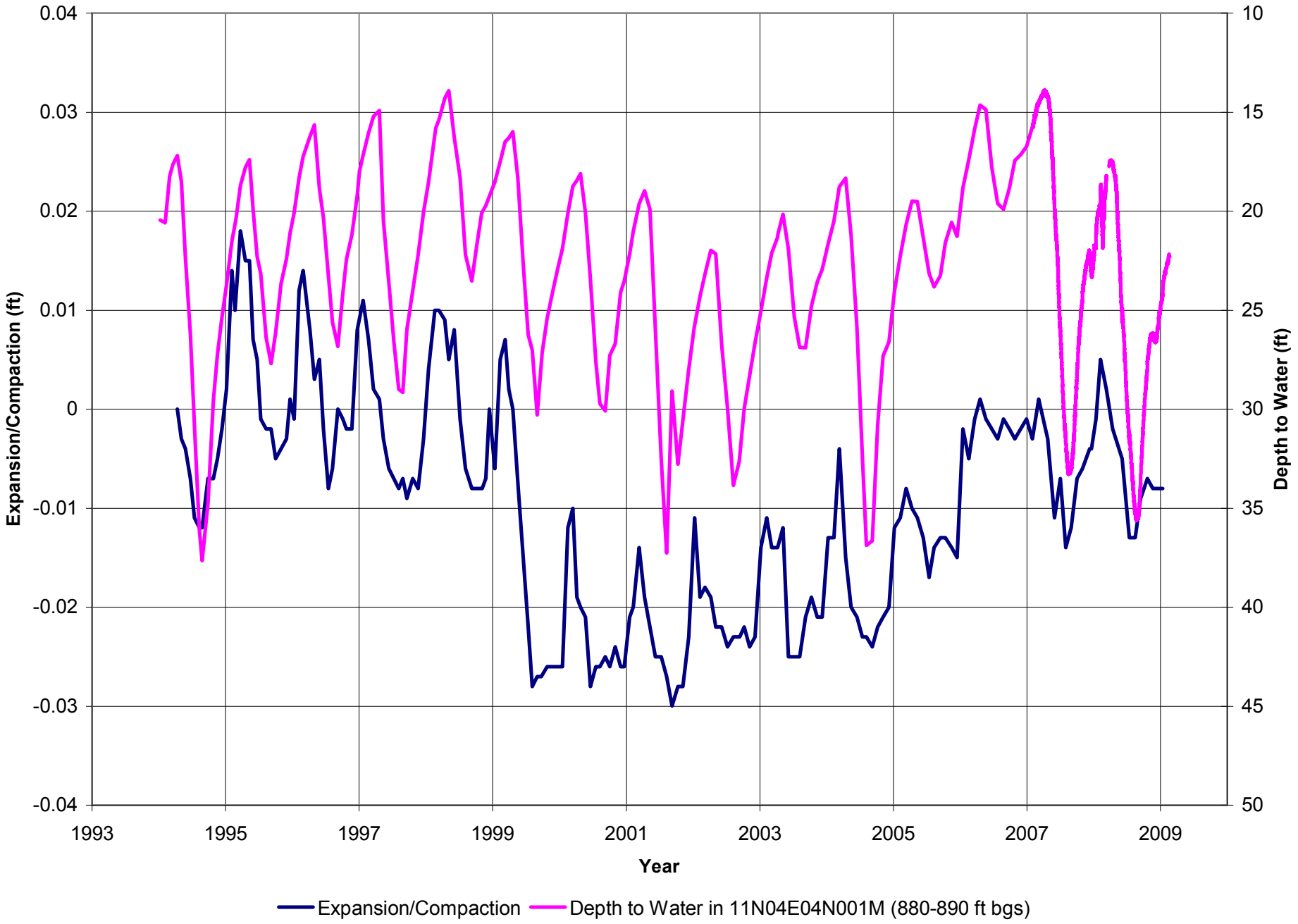

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Figure 17
Compaction and Water Level Data for the Sutter Extensometer

3.7 Areas of Concern/Identified Problems

There are no significant problems or areas of concern related to groundwater in the District. Where declining groundwater levels were once a concern, leading to the construction of Camp Far West Reservoir in the 1960's, conjunctive use of surface water from that project with local groundwater has successfully eliminated the previous decline, caused groundwater levels to recover, and resulted in general groundwater level stability, with some seasonal and other fluctuations.

Beyond the District's boundaries, a large groundwater depression remains south of the District (the North Sacramento County depression). Groundwater flow in the southern part of the District is dominated by that feature, as seen in all of the groundwater contour maps in this Plan. The District might otherwise be concerned about growth and impacts of that depression extending northward into its area; however, the District understands that groundwater management objectives in northern Sacramento County are to constrain such expansion, and the District thus plans to manage groundwater within its Plan area on the assumption that the southerly depression will not adversely impact its planned management actions or management objectives.

4. Elements of the Groundwater Management Plan

As part of long-term supply management in the Plan area, the District began conjunctive use operations in the 1960s by storing and delivering supplemental surface water from the Camp Far West Reservoir and integrating it with local groundwater to meet irrigation water requirements in the District. Prior to that time, and continuing to the present, the District and others have collected groundwater level and related data which in turn have been interpreted to progressively define and understand basin conditions, and to continue to meet water demands over the last four decades. Information derived from the monitoring and management efforts to date has allowed the District and various individual pumpers in the basin to continue to rely on the groundwater basin for some or all of their water supply without significant concern that the resource was either overdrafted or otherwise negatively impacted.

In light of the preceding, complemented by the District's original Groundwater Management Plan adopted in 1993, local groundwater management has already been initiated consistent with the opportunity provided by Water Code Section 10750 et seq. Despite those ongoing accomplishments, however, the District recognizes a number of evolving opportunities related to groundwater and other water supplies in the basin and, consistent with provision in the original plan to periodically update it, the District has prepared this broader-based groundwater management plan.

The management objectives, or goals, for the South Sutter Water District plan area are the following:

Goal 1:	Development of Local Groundwater, in Conjunction with Supplemental Surface Water for Regular and Dry-Year Water Supply
Goal 2:	Avoidance of Overdraft and Associated Undesirable Effects
Goal 3:	Preservation of Groundwater Quality
Goal 4:	Preservation of Interrelated Surface Water Resources

To accomplish those goals, this Plan incorporates a number of components which are divided into ten elements. The elements formally recognize the effectiveness of a number of ongoing water resource management activities, and they recognize the need for additional activity, such as potentially expanded use of supplemental surface water with local groundwater. They also reflect a wider focus on local groundwater management, such as continuing cooperation with the land owners in the District including those who make use of supplemental surface water as well as those who rely solely on groundwater, and with other water resource management entities in the region to address regional resource opportunities and/or challenges. In summary, this Groundwater Management Plan is intended to enable the District, individual landowners, and

their regional neighbors to continue use of local groundwater for regular water supply, to expand their use of local groundwater during dry periods or emergencies, and to work with other agencies via implementation of the following management plan elements.

Element 1: Monitoring of Groundwater Levels, Quality, Production and Land Subsidence
Element 2: Monitoring and Management of Surface Water Storage, Flows, and Quality
Element 3: Determination of Basin Yield and Avoidance of Overdraft
Element 4: Development of Regular and Dry Year Water Supplies
Element 5: Continuation and Potential Expansion of Conjunctive Use
Element 6: Development and Continuation of Federal, State, and Local Agency Relationships
Element 7: Public Education and Water Conservation Programs
Element 8: Well Construction, Abandonment and Destruction Policies
Element 9: Management and Protection of Recharge Areas and Wellhead Protection Areas
Element 10: Provisions to Update the Groundwater Management Plan

Each of the elements as discussed in limited detail as follows.

Element 1 – Monitoring of Groundwater Levels, Quality, Production and Land Subsidence

Prior to the 1964 initiation of surface water deliveries from the Camp Far West Reservoir, all water supply in the District was developed from local groundwater. Since 1964, surface water has become an important component of overall water supply in the District, but groundwater continues to be an important part of agricultural water supply. Long term development and use of groundwater in the area has led to a substantial amount of historical groundwater level data, some dating back to the early 1930's. Groundwater quality data, although less complete and available compared to groundwater levels, is publically available for many wells in and around the District. The District does not own or operate its own wells and, as a result, does not have a regular groundwater quality monitoring network, nor does it maintain records of groundwater production by various individual pumpers throughout the District. Subsidence has not been an issue in the District; an extensometer, located near the southwestern boundary of the District and maintained by DWR, provides compaction and expansion data paired with groundwater level data to quantify the status of subsidence

Groundwater Levels

Currently, the District monitors 16 wells within the District boundary (Figure 18) on a semi-annual basis to measure the spring and fall groundwater levels. That monitoring is complemented by a larger network of wells monitored by DWR. That network has historically varied but in the last couple of years, has included about 100 wells in the vicinity of the District,

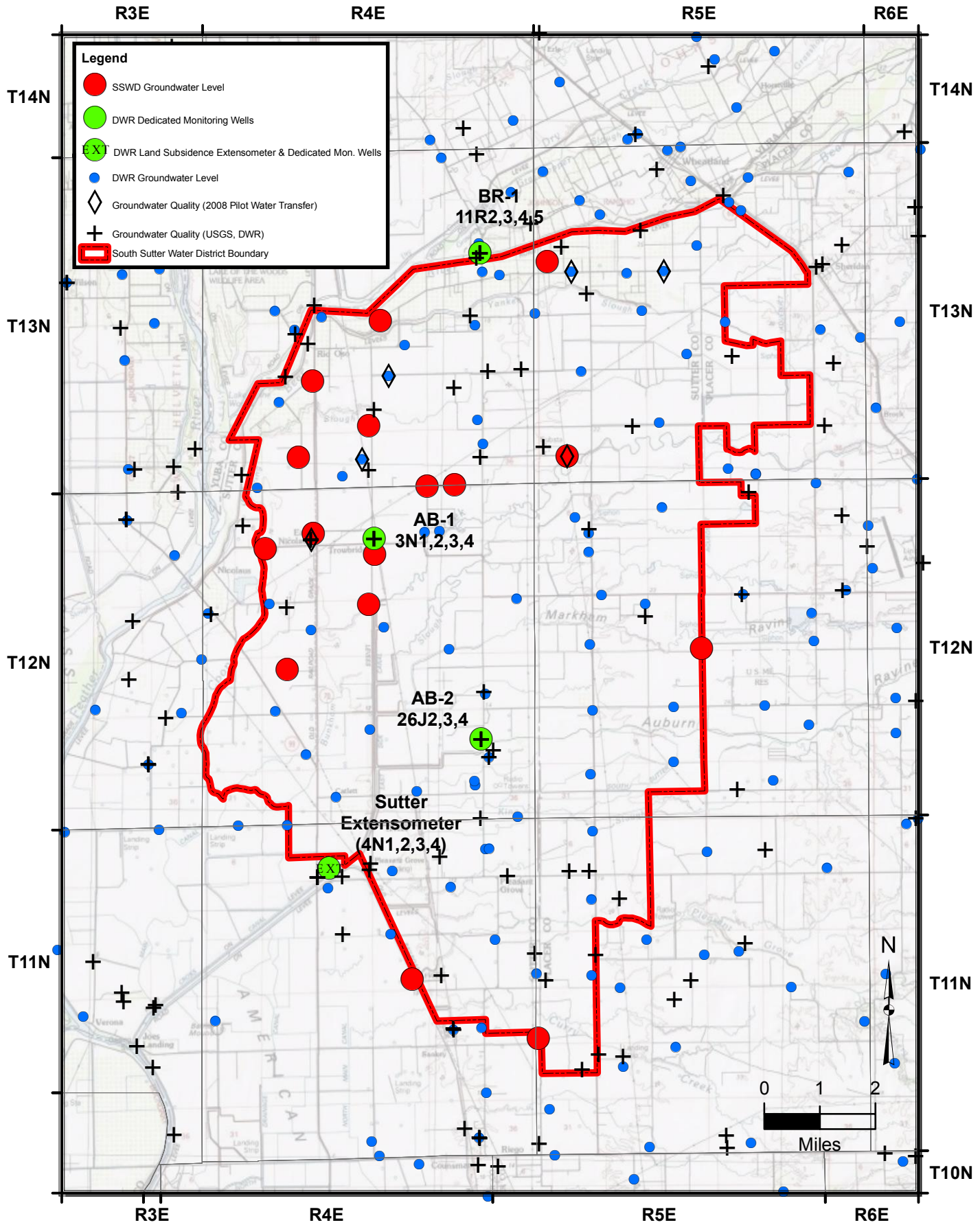

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Figure 18
Groundwater Monitoring Network
South Sutter Water District

40 of which are located within the District's boundary. That monitoring includes four dedicated multiple completion monitoring wells within and in close proximity to the District boundary (AB-1, AB-2, Sutter Extensometer, and BR-1), which provide groundwater levels on a more frequent basis. The publicly available DWR groundwater level data vary in frequency, ranging from semi-annual measurements to monthly measurements, to fifteen minute measurements in some wells. The District uses a combination of its monitoring data and groundwater level data recorded by DWR to interpret groundwater level conditions in the District.

Groundwater Quality

Some groundwater quality data is maintained by the U.S. Geological Survey, but there is no regular groundwater quality monitoring program in the District. The District participated in two recent water transfers in 2008 and 2009, which resulted in a cooperative monitoring effort by the District and DWR, and included measurements of groundwater quality field parameters in five wells, as well as laboratory analysis of one sampled well for general minerals and some heavy metals. Future opportunities for water transfers will be considered by the District; and associated groundwater quality monitoring will consider the adequacy of the 2008 and 2009 monitoring program, and continue or revise it as appropriate. The publicly available groundwater quality data will be complemented by an effort of monitoring for indicator parameters (e.g. pH, EC) in order to track groundwater quality in selected wells and on a frequency to be determined by the District. Implementation of this Plan is intended to develop a regular groundwater quality monitoring plan different than what might be required during water transfer years.

Groundwater Pumping

As part of its annual allocation of available surface water, the District receives estimates of planted acreage and specific crops from landowners prior to the irrigation season. Based on those acreage estimates and applied water duties for various crops, the District estimates total water requirements, and then allocates surface water deliveries by dividing the total available surface water supply by the total applied water demand. In order to estimate groundwater pumping within the District following an irrigation season, the total measured surface water deliveries at the main canal are subtracted from the applied water use demand. While this residual reflects estimated pumping by growers eligible for surface water deliveries, it does not include or reflect pumping by others who do not receive surface water from the District. Thus, part of this Plan is to incorporate an effort to estimate District-wide groundwater pumping, to track it over time, and to incorporate it in analyses of overall groundwater conditions as described in other elements of this overall Plan.

Land Subsidence

Land subsidence is continuously monitored by DWR at the Sutter Extensometer, located at the southwest corner of the District. This data is maintained in the DWR Water Data Library and will continue to be used to assess any local subsidence, as well as the potential for land subsidence in the District.

Although the District does not currently have an ongoing groundwater quality monitoring program and has not historically estimated District-wide pumping, the available data are sufficient to generally describe basin conditions. Continuation and potential expansion of groundwater level and groundwater quality data collection, continuation of land subsidence data collection, and initiation of an effort to estimate all groundwater pumping are key to accomplishing all of the goals in this management plan. Monitored groundwater levels and quality, estimated pumping, and subsidence data will be organized into a computerized data base for the entire District and, collectively, will be the bases for defining basin conditions and developing operational protocols that allow conjunctive use to support ongoing groundwater supply while avoiding undesirable conditions such as chronically depressed groundwater levels, degraded groundwater quality, and inelastic subsidence. Thus, the first element of this Plan is to develop and implement a groundwater monitoring program that is comprised of a network of wells, such as illustrated in Figure 18, with subsets of the entire network for groundwater level and groundwater quality monitoring. This data will be complemented by ongoing subsidence monitoring at the Sutter Extensometer, and by annual estimates of groundwater pumping. The frequencies and types of groundwater data collection will vary as a function of specific monitoring objectives in various parts of the basin.

Element 2 – Monitoring and Management of Surface Water Storage, Flows, and Quality

Groundwater is readily recharged by a combination of precipitation, natural surface water flows, and return flow from applied agricultural irrigation, as well as subsurface inflow from other areas. The District owns and operates the Camp Far West Reservoir and the Camp Far West Diversion Dam. A storage analysis was performed most recently for the District in 2009 to determine the storage capacity of Camp Far West based on aerial and bathymetric surveys. The District uses the results to calculate volumes of storage based on water elevation in the reservoir. The District also measures surface water at the Camp Far West Diversion Dam, fish flow bypass structure, the CFWID North Canal, the Main Canal, and several other stream channels on the east side of the District, which collectively represent the surface water deliveries to the District service area.

The USGS measures surface water flow on the Bear River at USGS Gage 11423800, Bear River Fish Release, and at USGS Gage 11424000, Bear River Near Wheatland, both sites located below Camp Far West Reservoir and Diversion Dam. DWR also maintains a stream flow gage at Pleasant Grove Road (BPG) along the Bear River. Historic water quality data is also available at one of the Bear River gages (USGS 11424000).

Ongoing monitoring of surface water storage and flows are generally considered to be sufficient for this element, but the flows in concert with surface water and groundwater quality data will be essential to incorporating surface water considerations into management of the underlying aquifer system. Therefore, monitoring of surface water quality will also be part of this Plan, and the resultant data will be incorporated into the database for analysis and understanding of interrelated groundwater effects on surface water. Implementation of this Plan element will be important to accomplishment of the fourth management objective for the Plan area.

Element 3 – Determination of Basin Yield and Avoidance of Overdraft

In order to accomplish all the goals for the basin, it will be essential to determine what yield can be developed on both a regular and an intermittent, i.e. dry period, basis. Such a determination of basin yield will be made to accomplish the main objective of operating within that yield and thus avoid overdraft.

On a long-term basis, since the implementation of the Camp Far West project in the 1960s, there has not been any widespread, steady degradation of groundwater conditions that might be indicative of overdraft, i.e. decrease in groundwater levels or storage as a result of pumping in excess of the yield of the basin. There have been, and continue to be, short-term fluctuations in groundwater levels that are basically related to variations in local hydrological conditions, and reflective of alternating increases and decreases in groundwater storage in response to wet and dry conditions (and associated fluctuations in recharge and pumping). Such fluctuations are typical of groundwater basin conditions in any conjunctive use setting; groundwater is utilized from storage during dry years, or dry periods, and that storage is replenished during subsequent wet years, or periods. The observation of these historical groundwater conditions, in combination with knowledge of water requirements and surface water availability, has led to current operational practices as well as general expectations regarding the approximate yield of the local groundwater system.

While historical operating experience, complemented by observed groundwater conditions, will remain an appropriate basis for generally planning for available groundwater supplies, it is possible to more precisely analyze the basin to determine values or ranges of yield under varying hydrologic conditions, and to assess the impacts of various management actions that might be implemented in the basin. The ultimate intent of this Plan element is to develop an

understanding and quantification of the yield of the basin, under varying hydrologic conditions and developing local cultural conditions, so that groundwater development and use can be managed in such a way to meet an appropriate fraction of total water demand while avoiding levels of groundwater use that would result in overdraft conditions. Thus, implementation of this Plan element is essential to accomplishing the first and second management objectives (goals) for the basin.

Element 4 – Development of Regular and Dry Year Water Supplies

A major consideration in this Plan will be accomplishing this element in concert with Element 3, i.e. development of both regular and dry year groundwater supply within the yield of the basin in order to avoid overdraft. Toward that goal, the monitoring described in Elements 1 and 2 will be interpreted in Element 3 to understand basin response to variations in the amounts and distribution of pumping throughout the District. The result will facilitate ongoing distribution of supplemental surface water, as well as planning for additional supplemental water supplies, and potentially planning for the addition of proactive recharge activities to augment basin yield as necessary to meet groundwater supply requirements. Thus, implementation of this Plan element, within the confines of Element 3, will be essential to accomplishment of the first management objective (goal) for the basin.

Element 5 – Continuation and Potential Expansion of Conjunctive Use

Beginning with the initial deliveries of surface water from the Camp Far West Project in the 1960s, the District and individual groundwater pumpers have collectively been practicing the conjunctive use of surface water and local groundwater. Conjunctive use in this setting has consisted of directly meeting water demands with a combination of supplemental surface water and local groundwater; surface water has not been separately dedicated, for example, to artificial groundwater recharge. Groundwater pumping has remained within a range that has not caused any evidence of overdraft, or associated undesirable impacts, and has fluctuated within that range to meet a varying fraction of total water requirements, for example a larger fraction of water demand during periods of reduced surface water availability, such as in 1976-77 and at the end of the 1987-1992 drought and for several years immediately thereafter.

Conjunctive use of local groundwater and conserved surface water will continue to be a key element in meeting all of the goals for the basin, most notably continued utilization of groundwater for water supply without overdrafting the basin. Historical experience with groundwater pumping and aquifer response to varying hydrologic conditions has shown that the groundwater basin can support variations in pumping during wet and dry periods, but it could not support continuous pumping at rates high enough to meet the total local water demands that preceded the deliveries of supplemental water from the Camp Far West Project.

As part of conjunctively using surface water and groundwater, it is recognized that there will continue to be variations in the amount of available surface water supply from year to year. Similarly, there are expected to be variations in local groundwater conditions as a function of local hydrologic conditions which affect, among other things, the natural recharge to the groundwater basin from year to year. Thus, conjunctive use management is necessary to ensure that the groundwater basin is maintained to be a regular component of water supply and to also provide a larger component of water supply during dry periods that affect supplemental surface water availability. Conjunctive use management is similarly important to ensure that local groundwater can be replenished, via reduced pumping and/or as a result of wetter local hydrologic conditions, during periods of wet/normal surface water availability. One possibility that is evident from the historic success of ongoing conjunctive use and awareness of potentially larger water requirements in the overall District area, and also evident from a successful initial participation in a water transfer in 2008, would be the potential expansion of conjunctive use for irrigation or other water supply, or for direct groundwater recharge in wet years, or for participation in other water supply programs, e.g. Drought Water Bank or other transfers, that would not be detrimental to in-District requirements. Implementation of this Plan Element is intended to consider that potential for expansion of ongoing conjunctive use. Overall, continued utilization of surface water in conjunction with local groundwater is essential to the management of groundwater for water supply without overdrafting that resource; thus, implementation of this Plan element will be essential to accomplishing all the management objectives (goals) for the basin.

Element 6 – Development and Continuation of Federal, State, and Local Agency Relationships

The District has a working relationship with DWR for coordinated groundwater monitoring in the Plan area. The District cooperated with DWR in its study of the "Feasibility Report, American Basin Conjunctive Use Project." More recently, the District participated in two water transfers through DWR to various State Water Contractor Agencies (SWRCB Corrected Order 2008-0039-DWR) in 2008 and again in 2009. The water transfer projects resulted in increased monitoring of groundwater levels and quality to serve as a basis for interpreting groundwater response to increased pumping during times of surface water transfer. This Plan envisions continued cooperation with DWR on programs of that type.

The District maintains a relationship with the State Water Resources Control Board, which involves an ongoing Settlement Agreement requiring the release of surface water into the Bear River during dry and critical years for in-stream beneficial uses within the Delta. The Settlement Agreement, and the subsequent SWRCB Order 2000-10 identify that there is a less than significant impact to export supplies available to State and Federal Contractors as a result of the

Settlement Agreement and associated increased groundwater pumping. The District worked cooperatively with DWR and the SWRCB to provide the necessary data and materials and will continue to do so.

The District maintains relations with nearby local irrigation districts, including Camp Far West Irrigation District and Nevada Irrigation District. The District is working with the Federal Energy and Regulatory Commission (FERC) for relicensing of the Camp Far West Dam.

This Plan element is primarily included to formalize the historical local and state agency working relationships as part of comprehensively managing local groundwater, in concert with currently developed supplemental surface water, and possibly with expanded surface water supplies, to accomplish all the management objectives (goals) for the Plan area.

The District will work with other State and Federal regulatory agencies when appropriate to protect the groundwater basin and achieve broader local and regional benefits. The District will expect to review land use plans and coordinate with land use planning agencies to assess activities which create a reasonable risk of groundwater impacts or contamination.

Element 7 – Public Education and Water Conservation Programs

As part of its conjunctive use operations, the District obtains land use and cropping plans from landowners who receive surface water from the District each year. The obtained data are utilized to estimate water requirements and to allocate supplemental surface water deliveries to maintain groundwater conditions. Part of that allocation effort includes public education about the extent and availability of supplemental surface water supplies.

In addition, the District continues to maximize the beneficial use of water, both groundwater and surface water, by implementing numerous water conservation efforts including, but not limited to improving conveyance canal control structures, recirculation of tailwater, limiting outflow from the District boundaries, and educational tools for District staff and its landowners. District staff works closely with landowners to provide water use efficiency information techniques and technologies. The District's landowners have implemented numerous individual water conservation efforts including, but not limited to land leveling, irrigation scheduling techniques and technologies, soil moisture monitoring, varietal changes, crop shifts, drainage improvements, reduced spill from rice fields, and minimum tillage techniques. All of these efforts contribute to improved water conservation efforts and improved water use efficiency of groundwater and surface water supplies throughout the District's service area.

This Plan Element is included to reflect a direction toward continued conservation and water use efficiency efforts in this conjunctive use system. This Plan Element also includes the

opportunity for expanded public education regarding groundwater and surface water conditions, relative to agriculture water demand and the management goal to avoid overdraft and any related undesirable effects.

Element 8 – Well Construction, Abandonment and Destruction Policies

Well construction permitting in the basin is administered by the Sutter and Placer County Health Departments, which effectively implement the State Well Standards for water wells and monitoring wells. Permitting of municipal supply wells is also within the purview of the State Department of Public Health. One goal of this Management Plan, protection and preservation of groundwater quality, requires that all wells be properly constructed and maintained during their operational lives, and properly destroyed after their useful lives, so that they do not adversely affect groundwater quality by, for example, serving as conduits for movement of contaminants from the ground surface and/or from a poor quality aquifer to one of good quality. Toward that end, this element is included in the overall Plan to support well construction and destruction policies, and to participate in their implementation in the Plan area, particularly with regard to surface and inter-aquifer well sealing and proper well destruction, which are critical in the management of an aquifer system that has some connection with the Bear River and possibly other surface waters.

Element 9 – Management and Protection of Recharge Areas and Wellhead Protection Areas

Aquifers beneath the Plan area are recharged by precipitation, streamflow, applied irrigation water, and subsurface inflow from other areas. Land use in the area has historically been primarily agricultural.

Groundwater management activities will continue to generally monitor land uses and associated impacts on groundwater recharge, potentially leading to participation in land use planning to protect critical recharge areas. Similarly, wellhead protection areas within which pumping of individual wells directly affects groundwater flow towards those wells will be analyzed and mapped as appropriate, with the intent to protect them if necessary. This is not expected to be of major importance in light of prevailing good groundwater quality and as local groundwater use continues to be primarily for irrigation supply.

Implementation of this Plan element is expected to contribute to accomplishment of the first three management objectives (goals) for the Plan Area.

Element 10 – Provisions to Update the Groundwater Management Plan

The elements of this local area Groundwater Management Plan reflect the current understanding of the occurrence of groundwater in the overall District area. The management components are designed to achieve certain goals to protect and preserve groundwater quantity and quality for overlying beneficial use into the foreseeable future. At the same time, the management components of this Plan are intended to create an opportunity for development of additional local groundwater, and to conjunctively utilize it with the historical surface water supplies available to the area. The planned conjunctive use of surface water and groundwater is also intended to create opportunities for transfer of surplus water, either locally or otherwise, to contribute toward solution of nearby or other water supply problems.

Ultimately, however, it is also recognized that, while the Groundwater Management Plan provides a framework for present and future actions, new data will be developed as a result of implementing the Plan. That new data could define conditions which will require modifications to currently definable management actions. As a result, this Plan is intended to be a flexible document which can be updated to modify existing components and/or incorporate new components as appropriate in order to recognize and respond to future groundwater conditions and to address changing management objectives as they evolve in the Plan area.

5. References

California Department of Water Resources (DWR), 1997. *Feasibility Report, American Basin Conjunctive Use Project*. Sacramento, CA.

California Department of Water Resources (DWR), 2006. *Sacramento Valley Groundwater Basin, North American Subbasin, Bulletin 118*. Sacramento, CA.

Central Valley Regional Water Quality Control Board (CVRWQCB). 2008. *A Compilation of Water Quality Goals*.

Central Valley Regional Water Quality Control Board (CVRWQCB). 2007. *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region, Fourth Edition, Revised October 2007 (with Approved Amendments), The Sacramento River Basin & The San Joaquin River Basin, California Regional Water Quality Control Board Central Valley Region.* http://www.swrcb.ca.gov/rwqcb5/water_issues/basin_plans/ (accessed 10/2008).

Fogelman, R., 1983. *Ground-water Quality in the Sacramento Valley – Water Types and Potential Nitrate and Boron Problem Areas*. USGS Hydrologic Investigations Atlas HA-651. Reston, VA.

Moran J. E**.,** G. B. Hudson, G. F. Eaton, and R. Leif, 2003. *A Contamination Vulnerability Assessment for the Sacramento Area Groundwater Basin,* Lawrence Livermore National Laboratory internal report, UCRL-TR-203258, Livermore, CA.

Murray, Burns & Kienlen (MBK), 1970. *Groundwater Conditions, South Sutter Water District*. Sacramento, CA.

Murray, Burns & Kienlen (MBK), 1994. *South Sutter Water District, Groundwater Conditions 1970-1993*. Sacramento, CA.

Planert, M. & Williams, J.S. *Ground Water Atlas of the United States – Segment 1 California Nevada*. http://ca.water.usgs.gov/groundwater/gwatlas/valley/quality.htm accessed 3/18/2009.

Appendix G

Water Measurement Certification Program

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Introduction

South Sutter Water District (District or SSWD) developed a Water Measurement Certification Program in 2012 in accordance with the requirements of the Agricultural Water Measurement Regulation, Water Code Section 10608.48. The District's Water Measurement Certification Program was submitted with the Progress Report Addendum to the District's 2003 Agricultural Water Management Plan (AWMP) along with additional items to meet the requirements of Water Code Section 10826. As a result of recent dry hydrological conditions, and limited availability of surface water for delivery, SSWD was unable to proceed with the schedule previously identified to certify the accuracy of the measurement devices currently in place throughout the District. This revised Water Measurement Certification Program updates the procedures, schedule and budget to certify the accuracy of the measurement devices and comply with Section.

Existing Measurement Program

SSWD measures and records deliveries to each customer using standardized flow measurement devices. SSWD believes the current flow measurement devices are within the required accuracy level for existing devices, ±12% by volume. All deliveries within the SSWD service area are measured by McCrometer propeller meters. McCrometer propeller meters are laboratory certified to be accurate to within ±2% of the true flow rate.

There are 382 turnouts within the District. The number of devices that are installed continuously versus daily depends on conditions within SSWD, which vary by season.

Although SSWD uses propeller meters to measure deliveries at all turnout locations, the volumes delivered are determined in two ways depending upon conditions at the turnout.

Condition 1 – Continuous Velocity Reading

The majority of turnouts in SSWD are measured by continuously installed propeller meters. These devices measure velocities and are factory calibrated for the size of the pipe to provide the flow rate and volume based on the measured velocities. The volume from the propeller meter

totalizer is read and recorded periodically by the District and the landowner is charged for the volume of water delivered.

Condition 2 – Instantaneous Velocity Reading

There are some areas of the District that are subject to debris that can interfere and clog propeller meters. Not only can this damage the meter, but it can also cause delivery interruptions and affect the accuracy of the measurements. In order to meet delivery obligations at these locations, the District uses propeller meters to set the gate opening to provide the flow rate requested by the landowner. The flow rate and gate openings are checked daily, or more frequently, if changes to the quantity of delivery is requested, to obtain an instantaneous flow rate and verify that the quantity of water ordered by the landowner is being delivered. The instantaneous flow rates are averaged to calculate the volume delivered at the turnout each day.

Certification of Existing Measurement Devices

SSWD intends to certify the accuracy of its existing measurement devices in accordance with CCR §597.4(a)(1)(A), using field-testing and analysis completed on a random and statistically representative sample of existing measurement devices. The field-testing and analysis protocols will be performed according to the manufacturer's recommendations, design specifications, or industry recognized standards. All field testing will be conducted by individuals trained in the use of the field testing equipment and will be documented in a report approved by an engineer. Two certification methods will be used to determine if the existing propeller meters meet the requirements of CCR §597.4(a)(1)(A), as further described below.

Certification Method No. 1

Devices that remain in place throughout the delivery season and continuously record volumes with an integrated totalizer provide a volumetric measurement. A SonTek Flow Tracker or similar device will be used to verify the flow rates indicated by the propeller meters. In addition, the volumes delivered will be verified by monitoring the flow rate over a specified period of time and the resulting calculated volume will be compared with the volume recorded by the totalizer.

Certification Method No. 2

Propeller meters placed in the turnout daily to measure an instantaneous flow rate do not measure volume of water delivered. Instead, the instantaneous flow rate is averaged over the period between measurements to calculate the volume delivered. Due to the fact the volume of water delivered is calculated, all measurement and conversion errors must be combined with the device errors to determine the volumetric error of each device. As with the permanent devices, a SonTek Flow Tracker, or similar device, will be used to verify the flow rates indicated by the propeller meters. In addition, water levels will be recorded within the canals to monitor variations in water level throughout the day and the irrigation season. This information will be used in the determination of the accuracy of the volume delivered at each locations. The certification process will evaluate all of the applicable errors and mathematically combine them to determine if each flow measurement device complies with CCR §597.3(a)(1).

Operation and Maintenance Protocols

In addition to verifying that the existing measurement devices meet the accuracy standards required under CCR §597, the certification process will include review of installation, operation and maintenance protocols to confirm the existing devices are installed and maintained to industry approved standards or manufacture's specifications. Field data collection, quality control and assurance procedures will be reviewed and documented in the report approved by an engineer.

Schedule

As previously identified, due to the on-going drought conditions and the resulting reduction in available surface water supplies (and deliveries) to the District was unable to implement the certification program described in its 2012 AWMP. The District estimates the cost to develop and implement the certification program described above and to prepare the report required pursuant to CCR §597 to be $110,000. SSWD intends to fully implement the certification program prior to the District's next Agricultural Water Management Plan cycle (2020). Table 1 provides the revised schedule for implementation and budget for the certification of the District's meters.

Table 1. Schedule and budget for measurement certification program.

	Year 1	Year 2	Year 3	Year 4
Activities	Develop Plan	-	-	Develop and Implement Corrective Action Plan (if necessary)
	Begin Field Testing	Continue Field Testing	Complete Field Testing	
	-	-	Compile Report	
Budget	$50,000	$46,000	$14,000	TBD

Total Budget for Measurement Certification Program: $110,000

Corrective Action Plan

As identified above, SSWD believes its existing measurement devices meet the accuracy requirements of CCR §597. A plan for corrective action will be developed following completion of the certification program if existing measurement devices are not in compliance. If a corrective action plan is needed, the District will revise the schedule and budget identified above to comply with CCR §597.