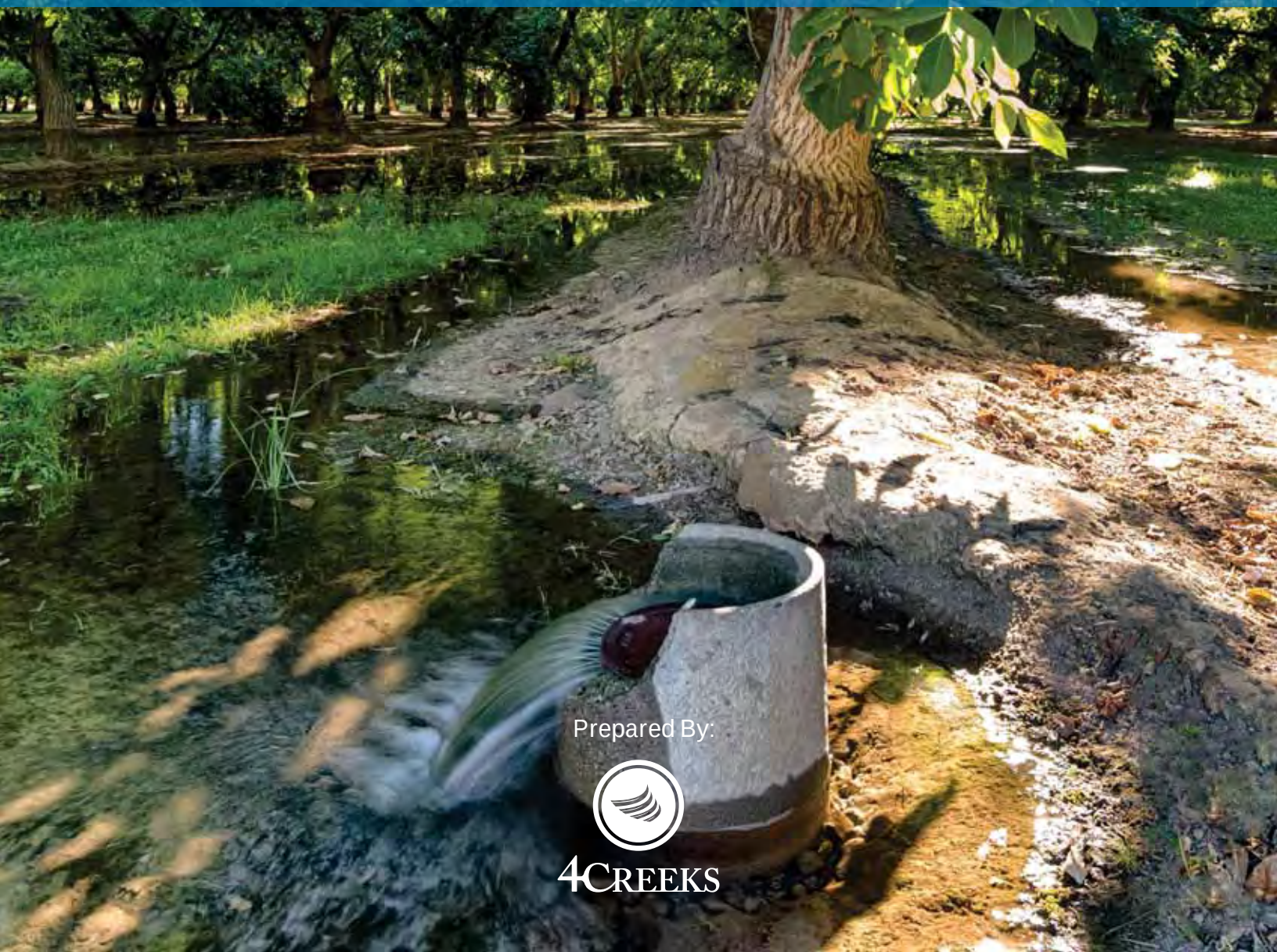
TULE BASIN WATER QUALITY COALITION

2904 W. Main Street, Visalia, CA 93291 • (559) 627-2948 • www.tbwqc.com

Groundwater Assessment Report

February 4, 2014



Prepared By:

4CREEKS

GROUNDWATER QUALITY ASSESSMENT REPORT

Prepared For:

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CERTIFICATION:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

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EXECUTIVE SUMMARY

I. GENERAL

The Tule Basin Water Quality Coalition (TBWQC), representing growers (Members) within the Tule River, Deer Creek, and White River service areas, has prepared a Groundwater Quality Assessment Report (GAR) as required by the California Regional Water Quality Control Board, Central Valley Region, Waste Discharge Requirements General Order R5-2013-0120 (General Order).

The objectives of the GAR are to provide an assessment of all available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation; establish priorities for implementation of monitoring and studies within high vulnerability areas; provide a basis for establishing work plans to assess groundwater quality trends; provide a basis for establishing work plans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality; and, provide a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.

The GAR provides a background of the TBWQC area, including the physical, geological, and hydrological conditions, with a summary of the existing water quality data available to establish a basis for identification of vulnerable groundwater areas.

Surface water and groundwater within TBWQC area are supplied from the Tule River, White River, and Deer Creeks watersheds along with imported supplemental surface water from the Central Valley Project. Watercourses of the Tule River, Deer Creek and White River are the major drainages in the Tule Subbasin, all of which flow westerly toward the Tulare Lakebed. The average annual runoff of the Tule River at Success Reservoir is about 140,000 acre-feet. The average annual runoff of the Deer Creek at Fountain Springs is about 22,000 acre-feet. The average annual runoff for water years 1972 through 2000, based on a USGS gauging station, for White River near Ducor was 7,400 acre-feet.

The climate of the region is semi-arid with mild winters and hot, dry summers. The average annual rainfall within the service area of the Tule Subbasin is approximately 9-inches. The eastern edge of the basin along the foothills experiences higher levels of rainfall, while the western edge of the basin is typically more arid and dry. The average annual precipitation in the Tule River watershed above Success Reservoir is 31-inches. Precipitation usually occurs from November to May. Snow typically melts during the spring months of April through June. From May through November, the area generally experiences dry summers when little rain occurs.

Thirteen developed communities are located within the TBWQC area, all of which are disadvantaged communities or within disadvantaged unincorporated communities.

Of almost 600,000-acres within the TBWQC boundary, about 364,000-acres are used for irrigated agriculture based on 2007 data from the California Department of Water Resources. Approximately 48% of the irrigated agricultural land within the Tulare Lake Hydrologic Region are irrigated by gravity flow and the remaining 52% by other methods such as sprinkler and low volume methods (e.g., drip irrigation).

II. HYDROGEOLOGY

Hydrogeology of the TBWQC area includes relatively impermeable crystalline rocks of the Sierra Nevada Mountain Range along the eastern one-third and permeable valley fill deposits along the western two-thirds. The Tule Subbasin is composed primarily of unconfined aquifers, however,

confined conditions may be encountered along the western one-third of the Subbasin. Groundwater typically flows westerly from the foothills toward the Tulare Lakebed. The relatively thin upper deposits (less than 1,500-feet thick) beneath the valley floor contain most of the fresh groundwater that is pumped for drinking and irrigation. These deposits are a heterogeneous mix of anastomosing gravel, sand, silt and clay layers. Clay lenses form confined groundwater conditions within the valley and partially beneath the TBWQC area; one of which is the E-Clay within the Tulare Formation.

Groundwater recharge is from river and stream seepage, underflow from permeable deposits bordering the valley, percolation from irrigation and ponding basins, and surface water in lieu of groundwater pumping. The trend in depth to groundwater indicates groundwater depths are increasing over time with concurrent depletion in aquifer storage.

Trend analyses of nitrate and electrical conductivity indicate both are increasing over time within the TBWQC area.

II. SCOPE

The intent of this study is to analyze and establish an approximate area of high vulnerability of groundwater quality. The process and methodology used to assess the high vulnerability area within the TBWQC area included a literature review of previous geologic and hydrogeologic studies as well as data compilation and analysis of available groundwater quality information.

To prepare a final high vulnerability area within the TBWQC boundary, groundwater vulnerability elements including irrigated lands, location of surface and subsurface geologic deposits, relative permeability of surface and subsurface deposits, and existing groundwater wells with nitrate and EC in exceedance of maximum contaminant levels. From the combined high vulnerability areas, a final compilation high vulnerability area map was prepared covering those areas that are currently high priority and require further assessment. A total of 404,158-acres is within the initial TBWQC high vulnerability area.

It is anticipated that future groundwater monitoring in the TBWQC area will refine the analysis taking into account variables such as growers' best management practices, groundwater statistical analyses, field investigations, and laboratory analyses of groundwater and/or soil properties. Better refinement over time with reliable quality controlled field and laboratory methods and data analysis will help create a more detailed and accurate model of the TBWQC area. Future updates to the GAR will include more accurate and consistent data with the goal of creating a more refined dynamic analysis of the high vulnerability area.

I. INTRODUCTION

The Tule Basin Water Quality Coalition (*TBWQC*), representing growers (*Members*) within the Tule River, Deer Creek, and White River service areas, has prepared a Groundwater Quality Assessment Report (*GAR*) as required by the California Regional Water Quality Control Board, Central Valley Region, Waste Discharge Requirements General Order R5-2013-0120 (*General Order*).

The purpose of the GAR is to provide the technical basis for the scope and level of effort for implementation of the General Order's groundwater monitoring and implementation provisions. The TBWQC will review and update the GAR to incorporate new information and data at a minimum every five (*5*) years after Executive Officer approval of the GAR.

The main objectives of the GAR are to:

- Provide an assessment of all available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation;
- Establish priorities for implementation of monitoring and studies within high vulnerability areas;
- Provide a basis for establishing workplans to assess groundwater quality trends;
- Provide a basis for establishing workplans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality; and,
- Provide a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.

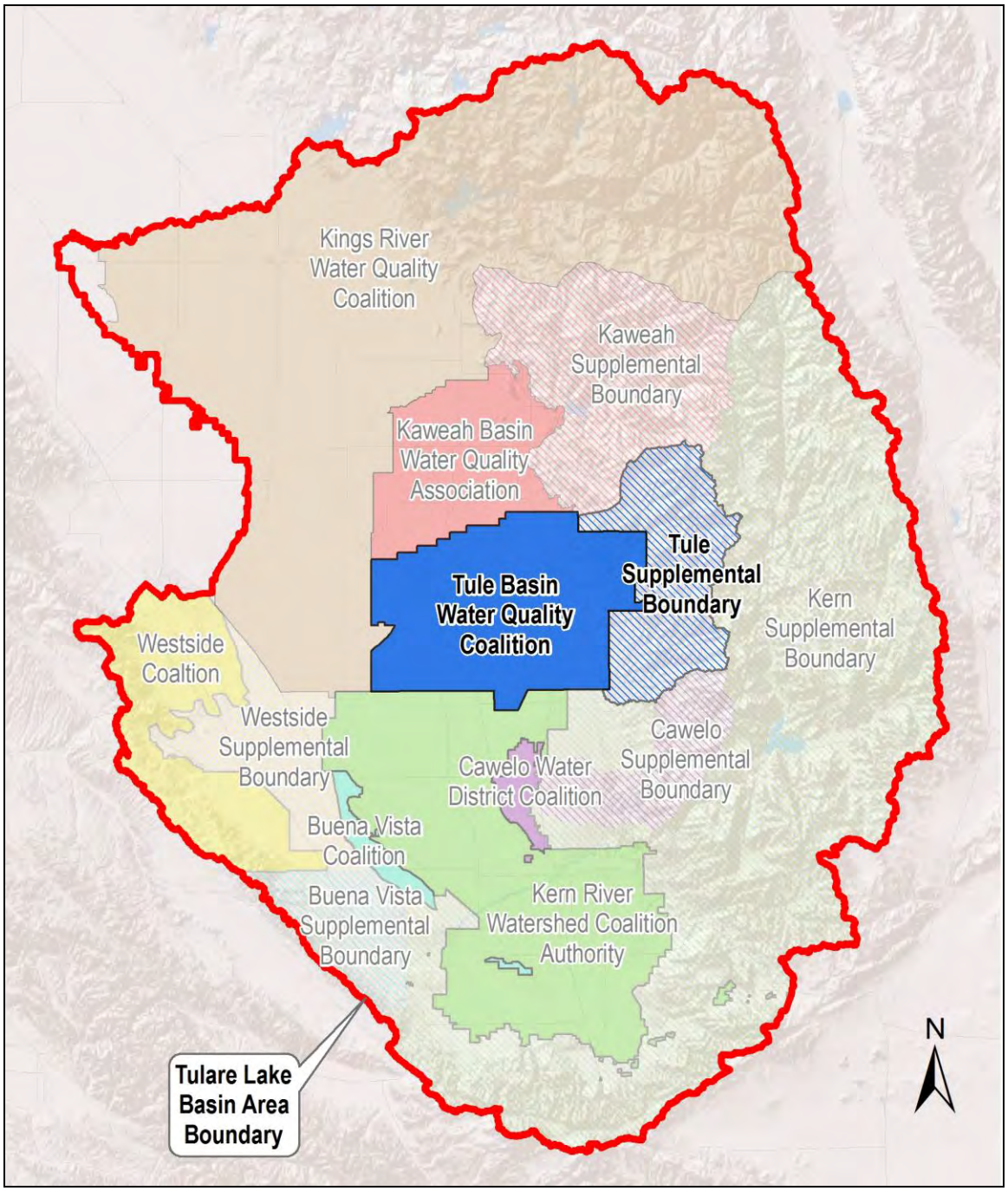
This report provides a background within the TBWQC area, including the physical, geologic, and hydrologic conditions, along with a summary of the existing water quality data available to establish a basis for identification of vulnerable groundwater areas.

To meet the requirements of the General Order, this GAR is being prepared by a California Licensed Professional Geologist and Professional Civil Engineers.

A. Tule Basin Water Quality Coalition

The TBWQC was accepted by the Regional Water Quality Control Board (*RWQCB*) as a Third Party to implement the requirements of the General Order on February 4, 2014. The TBWQC is located within the southern portion of Tulare County and within a small portion of northern Kern County, all within the Tulare Lake Basin. The TBWQC covers approximately 599,880-acres within the watersheds of the natural water courses of Tule River, Deer Creek, and White River and contains approximately 365,680-acres of irrigated agriculture, including the dairies, of the Tulare Lake Basin. The TBWQC also provides coverage for growers within an additional supplemental area of the three upper watersheds covering approximately 342,346-acres. The supplemental area includes minimal irrigated agriculture and is predominantly covered by the Sequoia National Forest and the Tule River Indian Reservation. **FIGURE 1: TULARE LAKE BASIN AND TULE BASIN WATER QUALITY COALITION BOUNDARIES**

FIGURE 1: TULARE LAKE BASIN AND TULE BASIN WATER QUALITY COALITION BOUNDARIES



As of January 31, 2015, there were 4,944 registered parcels within the TBWQC boundary totaling 240,828 acres with 222,976 irrigated acres (**ATTACHMENT A: CURRENT MEMBER PARCELS 2014 - 2015**). **APPENDIX A** includes a tabulation of the current registered member parcels that are in good standing within the TBWQC area.

II. PHYSICAL SETTING

A. Location

The TBWQC area covers a portion of the Tulare Lake Basin of about 733-square miles (**FIGURE 2**). The Tule Basin is bounded on the west by the Kings County line. This boundary is shared with the Tulare Lake Groundwater Subbasin. The northern boundary of the TBWQC follows the northern boundaries of Lower Tule Irrigation District and Porterville Irrigation District and is shared with the Kaweah Groundwater Subbasin. The eastern boundary is at the edge of the alluvium and crystalline bedrock of the Sierra Nevada foothills, and the southern boundary is the Kern County line and is shared with the Kern Groundwater Basin.

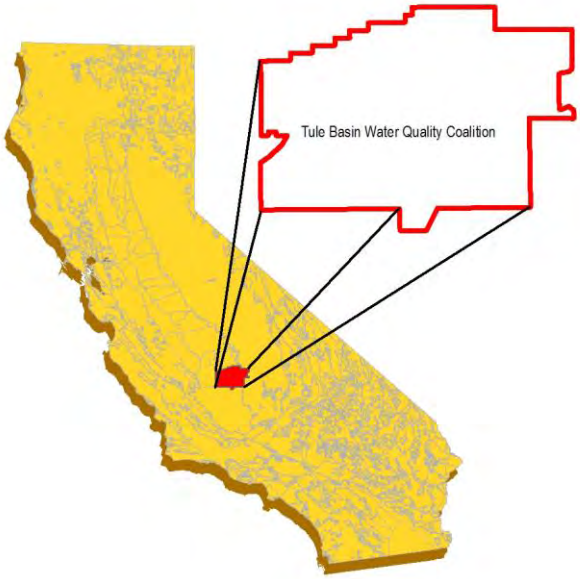


FIGURE 2

The TBWQC area covers the Tule Subbasin (Tule Basin) and a small portion of the Kern Subbasin (Kern Basin), both basins as defined by the Department of Water Resources (DWR) Bulletin 118 Groundwater Basins of the San Joaquin Valley Hydrologic Study.

B. Topography

Ground elevations range from approximately 200-feet above mean sea level in the western edge of the Basin to 2,000-feet above mean sea level in the eastern portion of the Basin. The ground surface within the Basin generally slopes to the West (**ATTACHMENT B: UNITED STATES GEOLOGICAL SURVEY QUADRANGLE MAP**).

C. Climate

The climate of the region is semi-arid with mild winters and hot, dry summers. The average annual rainfall within the service area of the Tule Subbasin is approximately 9 inches. The eastern edge of the Basin along the foothills experiences higher amounts of rainfall, while the western edge of the Basin is typically more arid and dry. The average annual precipitation in the Tule River Watershed above Success Reservoir is 31 inches. Precipitation usually occurs from November to May. Snow typically melts during the spring months of April through June. From May through November, the area generally experiences dry summers when little rain occurs.

Within the TBWQC area there are several precipitation stations, maintained and data recorded by the California Irrigation Management Information System (CIMIS) and the Department of Water

Resources (DWR). A summary of the average monthly precipitation from the stations within the TBWQC is shown in **TABLE 1: TBWQC AVERAGE PRECIPITATION**.

TABLE 1: TBWQC AVERAGE PRECIPITATION

Station Name	Success Reservoir (DWR SCC)	Porterville (CIMIS 169)	Alpaugh (CIMIS 203)	Delano (CIMIS 182)	Lindsay (DWR LND)	Angiola (DWR AGL)	Average Monthly Precipitation
Location within TBWQC	Eastern	East-Central	South Western	Southern	North Eastern	Western	
January	2.00	1.96	0.70	0.86	0.43	1.41	**1.49**
February	1.97	1.72	0.72	0.86	1.30	1.37	**1.41**
March	1.83	1.76	0.55	0.88	0.80	1.16	**1.32**
April	1.13	1.03	0.32	0.78	1.17	0.71	**0.84**
May	0.36	0.44	0.11	0.29	0.26	0.27	**0.31**
June	0.08	0.07	0.05	0.04	0.00	0.06	**0.06**
July	0.02	0.01	0.00	0.00	0.00	0.01	**0.01**
August	0.02	0.01	0.00	0.00	0.00	0.01	**0.01**
September	0.22	0.16	0.03	0.01	0.04	0.17	**0.11**
October	0.55	0.49	0.17	0.47	0.00	0.32	**0.43**
November	1.16	0.98	0.37	0.68	1.74	0.71	**0.82**
December	1.70	1.64	1.04	1.01	3.05	1.15	**1.40**
Long Term Annual Average Precipitation:	**11.05**	**10.26**	**4.07**	**5.88**	**8.79**	**7.35**	**8.01**
Long Term Data Range	1961 - 2014	1905 - 2014	2006 - 2014	2002 - 2014	1905 - 2014	1905-1985	

Note: **ATTACHMENT C: TBWQC CLIMATE AND DEMOGRAPHICS MAP** identifies the location of each Precipitation Station.

D. TBWQC Watersheds

The TBWQC area includes the watersheds of three natural watercourses: Tule River; Deer Creek; and White River. Each of these natural watersheds is described separately below:

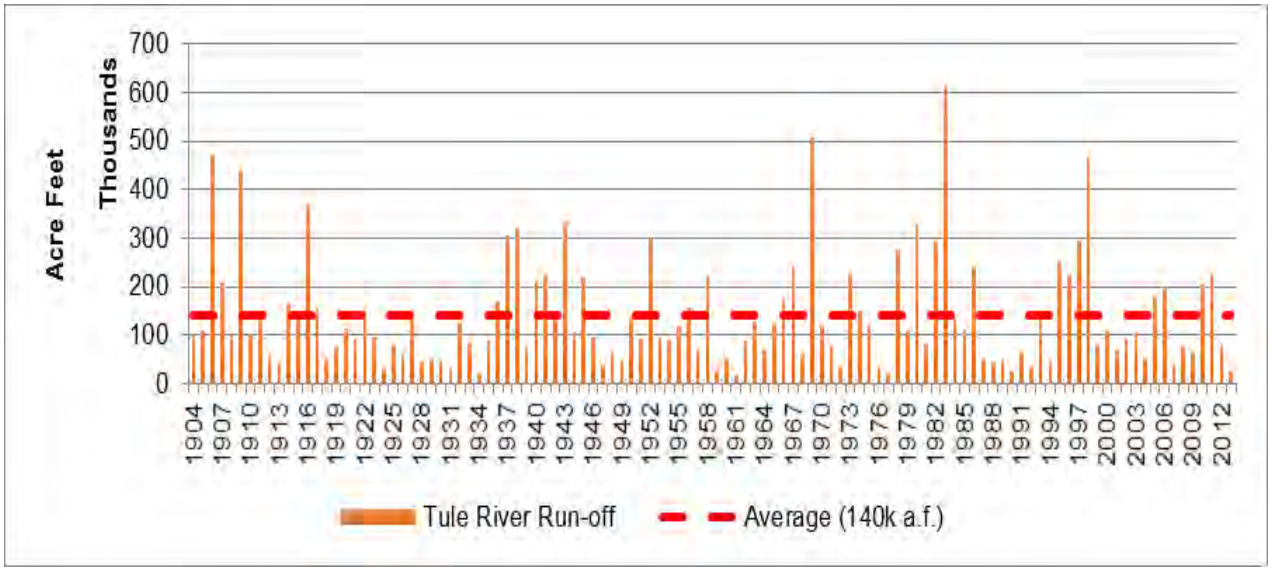
1. Tule River Basin

The Tule River is a natural watercourse with water flows generated from precipitation and snow melt from the Tule River watershed in the Sierra Nevada Mountains. Surface water flow of the Tule River into the Basin is controlled by Success Reservoir. Success Dam and Reservoir is owned and operated by the United States Army Corps of Engineers (COE). During the flood season (*November – April*), the storage in the reservoir is controlled by the Flood Control Diagram of the COE, which requires flood releases if the storage exceeds a certain level in the reservoir. Outside the flood controlled season, the Tule River natural runoff may be stored or released to satisfy the irrigation demands of the water rights holders downstream of Success Reservoir including: (1) Pioneer Water Company, (2) Lower Tule River Irrigation District; representing Poplar Irrigation Company and Woods-Central Ditch Company (3) Porterville Irrigation District; representing Hubbs-Miner Ditch Company, Porter Slough Ditch Company, and Rhodes-Fine Ditch Company (4) Vandalia Water District; representing Campbell-Moreland Ditch Company and Vandalia Ditch Company, and (5) Downstream Kaweah and Tule River Association.

Tule River is located north of Deer Creek and White River. The Tule River watershed covers approximately 392 square miles (649,600 acres) above Success Reservoir and drains a portion of the western slope of the Sierra Nevada Mountain Range. Tule River flows generally westward across the Lower San Joaquin Valley through Porterville, north of Poplar and Woodville, south of Tulare and Corcoran, and terminates in the Tulare Lakebed.

The annual surface water runoff was compiled for the Tule River at Success Reservoir from 1904 through 2013 and is set forth in **FIGURE 3: TULE RIVER ANNUAL RUNOFF AT SUCCESS RESERVOIR.** The 110 year average annual runoff of the Tule River at Success Reservoir is about 140,000 acre-feet.

FIGURE 3: TULE RIVER ANNUAL RUNOFF AT SUCCESS RESERVOIR



2. Deer Creek Basin

Deer Creek is an uncontrolled stream, wherein the runoff is seasonal based upon precipitation and snow melt from the Sierra Nevada Mountains. Temporary embankments and diversions to recharge basins along Deer Creek assist in the management of the seasonal flow. Typically, the timing of the seasonal flows does not correspond with the downstream irrigation water demands.

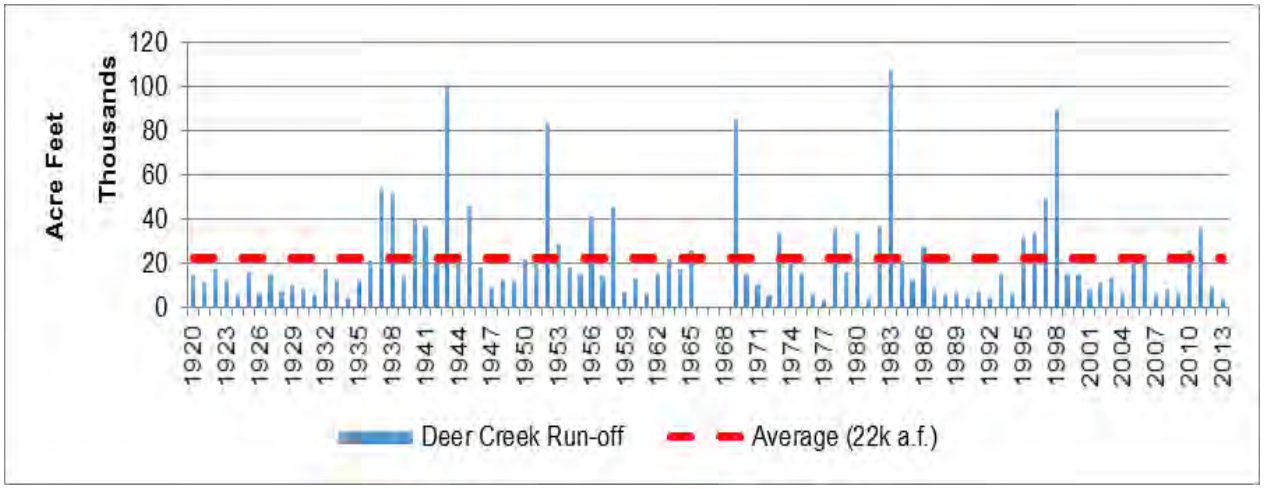
Deer Creek is located south of Tule River and North of White River. The Deer Creek watershed, 136 square miles (*87,040 acres*) above State Highway 65, drains a portion of the western slope of the Sierra Nevada Mountain Range. Deer Creek flows generally westward across the Lower San Joaquin Valley near the communities of Terra Bella and Pixley, through the Pixley Wildlife Refuge and terminates in the Homeland Canal of the Tulare Lakebed.

The watershed of Deer Creek is comprised of steep mountainous terrain covered mainly with pine and fir timber. At lower elevations, trees become scattered and brush is the predominant cover except at the foothill elevations where grass is the primary vegetation. Elevations within the Deer Creek watershed range with a maximum eastern elevation of 8,300-feet above mean sea level to a minimum western elevation of about 200-feet above mean sea level at the Homeland Canal. Irrigated agriculture within the Deer Creek Basin

commences at approximately elevation 600-feet above mean sea level and covers 137,500-acres in Tulare County of the Tule River Basin.

The annual surface water runoff was compiled for Deer Creek at Fountain Springs from 1918 through 2013 and is set forth in **FIGURE 4: DEER CREEK ANNUAL RUNOFF AT FOUNTAIN SPRINGS**. The 95 year average annual runoff of Deer Creek at Fountain Springs is about 22,000 acre-feet.

FIGURE 4: DEER CREEK ANNUAL RUNOFF AT FOUNTAIN SPRINGS



3. White River Basin

White River is an uncontrolled stream similar to Deer Creek, wherein the run-off is seasonal based upon precipitation and snow melt from the Sierra Nevada Mountains. Temporary embankments and diversions along White River have assisted in the management of the seasonal flow. Typically, the timing of the seasonal flows does not correspond with the downstream irrigation water demands.

White River is located South of Deer Creek and North of Poso Creek in Kern County. The White River watershed contains 124 square miles (*79,360 acres*) above State Highway 65 and drains a portion of the western slope of the Greenhorn Mountains, an intermediate range of the Sierra Nevada Mountains. White River courses westward through the lower San Joaquin Valley near the communities of Ducor, Earlimart, Allensworth and Alpaugh en route to the Tulare Lakebed.

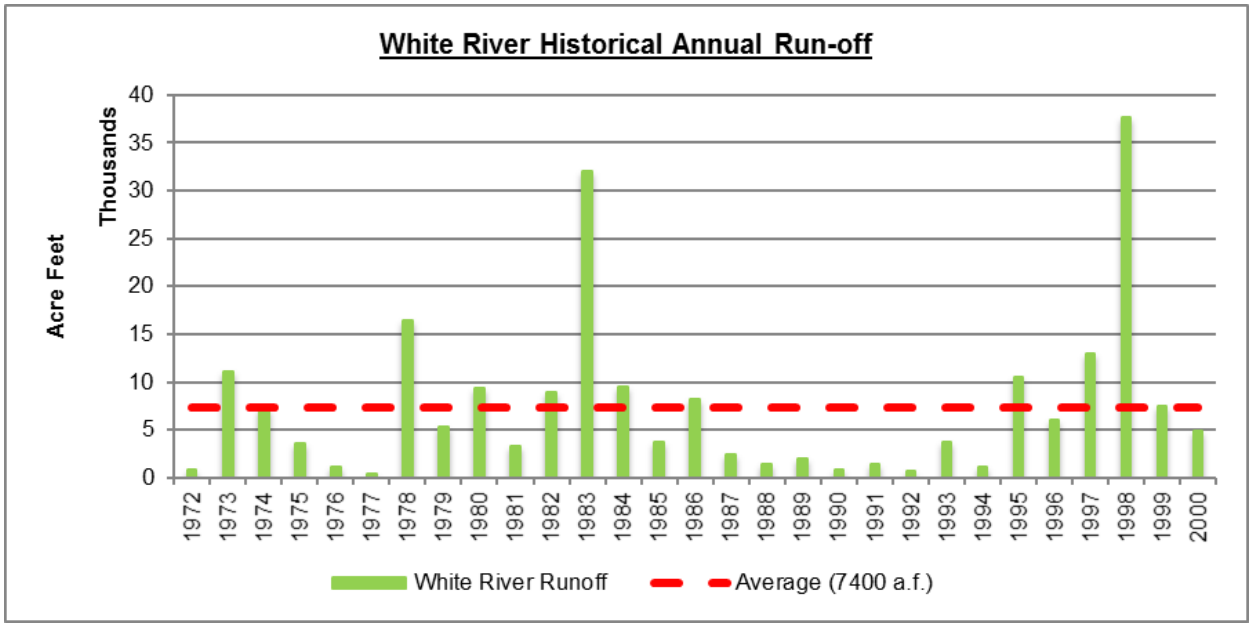
Typically, under normal conditions, the flow of White River dissipates as channel percolation and evaporation. Only during periods of extreme runoff (flood events) do flows reach the Tulare Lakebed. Flood flows that reach the Tulare Lakebed are diverted to holding cells and beneficially used for irrigation or evaporates. The Tulare Lakebed, a closed basin, does not have an outlet, and collects flood waters from numerous tributary rivers and creeks.

The White River watershed is similar to the Deer Creek watershed with a portion comprised of steep mountainous terrain covered mainly with pine and fir timber. At lower elevations scattered trees and brush are the predominant cover, except at the foothill

elevations where grass is the primary vegetation. Elevations within the White River watershed range with a maximum eastern elevation of approximately 8,300-feet above mean sea level to a minimum western elevation of about 200-feet above mean sea level at the Tulare Lakebed. Irrigated agriculture within the White River Basin commences at State Highway 65 and covers 132,500-acres in Tulare and Kern Counties of the Tule River Basin.

The U.S. Geological Survey maintained a gauging station on White River near Ducor for water years 1972 through 2000 as set forth in **FIGURE 5: WHITE RIVER ANNUAL RUNOFF AT DUCOR**, which was near an average period compared to the annual runoff data of Deer Creek, that indicated an average annual runoff of 7,400 acre-feet.

FIGURE 5: WHITE RIVER ANNUAL RUNOFF AT DUCOR



E. Soil Survey

Soil information for the study area was obtained from the National Cooperative Soil Survey (*NCSS*), a joint effort of the United States Department of Agriculture and other federal, state, and local agencies. Soil data for the Tule Basin is presented on soil survey maps that can be used for land-planning programs. For this report, the soil survey maps, provided for general reference, contain valuable information regarding soil properties in the TBWQC study area. Soil properties that affect land use are described in the soil survey. The soil survey maps contain predictions of soil behavior for selected land uses, highlight limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment (*USDA, 1982*).

Soils of the Tule Basin area were compiled in GIS from three soil surveys downloaded from the USDA-NRCS Soil Data Viewer, the Soil Survey Geographic (*SSURGO*) database, and from soil survey maps entitled, “Tulare County, California, Western Part”, “Tulare County California,

Central Part", and "Kern County, California, Northwestern Part". Soil units for each of the three surveys were combined and are shown on **ATTACHMENT D: NRCS SOIL SURVEY MAP**.

The map units delineated on the detailed Soil Survey Map represent the soil types or miscellaneous areas (*rock outcrops, dams, water features*) in the study area. A generalized description of each soil type is provided in **ATTACHMENT D.1: NRCS SOIL SURVEY SOIL TYPE LEGEND**.

Within the TBWQC area, there are 40 soil types from the Tulare County Western Part, 70 soil types from the Tulare County Central Part, and 14 soil types from the Kern County Northwestern Part.

Data from the NRCS soil web survey were used to create an irrigation map with qualitative ratings for general irrigation properties and qualities. The interpretation evaluates a soil's limitation(s) for agricultural purposes and use of irrigation systems. The ratings are for soils in their natural condition and do not consider present land use.

The soil properties and qualities important in design and management of irrigation systems are sodium adsorption ratio, depth to high water table, available water holding capacity, saturated hydraulic conductivity (Ksat), slope, calcium carbonate content, ponding, and flooding. Soil properties and qualities that influence installation of irrigation systems are stones, depth to bedrock or cemented pan, and depth to a high water table. The properties and qualities that affect the performance of the irrigation system are depth to bedrock or to a cemented pan, the sodium adsorption ratio, salinity, and soil reaction.

The ratings on **ATTACHMENT E: NRCS SOIL SURVEY IRRIGATION RATINGS** indicate the extent to which the soils are limited by all of the soil features that affect the irrigation capability. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

The irrigation ratings are listed for each map unit in **APPENDIX B: NRCS IRRIGATION RATINGS**. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

F. Geomorphic Units

Six (6) geomorphic units within the San Joaquin Valley were outlined (*Davis 1959*); five of which are located within the TBWQC area. **ATTACHMENT F: TBWQC GEOMORPHIC UNITS MAP** shows the geomorphic units which include the Sierra Nevada crystalline bedrock, dissected uplands of the foothills, low alluvial plains and fans, river floodplains and channels, and overflow lands and the lake bottom.

The geomorphic units are presented as a general reference to the geology of the TBWQC area, especially with regard to the boundary between the Sierra Nevada Mountain Range/Foothills provinces and San Joaquin Valley alluvial deposits.

The Sierra Nevada granitic block has been tilted slightly westward due to faulting and subsequent uplift of the east edge. The slopes are generally very steep on the east side and gentle on the west side. There is little, if any, lands that are irrigated within the Sierra Nevada Mountains.

The dissected uplands are discontinuous hills of moderate relief between the Sierra Nevada to the East and the alluvial plains and fans to the West. The dissected uplands are located along the entire fringe of the western Sierras, except between Orange Cove and Porterville. The elevation of the uplands range from 550 feet to about 1,000 feet above mean sea level. Irrigated parcels along the eastern TBWQC area overlie exposures of dissected uplands that trend south through Porterville, Terra Bella, and Ducor.

The coalescing low plains and alluvial fans of low relief are located between the dissected uplands and the nearly flat surface of the valley trough. Except near streams, the local relief is less than 10 feet. The unit extends for the entire length of the valley and has an average width of about 21 miles. A majority of irrigated lands within the TBWQC area overlies the low alluvial fans and floodplains.

The geologic units underlying the low plains and fans are mostly Quaternary alluvium and possibly some Pliocene sediments cropping out on the higher fans. Soils developed on this material commonly range from sandy types on the upper parts of the fans to silty types at the lower ends.

The overflow lands are defined as areas which the rivers splay into numerous sloughs and at times of highest flood conditions have either been partly or wholly inundated.

III. LAND USE

Land use within the TBWQC boundary is predominantly agriculture with small communities scattered throughout.

A. Population

There are 13 developed communities within the TBWQC Boundary area (**ATTACHMENT C: TBWQC CLIMATE AND DEMOGRAPHICS**). The total population within the TBWQC Boundary increased from 71,629 to 91,586 during the decade, year 2001 through year 2010, with an increase of 22%. However, the population within the TBWQC Boundary has decreased from 91,586 to 84,427 from 2011 to 2013, an approximate 8% decrease.

Disadvantaged Unincorporated Communities (*DUCs*) within the TBWQC area are included on **ATTACHMENT C**. DUCs are defined as "*a territory that constitutes all or a portion of a "disadvantaged community*" including 12 or more registered voters or some other standard. A "disadvantaged community" is defined as a community with an annual median household income that is less than 80 percent of the statewide annual median household income (*SB244*).

The historical population, 1960 through 2013, for each community within the TBWQC area is summarized in **TABLE 2: COMMUNITY POPULATION WITHIN THE TBWQC BOUNDARY**.

TABLE 2: COMMUNITY POPULATION WITHIN THE TBWQC BOUNDARY

Community	**2013 Census**	**2010 Census**	2000 Census	1990 Census	1980 Census	1970 Census	1960 Census
Porterville, including East Porterville Urban Area, Porterville Northwest, and Porterville West	**55,714***	**60,932**	46,346	35,353	24,925	25,361	16,164
Springville	**824**	**934**	1,109	NA	NA	NA	NA
Strathmore	**3,548**	**2,819**	2,584	2,353	1,955	1,221	1,095
Terra Bella	**3,105**	**3,310**	3,466	2,740	< 2,500	1,037	2,287
Ducor	**449**	**612**	504	NA	NA	NA	NA
Richgrove	**2,895**	**2,882**	2,723	1,899	1,398	1,023	NA
Tipton	**1,940**	**2,543**	1,790	1,383	< 2,500	< 1,000	1,045
Pixley	**2,969**	**3,310**	2,589	2,457	< 2,500	1,584	1,327
Woodville	**2,070**	**1,740**	1,678	1,557	< 2,500	1,031	1,045
Earlimart	**7,532**	**8,537**	6,583	5,881	4,578	3,080	2,897
Alpaugh	**793**	**1,026**	761	NA	NA	NA	NA
Allensworth	**386**	**471**	NA	NA	NA	NA	NA
Poplar / Cotton Center	**2,202**	**2,470**	1,496	1,901	< 2,500	1,239	1,478
Total Population:	**84,427**	**91,586**	71,629	55,524	32,856	35,576	27,338

*City of Porterville Only

In addition to the organized communities and cities, there are many individual homes and businesses within the TBWQC area.

Agricultural land use within the TBWQC area includes a wide range of field crops, orchards, and vineyards. Land use data from the Department of Water Resources and California Department of Conservation were used to summarize the agricultural use within the TBWQC area and are discussed below.

B. Department of Water Resources Land Use

The State of California, Department of Water Resources (DWR) publishes data on land use by crop type in each county. The general crop land use within the TBWQC area of Tulare County and a portion of Kern County as of the DWR 2007 data, excluding the lands within the supplemental area, (data for the supplemental boundary was sparse and unavailable as there is little irrigated agriculture within this area) is summarized in **TABLE 3: DWR CROP LAND USE WITHIN THE TBWQC BOUNDARY**. Based on the 2007 DWR data, approximately 364,000 acres (61%) of the developed land within the TBWQC Boundary are used for irrigated agricultural purposes. A map identifying the location of the different land uses within the TBWQC per the DWR data is identified in **ATTACHMENT G: TBWQC DEPARTMENT OF WATER RESOURCES (DWR) 2007 LAND USE MAP**.

TABLE 3: DWR CROP LAND USE WITHIN THE TBWQC BOUNDARY

Land Use	Area within TBWQC Boundary *(Excludes Supplemental Area)* acres	Percent of Total Land
IRRIGATED AGRICULTURE LAND USE		
Citrus and Subtropical	54,779.5	9.1%
Deciduous Fruits and Nuts	59,647.0	9.9%
Field Crops	53,215.8	8.9%
Grain and Hay Crops	84,524.0	14.1%
Pasture	49,176.3	8.2%
Vineyard	35,892.5	6.0%
Truck and Berry Crops	1,749.8	0.3%
Incidental to Agriculture	15,350.2	2.6%
Water Surface	9,747.5	1.6%
Sub-Total (acres):	**364,082.6**	**60.7%**
NON-IRRIGATED AGRICULTURE LAND USE		
Idle	11,578.5	1.9%
Barren	49.6	0.0%
Riparian Vegetation	1,598.1	0.3%
Native Vegetation	186,677.7	31.1%
Urban, Commercial, Industrial, Residential	35,892.5	6.0%
Sub-Total (acres):	**235,796.4**	**39.3%**
TOTAL (acres):	**599,879.0**	
Total Number of Dairy Facilities	**110** (86,886-Acres)	

C. California Department of Conservation FMMP Land Use

The State of California Department of Conservation has a Farmland Mapping and Monitoring Program (*FMMP*) which produces maps and statistical data used for analyzing impacts on California's agricultural industry. Agricultural land is rated according to soil quality and irrigation status; the best quality land is called Prime Farmland. The maps are updated every two years with the use of a computer mapping system, aerial imagery, public review, and field reconnaissance.

The FMMP data within the TBWQC area is compatible with modern soil surveys developed by the US Department of Agriculture (*USDA*). A classification system that combines technical soil ratings and current land use as the basis for the Important Farmland Maps of these lands. Most public land areas, such as National Forests and Bureau of Land Management holdings, are not mapped.

The minimum land use mapping unit is 10 acres unless otherwise specified. Smaller units of land are incorporated into the surrounding map classifications. In order to most accurately represent the NRCS digital soil survey, soil units of one acre or larger are depicted in Important Farmland Maps.

1. Prime Farmland (P)

Farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

2. Farmland of Statewide Importance (S)

Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

3. Unique Farmland (U)

Farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

4. Farmland of Local Importance (L)

Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.

5. Grazing Land (G)

Land on which the existing vegetation is suited for the grazing of livestock. This category was developed in cooperation with the California Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities.

6. Urban and Built-up Land (D)

Land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial,

commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.

7. Other Land (X)

Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and water bodies smaller than forty acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land.

The general land use for the TBWQC area within Tulare County and a portion of Kern County using the FMMP identifications is summarized in **TABLE 4: FMMP LAND IDENTIFICATION**. Based on the 2010 FMMP data, approximately 457,600 acres (*48%)* of the lands within the TBWQC Boundary are rated for irrigation purposes. A map of the locations of the different land FMMP identifications within the TBWQC boundary are provided in **ATTACHMENT H: 2010 FMMP LAND IDENTIFICATION MAP**.

TABLE 4: FMMP LAND IDENTIFICATION

FMMP Land Use Category	Area (acres)	% of Total Area
IRRIGATED AGRICULTURE		
Confined Animal Agriculture	11,987.4	1.3%
Farmland of Local Importance	93,554.1	9.9%
Prime Farmland	179,817.5	19.0%
Unique Farmland	4,965.6	0.5%
Farmland of Statewide Importance	164,585.3	17.4%
Semi-Agricultural and Rural Commercial Land	2,746.1	0.3%
Sub-Total:	**457,656.0**	48.3%
NON-IRRIGATED AGRICULTURE		
Urban and Built-Up Land	17,225.0	1.8%
Natural Vegetation	95,461.4	10.1%
Rural Residential	9,314.7	1.0%
Grazing Land	214,147.8	22.6%
Vacant or Disturbed	5,093.0	0.5%
Water	2,561.1	0.3%
Other Land	145,349.8	15.4%
Sub-Total:	**489,152.80**	51.7%
TOTAL (acres):	**946,808.8**	
**2010 Data from California Department of Conservation: Farmland Mapping and Monitoring Program - Kern and Tulare Counties*		
http://www.consrv.ca.gov/dlrp/fmmp/Pages/Index.aspx		

D. Irrigation Practices Generally Associated with Predominant Crops

The Department of Water Resources provides data detailing results of a survey to identify California Irrigation Methods by crop category. To receive the data results, variables are inputted into the DWR database, such as year (*1991, 2001, or 2010*), data type (*percentage or acreage*), and hydrologic region.

DWR states that approximately every 10 years, a one-page irrigation survey form is mailed to California growers to update their records on irrigation system methods. A statewide survey of current irrigation methods was conducted during 2011 to determine which irrigation methods that were used in California during calendar year 2010. The study was conducted by mailing questionnaires to approximately 58,000 growers who were randomly selected from a list of growers as a sample set. Any farmer that only farms rice, not irrigated, and only has livestock was excluded from the list. Growers were asked to state the main County in which they farm and the acreages planted between 2001 and 2010. For each crop category, the farmer chose one of a possible 20 crop categories by irrigation method.

The irrigation practices including gravity methods, sprinkler, and low-volume such as drip and microsprinkler, are the main irrigation methods used by growers within the Central Valley of California. A small amount of subsurface irrigation is conducted but the area is insignificant compared to other methods. The DWR dataset, including crop name and irrigation method for the Tulare Lake Region, is summarized in **TABLE 5: 2010 IRRIGATION METHODS SURVEY DATA IN ACREAGE IN TULARE LAKE HYDROLOGIC REGION**.

TABLE 5: 2010 IRRIGATION METHODS SURVEY DATA IN ACREAGE IN TULARE LAKE HYDROLOGIC REGION

Crop Name	Gravity (Acreage)	Sprinkler (Acreage)	Low Volume (Acreage)	Other (Acreage)	Total
Corn	33,056.7	160.0	3,660.1	--	**36,876.8**
Cotton	19,516.0	2,730.0	5,730.0	570.0	**28,546.0**
Beans (dry)	1,379.8	790.0	55.9	--	**2,225.7**
Grains	34,887.2	4,201.0	1,598.0	538.2	**41,224.4**
Safflower	260.0	111.0	--	--	**371.0**
Sugar beets	--	68.0	--	--	**68.0**
Other Field Crops	3,302.0	2,123.0	756.5	603.0	**6,784.5**
Alfalfa	36,950.1	1,454.0	2,137.0	1,986.0	**42,527.1**
Pasture	2,275.5	112.0	--	85.5	**2,473.0**
Cucurbit	629.3	79.0	1,322.4	--	**2,030.7**
Onions & Garlic	769.5	1,520.0	2,917.0	25.0	**5,231.5**
Potatoes	10.0	410.0	--	--	**420.0**
Tomatoes (fresh)	0.5	--	402.0	--	**402.5**
Tomatoes (process)	143.1	596.0	20,655.6	--	**21,394.7**
Other Truck Crops	409.0	8,429.0	2,735.5	19.0	**11,592.5**
Almonds & Pistachios	9,496.0	1,439.0	41,166.9	716.3	**52,818.2**
Other Deciduous	22,537.3	1,279.5	14,409.1	420.2	**38,646.1**
Subtropical Trees	3,502.3	6,192.1	43,868.7	999.0	**54,562.1**
Turfgrass & Landscape	10.0	655.0	449.0	--	**1,114.0**
Vineyard	23,079.0	538.2	28,239.9	2,320.5	**54,177.6**
All Crops	**192,213.3**	**32,886.8**	**170,103.6**	**12,734.1**	**407,937.7**

For the Tulare Lake Hydrologic Region, 48% of the irrigation practices are by gravity, 8% of the irrigation practices are by sprinkler, 42% are by low volume such as drip irrigation, and 2% are by other means. Sugar beets, safflower, tomatoes, potatoes, turfgrass & landscape, cucurbit, beans (dry), pasture, onions and garlic, other field crops and other truck crops account for approximately 54,000 acres. Cotton, other deciduous, grains, alfalfa, almonds & pistachios, vineyard, and subtropical trees account for approximately 350,000 acres.

E. Fertilizer and Soil Amendments Associated with Predominant Crops

Fertilizers are compounds with one or more organic or inorganic chemical elements added to soil or applied directly onto plants. Sources of plant nutrients include manure, plant residues, biological nitrogen fixation and commercial inorganic fertilizers. Types of fertilizers commonly used for crop production are natural fertilizers such as cow manure or chemical fertilizers in solid or liquid form. Fertilizers include nitrogen, phosphorus, and potassium, commonly referred to as NPK.

Rosenstock et.al. (2013) evaluated existing data on nitrogen use, estimated typical nitrogen fertilization rates for common crops, analyzed historical trends in nitrogen use, compared typical nitrogen use to research-established guidelines and identified cropping systems that have

significant influence on the state's nitrogen cycle. The Rosenstock (2013) data of crop area, nitrogen rates, and nitrogen use in California crops are provided in **TABLE 6: CROP AREA AND NITROGEN APPLICATION RATES IN CALIFORNIA, 1973 AND 2005**.

TABLE 6: CROP AREA AND NITROGEN APPLICATION RATES IN CALIFORNIA, 1973 AND 2005

Crop Name	Area (acres)		Nitrogen Rates (pounds N/acre)			Nitrogen Use (% total)	
	1973	*2005*	*1973*	*2005*	*% change*	*1973*	*2005*
Avocado	20,360	61,820	125	112	-11	1	1
Beans, dry	169,400	64,000	51	91	79	2	1
Broccoli	43,580	117,500	182	190	4	2	3
Carrots	31,480	70,620	120	216	80	1	2
Cauliflower	23,160	34,060	183	238	30	1	1
Celery	18,050	25,740	287	259	-10	1	1
Corn, Sweet	14,200	25,560	145	213	47	0	1
Lemons	41,520	48,400	166	123	-26	2	1
Lettuce	145,120	232,400	159	193	21	5	6
Melons, cantaloupe	47,540	44,600	95	163	71	1	1
Melons, watermelon	11,200	11,920	159	151	-5	0	0
Nectarines	10,460	33,700	131	104	-21	0	1
Onions	28,500	46,860	146	212	45	1	1
Peaches, cling	50,500	29,380	133	102	-23	2	0
Peaches, free	21,100	33,400	133	113	-15	1	1
Peppers, bell	8,800	20,700	162	346	114	0	1
Peppers, chili	4,718	5,460	162	300	85	0	0
Pistachio	NA	102,600	148	159	7	NA	2
Plums, dried	82,800	67,600	95	130	37	2	1
Plums, fresh	23,540	32,200	110	104	-6	1	0
Potato	70,060	40,820	189	248	31	3	1
Strawberry	8,620	33,680	159	193	21	0	1
Wheat	675,600	394,800	88	177	101	14	10
Predominant Crops in TBWQC Area							
Almond	216,154	592,000	127	179	41	6	15
Cotton	932,100	626,000	109	174	60	24	16
Grapes, raisin	240,200	240,000	57	44	-23	3	2
Grapes, table	66,080	83,200	57	43	-24	1	1
Grapes, wine	164,980	477,800	53	27	-49	2	2
Oranges	186,040	192,400	65	95	46	3	3
Rice	413,000	535,800	86	130	52	8	10
Tomatoes, fresh market	28,180	38,800	142	177	24	1	1
Tomatoes, processing	221,940	279,400	142	182	28	7	7
Walnut	159,040	215,200	120	138	15	4	4

Total Acreage	4,178,022	4,858,420

Total - Predominant Crop Acreage	**2,627,714**	**3,280,600**
Percent - Predominant Crop Acreage	63%	68%

NA: Not Available

Almonds, cotton, grapes, ranges, rice, tomatoes, and walnuts are the predominant crops in the TBWQC area. In California, these crops accounted for 2,627,714 acres in 1973 (63% of the total

crop acreage) and 3,280,600 acres in 2005 (68% of the total crop acreage). Based on this data, Almonds accounted for a largest portion of nitrogen use among crops within TBWQC area.

IV. HYDROGEOLOGY

A. Regional Geology

Igneous, metamorphic, and sedimentary rocks are generally older along the eastern boundary and valley fill deposits are younger along the western boundary of the TBWQC area. The igneous, metamorphic, and sedimentary rocks are generally exposed and divided at the eastern third above the dissected uplands and alluvial fans formed near the western base of the Sierra Nevada Mountain Range. The foothill igneous, metamorphic, and sedimentary rocks grade into unconsolidated and consolidated alluvial sediments within the western two-thirds of the TBWQC area. A geologic map is included in **ATTACHMENT I: GEOLOGIC MAP OF THE TBWQC AREA.**

The geology of the TBWQC area was described by the Department of Water Resources in Bulletin 118 under the section covering the Tule Subbasin (*DWR Bulletin 118 - Subbasin 5-22.13*), which is one of seven subbasins within the Tulare Lake Basin and covers approximately 467,000-acres. The TBWQC lands overlie the entire Tule Subbasin and extends east into the Sierra Nevada Mountain Range and south into the Kern Subbasin. As described in Bulletin 118, the east boundary of the Tule Subbasin is defined as the edge of the alluvium as stated below:

> *"The Tule Groundwater Subbasin is generally bounded on the west by the Tulare County line, excluding those portions of the Tulare Lake Basin Water Storage District and Sections 29 and 30 of Township 23 South, Range 23 East, that area west of Homeland Canal. The northern boundary of the basin follows the northern boundaries of Lower Tule Irrigation District and Porterville Irrigation District and the southern boundary of the Lindmore Irrigation District.* ***The eastern boundary is at the edge of the alluvium****, and the southern boundary is the Tulare-Kern County line."*

The TBWQC area crosses the geomorphic boundary between the permeable alluvial fan deposits and relatively impermeable crystalline bedrock of the Sierra Nevada Mountain Range. Portions of the southern and northern areas of the TBWQC, and the entire western area of the TBWQC overlie the alluvium of the San Joaquin Valley (*DWR, 2003*).

The Central Valley is a structural trough about 400 miles long, 20 to 70 miles wide, and extends over 20,000 square miles. The trough is filled with marine and continental sediments, which are the result of inundation by the ocean and erosion of the rocks that form the surrounding mountains (*USGS, 1995*). The base of the Central Valley is comprised of plutonic and metamorphic rocks that are largely impermeable. These basement complex rocks are exposed in the eastern portion of the TBWQC area and are mainly intrusive and extrusive igneous rocks with Paleozoic metavolcanic and Mesozoic, ultramafic, granitic, and gabbroic rocks.

The metavolcanic rocks include latite, dacite, tuff, and greenstone that are commonly schistose. The ultramafic rocks are mostly serpentine with minor peridotite, gabbro, and diabase. The granitic rocks include granite, quartz monzonite, granodiorite, and quartz diorite. The mafic and intermediate rocks include gabbro and diorite. Undivided pre-Cenozoic metasedimentary and metavolcanic rocks in the foothills area are mostly slate, quartzite, hornfels, chert, phyllite, mylonite, schist, gneiss, and minor marble (*Jennings, et.al., 1977*).

The basement complex rocks are buried beneath valley fill deposits that thicken toward the axis of the valley. More than 14,000 feet of Cretaceous, Tertiary, and Quaternary age sediments are buried beneath the Tulare Lake bed. These extensive deposits of marine and mixed marine and

continental sediments are the result of erosion from the Coast Ranges, Cascade Range, and Sierra Nevada Mountains. Continental deposits eroded from the Sierra Nevada Mountain Range and Coast Ranges have formed valley sediments that are a heterogeneous mix of gravels, sands, silts, and clays. Unconsolidated deposits overlie the marine and continental deposits and form the floor of the San Joaquin Valley (*Croft, 1972*).

Loosely consolidated Miocene to Pleistocene deposits exposed in the western portion of the TBWQC area include sandstone, shale, and gravel. The valley floor is unconsolidated alluvial and flood plain deposits of major rivers, in addition to lacustrine and marsh deposits. The lacustrine and marsh deposits crop out in the San Joaquin Valley beneath the Buena Vista, Kern, and Tulare Lake beds. The Tulare Lake bed contains lacustrine and marsh deposits more than 3,600-feet thick (*Page, 1986*). These sediments are relatively flat to gently rolling and generally below an elevation of 500-feet (*USGS, 1995*).

B. Groundwater Occurrence

Igneous, metamorphic, and sedimentary rocks and alluvial deposits exposed along the margin of the valley, including those within the TBWQC area, are divided into three main groups. Within the alluvial deposits, groundwater occurs under confined and unconfined conditions (*Davis et.al., 1959*). The first group are the main freshwater-bearing sediments that include flood basin deposits, younger alluvium, older alluvium, the Tulare Formation, and continental deposits undifferentiated (*DWR, 2003*). These deposits supply nearly all the water pumped from wells in the valley and are the primary source of freshwater. The second group are mostly nonwater-bearing marine sedimentary rocks that generally contain saline water. The third group are nonwater-bearing basement complex rocks.

Within the first group are Tertiary and Quaternary continental deposits of younger alluvium that are interstratified and discontinuous beds of unsorted to fairly well sorted clay, silt, sand, and gravel comprising the materials beneath the alluvial fans in the valley and stream channels. The younger alluvium is moderately to highly permeable, largely unsaturated, and serves as a conduit for recharge to the underlying deposits.

The older alluvium contains poorly sorted clay, silt, sand, and gravel with moderate to high permeability and is a major source of water for wells. Alluvial deposits of recent, Pleistocene, and possibly later Pliocene Age overlying the Tulare Formation contain a body of unconfined and semiconfined fresh water. The contact between the younger and older alluvium and Tulare Formation is gradational and virtually impossible to differentiate because of the lithologic similarity.

The Tulare Formation is poorly sorted deposits of clay, silt, sand, and gravel derived predominantly from the Coast Ranges. It contains the E-Clay, which is a major confining unit that stratigraphically pinches out near Highway 99 beneath the western one-third of the TBWQC area (**ATTACHMENT I: GEOLOGIC MAP OF THE TBWQC AREA**).

An additional body of fresh water is confined beneath the E-Clay, which occurs in alluvial and lacustrine deposits of late Pliocene age or older (*Davis, et. al., 1959 and USGS 1995*). In much of the eastern part of the valley, especially in areas of the major streams (*such as within the TBWQC area*), the E-Clay is not present, and groundwater occurs as one freshwater body to considerable depth (*Davis, et. al., 1964*).

The continental deposits are undifferentiated poorly sorted lenticular layers of clay, silt, sand, and gravel derived from the Sierra Nevada Mountain Range. They are moderately permeable, and yield large quantities of groundwater.

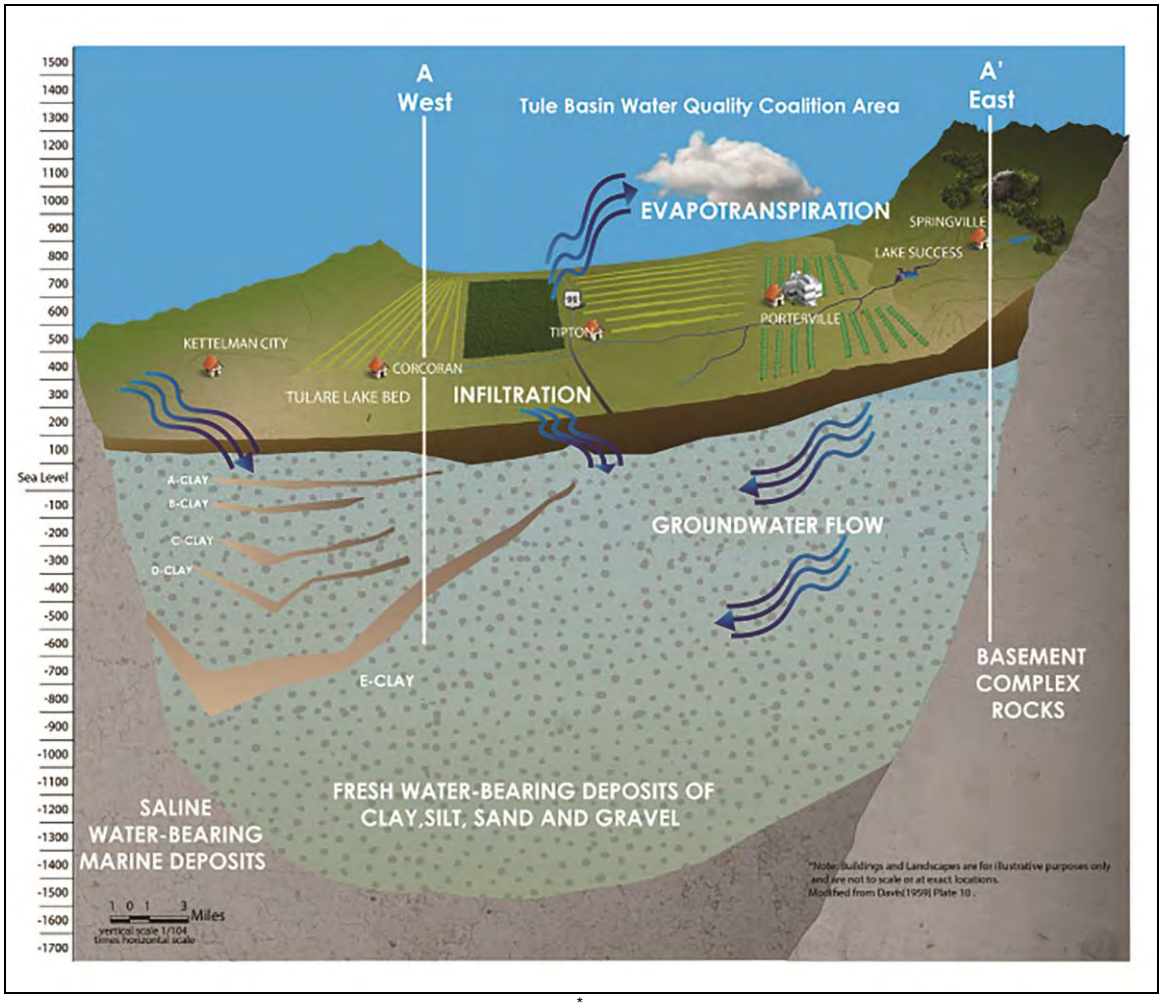
Within the second group are semiconsolidated to consolidated mostly nonwater-bearing Cretaceous and Tertiary marine sedimentary rocks. They generally containing saline water that underlie the freshwater-bearing deposits. The water body underlying the freshwater aquifers throughout the valley is of no importance as a source of fresh groundwater. It contains connate water of poor quality except in a few places in the outcrop areas where the connate water probably has been flushed out and replaced with meteoric water.

The third group consists mainly of nonwater-bearing pre-Tertiary crystalline basement complex rocks of the Sierra Nevada Mountain Range. The crystalline basement complex rocks are of little importance as a source of groundwater, although the water contained in fractures or weathered rocks is fresh and is utilized to some extent for domestic and stock water supply (*Davis, et.al., 1959*).

The hydrogeologic groundwater conditions beneath the TBWQC area consist of no-flow on [portions] of the northern, southern, and eastern boundaries, and a general-head on the western boundary (*Harter et. al., 2001*).

A generalized cross-section of the hydrogeologic regime beneath the TBWQC area identified as Cross Section g-g' in the USGS Report 1459 (*Davis, et.al., 1959)* and B-B' in the USGS Report 1999-H (*Croft, 1972*), was used as a basis for **FIGURE 6: GENERALIZED GEOLOGIC CROSS-SECTION - TBWQC AREA**. (Identified as cross section line A-A' on **ATTACHMENT I: GEOLOGIC MAP OF THE TBWQC AREA**).

FIGURE 6: GENERALIZED GEOLOGIC CROSS-SECTION – TBWQC AREA



*

Modified from Davis (1959) and Croft (1972)

C. Groundwater Recharge

Prior to development within the Central Valley, the aquifer system was under steady-state conditions in which natural recharge balanced natural discharge. By the middle of the 20th century, development had lowered and altered the groundwater flow patterns throughout the Central Valley (*in addition to the Tule Subbasin*). Over the years, the hydraulic head in the lower confined portion of the aquifer system has declined below the water table and the vertical hydraulic gradient has reversed. Much of the water that used to flow to discharge areas such as rivers now flows vertically downward through unconfined, semiconfined, and confining beds (*USGS, 1995*). Groundwater discharge now occurs mainly by evapotranspiration and discharge to streams where groundwater levels are near land surface.

Recharge to the unconfined and semiconfined aquifers is by seepage from rivers and natural streams, underflow in the permeable materials flooring the canyons bordering the valley, losses from irrigation canals and ditches, deep penetration of water applied for irrigation in excess of plant requirements and below the root zone, direct recharge from developed ponding basins and

water banks, and in-lieu recharge where surface water is made available in-lieu of groundwater pumping.

Replenishment to the confined aquifers occurs chiefly from unconfined and semiconfined deposits beyond the featheredges of the confining beds (for example, the E Clay) but also in part from slow downward penetration of water through the confining beds in places where the artesian head in the confined aquifers has been drawn down by heavy pumping (*Davis, et.al., 1964*).

Some water agencies accomplish recharge by directing available supplemental surface water into existing natural streambeds and sloughs, and others encourage over-application of irrigation water, when available, on farmed fields. Recharge facilities within the TBWQC area cover approximately 2,100 acres of basins and 166.6 miles of natural rivers which are identified on **ATTACHMENT J: RECHARGE BASINS MAP**.

Groundwater flowing through shallow parts of the aquifer system within the TBWQC area emanates as runoff at higher elevations, specifically from the Sierra Nevada Mountains. The eastern valley margin soils are generally more coarse and permeable, especially along the east side of the Tule Subbasin adjacent to the Sierra Nevada foothills (*USGS, 1995*). Deep percolation on the valley floor upgradient from swampy areas and lakes is a significant source of recharge in wetter areas and during wetter years (*Williamson, et.al., 1989*).

Based on the Central Valley Hydrologic Model (*CVHM*), the average groundwater recharge from surface water processes throughout the Central Valley is 7.7-million acre-feet per year. The average annual hydrologic budget from the years 1962-2003 net recharge from landscape (*surface water processes*) from the CVHM within the combined Kaweah/Tule basin “water balance subregions” was 710,000 acre-feet (*USGS, 2009*). For the CVHM study, the Central Valley was divided into water-balance subregions. The boundaries of the water-balance subregions of the San Joaquin and Tulare Lake Basin is hydrographic, rather than political.

Recharge rates from precipitation have not changed significantly from predevelopment times. Generally, recharge of the Central Valley Aquifer system occurs during the winter months (*December through March*) and discharge occurs during the summer months which include the growing season (*May through September*). Large amounts of water are drawn from storage during the pumping period. The shallow portion of the aquifer system receives some recharge during irrigation. In typical years, water levels generally recover during the wet season (*December through March) (USGS, 2009*).

In much of the valley, the annual rainfall is so low that little precipitation penetrates deeply, and soil-moisture deficiency is perennial. Infiltration from stream channels, canals, and irrigated fields are the principal sources of groundwater recharge (*Davis, et.al., 1964*). Precipitation falling on the valley floor during the rainy season provides only a small part of the total recharge (*USGS, 2009*).

The operations of the Deer Creek and Tule River Authority (*DCTRA*) provide an example of how groundwater management activities can be coordinated with other resources. The Authority, in conjunction with the US Bureau of Reclamation (*USBR*), has constructed more than 200 acres of recharge basins as part of its Deer Creek Recharge-Wildlife Enhancement Project. When

available, the USBR delivers surplus Central Valley Project water during winter months to the recharge basins, which serve as winter habitat for migrating waterfowl. Most of the water percolates into the underlying aquifer, thereby benefiting the local aquifer system (*DWR, 2009*).

With the exception of the community of Terra Bella, the communities and cities of Porterville, Springville, Strathmore, Ducor, Richgrove, Tipton, Pixley, Woodville, Earlimart, Alpaugh, Allensworth, and Poplar-Cotton Center are entirely dependent on groundwater, and thus groundwater recharge, for their supply.

D. Groundwater Overdraft

According to DWR (*2003*), "overdraft is the condition of a groundwater basin in which the amount of water withdrawn by pumping over the long term exceeds the amount of water that recharges the basin. Overdraft is characterized by groundwater levels that decline over a period of years and never fully recovers, even in wet years." Consequences of overdraft include increased extraction costs, costs of well deepening or replacement, land subsidence, water quality degradation, and environmental impacts. Eleven basins in California have been identified as being in critical overdraft by DWR; Tule River Basin being one of them.

Groundwater overdraft in California in 1995 was nearly 1.5 million acre-feet annually, with most of the overdraft occurring in the Tulare Lake, San Joaquin River, and Central Coast hydrologic regions (*DWR, 2009*). Based on the trend in decreasing groundwater elevation beneath the TBWQC area, overdraft is still occurring. According to USGS (*2009*) the San Joaquin Valley has experienced large changes in groundwater storage. In the early 1960s, groundwater pumpage exceeded surface-water deliveries in the San Joaquin Valley, causing water levels to decline to historic lows on the west side of the San Joaquin Valley, which resulted in large amounts of subsidence.

E. Groundwater Movement

Groundwater moves in response to the hydraulic gradient from areas of recharge to areas of discharge. Under natural conditions, the unconfined and semiconfined groundwater in the San Joaquin Valley moves toward topographically low central areas, where it is discharged at the land surface or consumed by plants.

Little information is available on the hydraulic gradient in the principal confined aquifer beneath the E Clay during early development, but it is presumed that the water moved slowly toward the center of the valley and then northward in the direction of the Sacramento-San Joaquin Delta. The artesian head in the confined aquifer was sufficient to raise the water level above the land surface, in wells tapping that aquifer, in much of the central part of the valley. Some water, therefore, must have moved upward through the confining clay bed in the central valley. The diversion of surface water from the streams and the development of groundwater for irrigation have lowered the water level, changing the hydraulic gradient, and in some places, the direction of movement of the groundwater.

Surface-water supplies in the past have been generally inadequate to meet irrigation demands, and overdraft on groundwater supplies has been widespread. As a result, water level fluctuations have occurred in response to the groundwater withdrawals. The water table declines rapidly in late spring and summer and recovers as pumping ceases late in the autumn. In overdrafted areas, a year-by-year decline has occurred. Imports of Central Valley Project surface water

through the Friant-Kern Canal have supplied additional recharge to the groundwater basins locally and helped to reduce pumping overdraft (*Davis, et. al., 1959*).

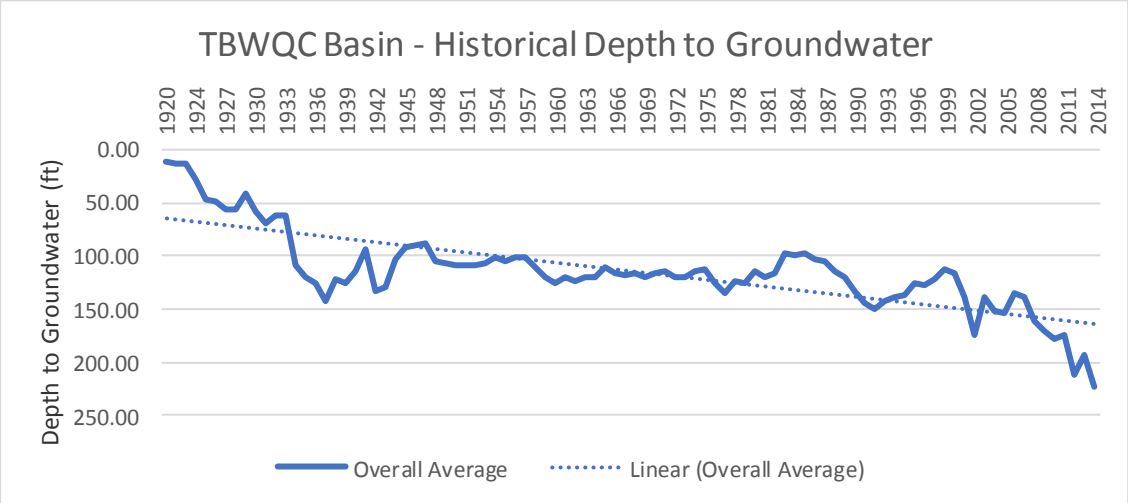
Depth to groundwater data from spring (January through May) 2013 and 2014 were used to prepare contour maps of the water table level beneath the TBWQC area. For the 2013 depth to groundwater map, 130 Department of Water Resources (DWR) and 129 Deer Creek and Tule River Authority (DCTRA) groundwater well measurements were utilized. To prepare the 2014 depth to groundwater map, 81 DWR and 90 DCTRA groundwater wells were measured. The water level contours were created by performing a "natural neighbor" interpolation between the data points. From the data, water level contours with gradational color zoning between contours was prepared to indicate areas of lesser or greater depth. **ATTACHMENT K: 2013 SPRING DEPTH TO GROUNDWATER MAP** and **ATTACHMENT L: 2014 SPRING DEPTH TO GROUNDWATER MAP** provide the spring 2013 and 2014 depths to groundwater.

Even though a different number of wells were used for each model, the groundwater contours generally match between the spring 2013 and spring 2014 data. Based on the spring 2013 and spring 2014 depth to groundwater models, depth to groundwater is generally less along the northern and southwest areas of the Tule Basin. Depth to groundwater is greater than 500-feet in the southeast TBWQC area near Richgrove. With exception of the southeast portion of the Tule Basin, there are three deeper zones modeled as northwest trending troughs through the middle and eastern portion of the TBWQC area. Groundwater depths are a maximum of approximately 250-feet in these three areas near Pixley, Alpaugh and west of Tipton. The groundwater contours generally diverge from Tule River, Deer Creek, and portions of White River.

With the exception of the Toledo Recharge Basin located west of Tipton, the total depth to groundwater is generally less in areas around the recharge basins and natural waterways.

Depth to groundwater within the TBWQC area was tabulated for years 1920 through 2014. For each year, depths to groundwater data were averaged to estimate the pattern of change of groundwater depth in the TBWQC area**.** **FIGURE 7: HISTORICAL DEPTH TO GROUNDWATER** below the ground surface, years 1920 to 2014, shows an increase in depth to groundwater throughout the TBWQC area. Based on the average for each year, the depth to groundwater increased approximately 212-feet between 1920 and 2014, or an average of 2.2 feet per year.

FIGURE 7: HISTORICAL DEPTH TO GROUNDWATER

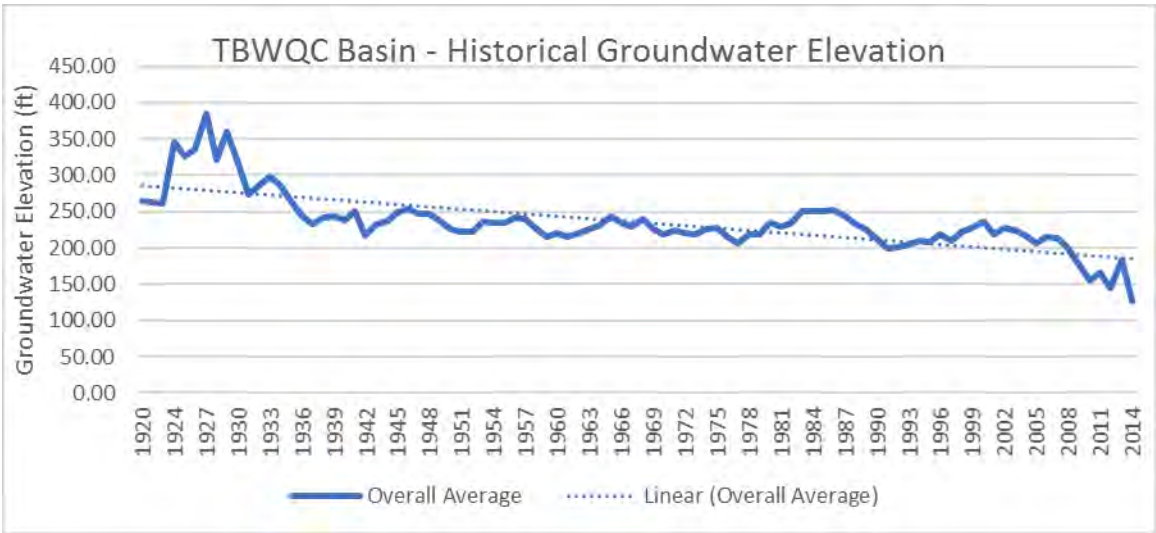


A groundwater elevation map with water elevation contours for the spring 2014 using DWR and DCTRA data was prepared as **ATTACHMENT M: 2014 SPRING GROUNDWATER ELEVATION MAP**. Groundwater elevation data from January through May (spring) were used to create the model and are tabulated in **APPENDIX C: 2014 SPRING GROUNDWATER ELEVATION DATA**. As with the depth to groundwater maps, the model was created by "natural neighbor" interpolation between the data points.

In general, the groundwater elevation contours trend similar to the depth to groundwater contours for the Tule River. Groundwater contours diverge beneath the Tule River, indicating the Tule River is a losing stream. Groundwater elevation contours generally do not diverge beneath Deer Creek in the southwest TBWQC area, most likely a result of relatively small volumes of water normally flowing through these streams.

Groundwater elevation data from 1920 through 2014 were tabulated and shown below in **FIGURE 8: HISTORICAL AVERAGE GROUNDWATER ELEVATION**. For each year, the groundwater elevation data (relative to mean sea level) were averaged to estimate the pattern of change in groundwater elevation in the TBWQC area. Based on the averages for each year, the average groundwater elevation has decreased approximately 138-feet since 1920.

FIGURE 8: HISTORICAL AVERAGE GROUNDWATER ELEVATION



Groundwater contours diverge from the path of the Tule River and White River as indicated on **ATTACHMENT K: 2013 SPRING DEPTH TO GROUNDWATER CONTOURS** and **ATTACHMENT L: 2014 SPRING DEPTH TO GROUNDWATER CONTOURS.** The elevation of the groundwater table above mean sea level in the TBWQC is identified in **ATTACHMENT M: 2014 SPRING GROUNDWATER ELEVATION**. General groundwater flow directions beneath the TBWQC area are depicted by arrows crossing the water table contours (equipotential lines) on Attachment M. The groundwater gradient and direction of flow are generally westward across the TBWQC area with four localized depressions near Richgrove, Poplar-Cotton Center, Alpaugh, and west of Tipton. Flowlines converging to these four depressions indicate they are areas of increased groundwater pumping assuming homogenous and isotropic conditions. However, actual geologic conditions are heterogeneous and anisotropic and therefore the resulting depressions may be a combination of many factors, some of which could be water well pumping centers, geologic structural and/or stratigraphic conditions, and soil texture.

1. Data Gaps and Assumptions

Well construction information was not considered. Total depth and screened interval for each well were unknown. Only wells constructed in the alluvial deposits west of the foothills and Sierra Nevada Mountain Range were used. Groundwater wells, and therefore depth to groundwater data, were not available where the areas of the maps are void of contours. Groundwater was assumed to be unconfined for each data point. Depth to groundwater data were assumed to be referenced from the top of well casing for each well. The differences in depth to groundwater and groundwater elevation did not account for variables such as well construction. Well construction information was not available for each well. Groundwater elevations were assumed relative to mean sea level, when not indicated.

F. Groundwater Storage

Permeable deposits within the TBWQC area contain stored volumes of water that are replenished via recharge or expelled by discharge. The groundwater stored within aquifers of the San Joaquin Valley is used extensively for irrigation, among many other uses. Changes in groundwater storage in the 1960's resulted in large amounts of subsidence along the west side of

the San Joaquin Valley. In recent decades, the construction of surface water delivery systems throughout the valley have resulted in less pumping and reduction of storage. However, the Tule Basin is still experiencing large declines in groundwater levels and the accompanying increased depletion of groundwater storage (*USGS, 2009*).

Based on DWR, Bulletin 118, the estimated capacity and water in storage of the Tulare Lake Basin is stated as follows:

> *"Estimations of the total storage capacity of the subbasin and the amount of water in storage as of 1995 were calculated using an estimated specific yield of 9.5 percent and water levels collected by DWR and cooperators. According to these calculations, the total storage capacity of this subbasin is estimated to be 14,600,000 acre-feet to a depth of 300 feet and 94,100,000 acre-feet to the base of fresh groundwater. These same calculations give an estimate of 9,100,000 acre-feet of groundwater to a depth of 300 feet stored in this subbasin as of 1995 (DWR 1995). According to published literature, the amount of stored groundwater in this subbasin as of 1961 is 33,000,000 acre-feet to a depth of <1000 feet (Williamson 1989)."*

G. Relative Permeability of Deposits

The alluvial deposits generally increase in permeability from east to west across the TBWQC area. The soil mantle overlying the dissected uplands and crystalline bedrock along the east side of the area are relatively thin and immature. These deposits generally have low groundwater yield with relative low permeability to no permeability.

1. Consolidated Rocks

Fractures, joints, and faults within the Pre-Tertiary consolidated basement complex metamorphic and igneous rocks yield relatively small quantities of water. The crystalline rock matrix is relatively impermeable. The Tertiary consolidated sandstone, siltstone, and shale marine rocks overlying the basement complex rocks generally do not yield freshwater.

2. Unconsolidated Deposits

The Tertiary and Quaternary continental deposits overlying the marine sediments are a maximum of 2,000-feet thick, moderately permeable, semi-confined to confined, from which wells yield large quantities of groundwater. The overlying oxidized deposits are a maximum of 500-feet thick, poorly permeable, semiconfined, and wells generally yield low volumes of water. These deposits consist of sand, silt, and clay with gravel deposits and well developed soils in the oxidized zone.

Quaternary age older alluvial fan deposits overlie the lacustrine and marsh deposits and are a maximum 1,000-feet thick, unweathered, reduced, silty sand, clay, very fine to coarse sand, moderately permeable, semiconfined and confined. Overlying the older reduced deposits are a maximum of 600-feet of oxidized gravels, silt, clay, and very fine to coarse sand. This layer is highly permeable, unconfined and semiconfined. The reduced and oxidized older alluvial deposits yield large quantities of freshwater and are the major aquifer source throughout the region.

Overlying the older alluvium are recent younger alluvial fan deposits of sand, gravel, silty sand, silt, and clay. These younger deposits are weakly oxidized and reduced with poorly developed soil profiles. This unit is a maximum 55-feet thick, highly permeable, unconfined, and is largely unsaturated and a conduit for recharge to underlying sediments.

Overlying the younger alluvium are surficial poorly permeable recent flood basin deposits of silt, clay, and fine sand that are unconfined. The flood basin deposits are relatively impermeable silt and clay interbedded with some moderately to poorly permeable fine sand layers that interfinger with the younger alluvium.

To the west beneath the communities of Porterville, Poplar-Cotton Center, Woodville, Tipton, Pixley, and Earlimart, the younger alluvial fan and basin rim deposits are permeable to moderately permeable. Basin soils along the west boundary of the study area are poorly permeable to nearly impermeable, especially the confining clays of the Tulare Formation (*Davis et. al., 1959*).

TABLE 7: RELATIVE PERMEABILITY OF DEPOSITS provides a generalized tabulation of the deposits and relative permeabilities adapted from Croft and Gordon (*1968*).

TABLE 7: RELATIVE PERMEABILITY OF DEPOSITS AND ROCK UNITS

System	Geologic Unit	Relative Permeability
Quaternary (recent)	Flood Basin Deposits	Poor
Quaternary - Pleistocene to Recent	Younger Alluvium	High
Quaternary - Pleistocene to Recent	Older Alluvium	Moderate to High
Tertiary and Quaternary - Pliocene and Pleistocene	Lacustrine and Marsh	Poor
Tertiary and Quaternary - Pliocene (?) and Pleistocene (?)	Continental Deposits	Poor to Moderate
Tertiary	Marine	Mostly brackish water. Least permeable deposits.
Pre-Tertiary	Basement Complex	Locally yields small quantities, otherwise virtually impermeable.

Hydraulic conductivities of soils throughout the central valley were measured from laboratory samples and estimated average vertical (*Kv*) and horizontal hydraulic (*Kh*) conductivities were reported by Bertoldi, et.al. (*1991*). **TABLE 8: LABORATORY HYDRAULIC CONDUCTIVITY VALUES OF UNCONSOLIDATED SEDIMENTS IN THE CENTRAL VALLEY** contains laboratory values of unconsolidated sediments as reported by Bertoldi, et.al.

TABLE 8: LABORATORY HYDRAULIC CONDUCTIVITY VALUES OF UNCONSOLIDATED SEDIMENTS IN THE CENTRAL VALLEY

Sediment	Average Vertical Hydraulic Conductivity		Average Horizontal Hydraulic Conductivity	
	ft./day	*cm/sec*	*ft/day*	*cm/sec*
Sand	11.5	4.06E-03	14	4.94E-03
Clayey Sand	NA	NA	NA	NA
Sand-Silt-Clay	0.02	7.06E-06	0.02	7.06E-06
Clayey Silt	0.0001	3.53E-08	NA	NA
Silty Sand	0.21	7.41E-05	0.16	5.64E-05
Sandy Silt	0.02	7.06E-06	0.13	4.59E-05
Silt	0.0002	7.06E-08	NA	NA
Silty Clay	0.0001	3.53E-08	0.002	7.06E-08
Clay	NA	NA	NA	NA

The horizontal hydraulic conductivity (*Kh*) average from 14-feet per day for sand to 0.002 feet per day for silty clay, as determined from laboratory tests of core samples. However, the average horizontal hydraulic conductivity of the entire Central Valley aquifer system is estimated to be 6 feet per day based on calibration of a regional groundwater flow model. This value is somewhat less than the average value for sand but probably reflects the lateral discontinuity of sand beds and more accurately represents the conductivity that controls groundwater flow on a regional scale (*Bertoldi, et. al., 1991*).

V. GROUNDWATER QUALITY

Groundwater quality in the TBWQC area is influenced by natural recharge from streams entering the valley from the Sierra Nevada Mountains to the East and imported CVP water from the Friant-Kern Canal. The TBWQC area lies regionally along the east and axial portions of the San Joaquin Valley. Davis (*1959*) characterized the east side of the valley with groundwater as bicarbonate type with low to moderate dissolved solids concentrations and the axial portion of the valley generally contains higher concentrations of dissolved solids than water on the east side.

Davis further divided groundwater into three vertical zones: unconfined, semiconfined, and confined. The confined water generally has lower concentrations of dissolved solids and higher percent sodium in addition to cation-exchange reactions.

Readily available groundwater quality data for the TBWQC area was obtained from the State Water Resources Control Board Groundwater Ambient Monitoring and Assessment program (*GAMA*), County of Tulare, and the Regional Water Resources Control Board, Dairy General Order Monitoring Program.

The GAMA database included data from the California Department of Public Health, California Department of Pesticide Regulation, California Department of Water Resources, State Water Resources Control Board Geotracker Electronic Deliverable Format, GAMA Domestic Well Project, United States Geological Survey (*USGS*), and USGS National Water Information System.

With each of these data sets, no information was available on the specific well from which the sample was taken. It was assumed that each water sample was drawn relatively from the same aquifer system.

A. Constituent Focus: Nitrate and Electrical Conductivity

The principal focus of groundwater quality, to determine the vulnerability lands from irrigated agriculture operations, was on the constituents of Nitrate (NO_3) and Salts measured as Electrical Conductivity (EC). In regards to the definition of Nitrate, the maximum contaminate level, and the potential sources, the General Order states:

> *"Nitrate from both agricultural and non-agricultural sources has resulted in degradation and/or pollution of groundwater beneath agricultural areas in the Central Valley. Available data (see Information Sheet and the PEIR) indicate that there are a number of wells within the Tulare Lake Basin Area that have exceeded the MCL for nitrate. Groundwater in the Tulare Lake Basin Area has been designated for drinking water uses; therefore, the water quality objective of 10 mg/L for nitrate plus nitrite (as nitrogen)* [or 45 mg/L nitrate as nitrate] *applies to groundwater in the Tulare Lake Basin Area. Where nitrate groundwater quality data are not available, information on the hydrogeological characteristics of the area suggest that significant portions of the Tulare Lake Basin Area are vulnerable to nitrate contamination. Sources of nitrate in groundwater include leaching of excess fertilizer, confined animal feeding operations, septic systems, discharge to land of wastewater, food processor waste, unprotected well heads, improperly abandoned wells, and lack of backflow prevention on wells".*

In regards to the definition of salt (*EC*), and the potential sources, the General Order states that by reducing and properly managing Nitrates, salts should be directly correlated and reduced:

> *"The Tulare Lake Basin Plan recognizes that degradation is unavoidable without a plan for removing salts from the Basin and that salt sources should be managed to the extent practicable to reduce the rate of groundwater degradation until there is a long-term solution to the salt imbalance….This Order requires actions that will reduce nitrate discharges and should result in practices that reduce salt loading".*

For the analyses completed in this report, the Nitrate (*NO_3*) Maximum Contaminant Level (*MCL*) was established as 45-mg/l and the Electrical Conductivity (*EC*) Secondary MCL as 1,000-µmhos/cm.

The nitrate concentration and EC measurements from the data sets available were compiled and spatially mapped within the TBWQC Boundary. The Nitrate concentrations are identified on **ATTACHMENT N: NITRATE CONCENTRATION IN WELLS FROM 1945-2014.** The EC measurements are identified on **ATTACHMENT O: ELECTRICAL CONDUCTIVITY MEASUREMENTS IN WELLS FROM 1945-2014.**

1. Data Gaps and Assumptions

Where not specified, nitrate concentrations were assumed to be in milligrams per liter. Units were assumed similar among data sets. Depth of each sample, well construction, and screened intervals were unknown for each well from which the water quality result was sampled. Quality control of sampling procedures was unknown. Analytical methods were unknown. Data sets were sorted for duplicate wells with the same parameters of latitude, longitude, result, and date. Well locations were defined by latitude and longitude, not well name. Concentrations of 0.0 were assumed as non-detects below the method detection limit.

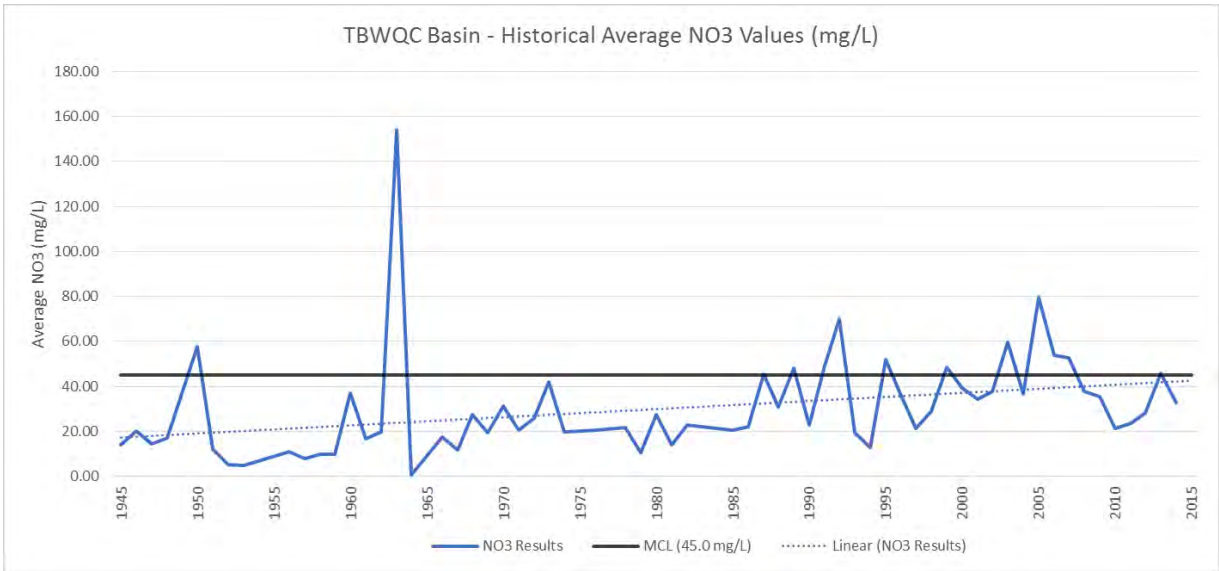
B. Nitrate and Electrical Conductivity Trends

1. Nitrate Trends

The datasets used to create the nitrate concentration maps were prepared and plotted on a chart showing the historical trend of nitrate in groundwater. First, the dataset was sorted by year and then the average nitrate value was calculated for each year. Yearly averages were used for the trend analysis to reduce the number of data points and smooth out any outliers in the dataset. The maximum value was 154-mg/L, the minimum value was 0.8-mg/L, the mean value was 30.36-mg/L, and the standard deviation was 22.85-mg/L.

The General Order water quality trigger limit for NO_3 is 45-mg/L. Of the 63 data points used for the yearly averages, 51 of the data points, or 81% of the data, were less than 45-mg/L. **FIGURE 9: HISTORICAL AVERAGE ANNUAL NITRATE CONCENTRATION (mg/L)** identifies the trends of the annual average NO_3 concentration between 1945 and 2014 throughout the TBWQC area.

FIGURE 9: HISTORICAL AVERAGE ANNUAL NITRATE CONCENTRATION (mg/L)



Of the 13,361 total data points gathered that included a NO_3 concentration, 3,350 of these data points were equal to or above 45-mg/L (*25.1%).* A statistical analysis was performed on the data using ProUCL software, created by the United States Environmental Protection Agency (*USEPA*). Data points were not available for years 1949, 1954, 1955, 1965, 1975, 1977, 1983, and 2015. The histogram in **APPENDIX D: NITRATE STATISTICAL ANALYSIS** show the data to be positively skewed. If data are positively skewed, a gamma model for the confirmation of the fit test for skewed distributions is recommended. A Gamma Q-Q plot displaying the linear pattern of the data is presented in **APPENDIX D** showing the upward trend in NO_3 over time. A Mann-Kendall (M-K) statistical trend test can be used to determine increasing or decreasing trends in measurement values of the response variable, y, observed during a certain time period. Based on the M-K test, the data follow an increasing trend.

An outlier test was performed on the data set. Based on the box plot and outlier test in **APPENDIX D**, there is one outlier identified in the dataset.

The 95% upper confidence limit was computed for the data. According to EPA, the UCL95 of the mean is defined as follows:

> *"Many environmental decisions including exposure and risk assessment and cleanup decisions are made based upon the mean concentrations of the contaminants/constituents of potential concern (COPCs). To address the uncertainty associated with the sample mean, a 95% upper confidence limit (UCL95) is used to estimate the unknown population mean, μ1. A UCL95 is routinely used to estimate the exposure point concentration (EPC) term (EPA, 1992; EPA, 2002a). A UCL95 of mean represents that limit such that one can be 95% confident that the population mean, μ1, will be less than that limit with 95% confidence. From a risk point of view, a 95% UCL of mean represents a number that is health protective when used to compute risk and health hazards."*

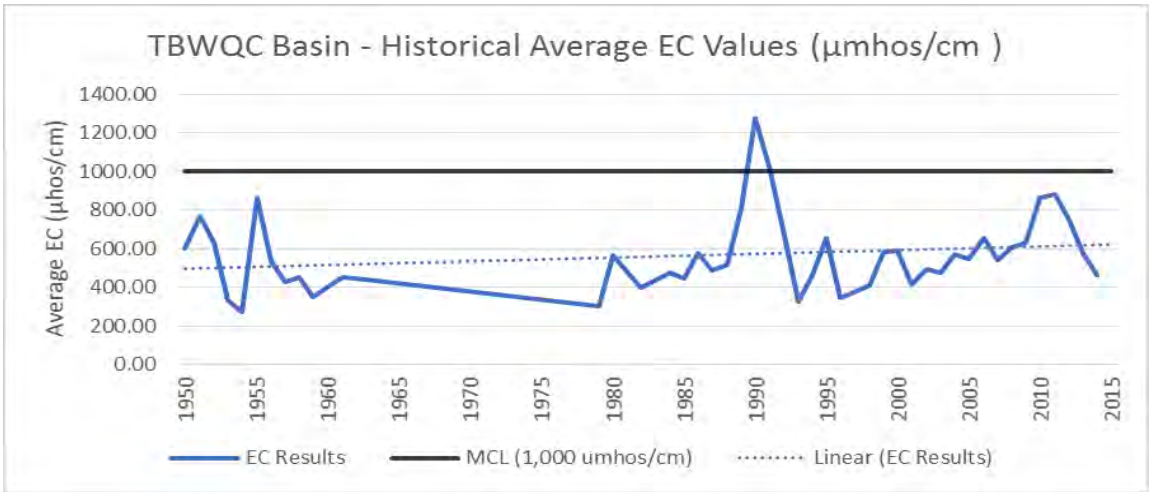
The UCL95 mean for the NO_3 data in **APPENDIX D** is 35.24-mg/L. There is 95% confidence that the population mean for the TBWQC area will be less than 35.24-mg/L.

2. Electrical Conductivity Trends

The datasets used to evaluate EC were prepared and plotted below on **FIGURE 10: HISTORICAL AVERAGE ANNUAL EC VALUES (µmhos/cm)** showing the historical trend of EC in groundwater from 1950 through 2014. EC values in the immediate area of Alpaugh were extremely high (>50,000-µmhos/cm) with respect to the rest of the TBWQC area. Data values greater than 5000-µmhos/cm were not used in the statistical analysis. The datasets were sorted by year and the average nitrate value was calculated for each year. The yearly average was used for the trend analysis to reduce the number of data points and smooth any outliers in the data set. The maximum value used was 1,604-µmhos/cm, the minimum value was 271-µmhos/cm. The mean value was 561-µmhos/cm and the standard deviation was 221.8-µmhos/cm.

The General Order water quality trigger limit for EC is 1,000-µmhos/cm. Of the 41 data points used for the yearly averages, 40 of the data points, or 98% of the data, were less than 1,604-µmhos/cm.

FIGURE 10: HISTORICAL AVERAGE ANNUAL EC VALUES (µmhos/cm)



Of 1,506 data points evaluated for EC, 186 data points were equal to or higher than 1,000-µmhos/cm *(12.3%).* A statistical analysis was performed on the data using ProUCL software, created by the United States Environmental Protection Agency (USEPA). Data points were not available for years 1960, 1963 through 1978, 1981, 1983, 1997, and 2015. Outlier values from 1989, 1990, 1991, and1992 were not included in the analysis. The histogram in **APPENDIX E: ELECTRICAL CONDUCTIVITY STATISTICAL ANALYSIS** show the data to be positively skewed. A gamma model for the "goodness of fit" test for skewed distributions was prepared. A Gamma Q-Q plot displaying the linear pattern of the data is presented in **APPENDIX E** and shows an increase in EC over time. A Mann-Kendall (M-K) statistical trend test can be used to determine increasing or decreasing trends in measurement values if the response variable, "*y*", observed during a certain time period. Based on the M-K test, the data follow an increasing trend.

An outlier test was performed on the dataset. Based on the box plot and outlier test in **APPENDIX E**, there is one outlier identified in the dataset.

The adjusted Gamma UCL95 mean for the EC data in **APPENDIX E** is 616.8-µmhos/cm. There is 95% confidence that the population mean within the TBWQC for EC will be less than 616.8-µmhos/cm.

C. Other Water Quality Constituents

The GAMA datasets available for Tulare County and Kern County were filtered for constituents listed on Table 5 of the General Order. A statistical summary of the chemical constituents/parameters simazine, total dissolved solids (TDS), boron, copper, lead, molybdenum, selenium, zinc, and pH is included in **TABLE 9: ADDITIONAL WATER QUALITY CONSTITUENTS**.

TABLE 9: ADDITIONAL WATER QUALITY CONSTITUENTS

Constituent	Trigger Limit	Units	No. of Wells	No. of Measurements	Range of Sample Dates	Max Value	Min. Value	Average	Units	No. Samples Over Trigger Limit
pH - Minimum	6.5	Units	282	318	1950-2013	9.80	6.4	7.71	Units	2
pH - Maximum	8.3	Units	282	318	1950-2013	9.80	6.4	7.71	Units	22
Boron (B)	1.0	mg/L	290	554	1950-2013	24.00	0.00	0.48	mg/L	28
Copper (Cu)	1.0	mg/L	184	653	1980-2014	0.90	0.00	0.02	mg/L	0
Dissolved Oxygen	7.0	mg/L	7	10	2005-2011	4.60	0.64	3.02	mg/L	10
Lead (Pb)	15.0	µg/L	201	613	1980-2014	489	0.00	4.49	µg/L	197
Molybdenum (Mo)	N/A	µg/L	62	78	1986-2012	14,000	0.00	758.88	µg/L	N/A
Selenium (Se)	50.0	µg/L	189	639	1980-2014	1,000	0.00	3.60	µg/L	5
Zinc (Zn)	5.0	mg/L	185	652	1980-2015	1.60	0	0.038228	mg/L	0
Simazine	4.0	µg/L	330	671	1984-2014	10.10	0.00	0.20	µg/L	2
Total Dissolved Solids (TDS)	500-1,000	mg/L	357	1,613	1950-2014	52,800	0	513.3627	mg/L	29

VI. VULNERABILITY ANALYSIS

A. Methodology and Rationale for Determining High Vulnerability areas

The high vulnerability area within the Tule Basin was determined qualitatively through readily available geologic and hydrogeologic information summarized in this report. The process and methodology used to assess the high vulnerability of the TBWQC area included a literature review of previous geologic and hydrogeologic studies as well as data compilation and analyses of available groundwater quality information. Data gaps exist and assumptions were made to complete the high vulnerability analysis. This analysis represents a broad-based qualitative analysis, created from recent work by the USGS and others.

The intent and purpose of the high vulnerability area model is to identify an approximate area of high vulnerability to contamination by reviewing hydrogeologic conditions and groundwater quality data. The goal was to create a two-dimensional bounded model of high vulnerability showing permeability of soil and deposits in the TBWQC area. It is anticipated that future groundwater monitoring in the TBWQC area will refine the model taking into account variables such as growers' best management practices, groundwater statistical analyses, field investigations, and laboratory analyses of groundwater and/or soil properties. Better refinement over time with reliable quality controlled field and laboratory methods and data analyses will create a more detailed and accurate model of the area. Future updates of this GAR will include more accurate and consistent data with the goal of creating a more refined dynamic model of the high vulnerability area.

Following is the step by step analysis in preparation of the TBWQC High Vulnerability Area Map.

B. State Water Resources Control Board Hydrogeologically Vulnerable Area Map and Department of Pesticide Regulation Groundwater Protection Areas

The first step in creating the TBWQC high vulnerability area was preparing a map of the State Water Resources Control Board (*SWRCB*) Hydrogeologically Vulnerable Area Map and Department of Pesticide Regulation (*DPR*) Groundwater Protection Areas (*GWPA*). The SWRCB and DPR areas within the TBWQC area are identified in **ATTACHMENT P: SWRCB HVA AND DPR GWPA MAP**.

DPR scientists used pesticide detection data, various statistical techniques, a mathematical model, and depth to groundwater data to identify vulnerable areas. These vulnerable areas where unmitigated use of certain pesticides is likely to contaminate groundwater were adopted in regulation as "ground water protection areas." The DPR GWPA covers 98,956-acres within the TBWQC boundary.

The SWRCB Hydrogeologic Vulnerability Area map was generated using published hydrogeologic information that indicated soil conditions may be more vulnerable (*or susceptible*) to groundwater contamination and to identify areas where geologic conditions are more likely to allow recharge at rates substantially higher than in lower permeability or confined areas of the same groundwater basin. The SWRCB HVA covers 401,037-acres within the TBWQC boundary.

C. Groundwater Vulnerability Elements

The second step in identifying the High Vulnerability Area was to evaluate the different potential vulnerability elements individually within the TBWQC Boundary. For each individual vulnerability

element, an individual high vulnerability sub-boundary was prepared. The individual vulnerability elements reviewed to specifically determine the high vulnerability areas were as follows:

- Boundary of irrigated agriculture parcels
- Boundary of surface and subsurface geologic deposits based on type of lithology as provided on **ATTACHMENT I: GEOLOGIC MAP OF THE TBWQC AREA**
- Boundary of relative permeability of deposits at different depths based on particle sizes of gravel, sand, silt, and clay
- Boundary of groundwater wells with nitrate and EC levels above the MCL.

The boundaries for each element were combined into a composite boundary to create the TBWQC high vulnerability area. A summary of each vulnerability element and rationale is discussed below.

1. **Irrigated Parcels - ATTACHMENT Q: IRRIGATED LANDS MAP**

A map of the TBWQC irrigated agriculture area was prepared to identify all of the current irrigated lands covering approximately 354,696-acres. The overall boundary includes non-irrigated parcels. A boundary was drawn along the irrigated parcels as the basis to define the limits of the high vulnerability area. The General Order covers irrigated lands within the Tulare Lake Basin and therefore the high vulnerability analysis performed is limited in scope to the irrigated agriculture parcels within the TBWQC Boundary.

2. **Geologic Vulnerability Analysis - ATTACHMENT I: GEOLOGIC MAP OF THE TULE BASIN STUDY AREA**

The geologic map of the TBWQC area shows surficial rock (foothills area) and soil, in addition to the subsurface E-Clay. The contact between the alluvial boundary and the crystalline Sierran bedrock is the location for the relative change in permeability along the east boundary of the TBWQC. The alluvial boundary was overlaid onto the geologic map and marks the east boundary of vulnerable area on the map.

Structure contours of the E-clay indicate the layer dips toward the west at depths ranging from approximately 150-feet, at the eastern extent, to approximately 700-feet below ground surface near the westernmost edge of the TBWQC boundary. The E-Clay is a confining layer with relatively low natural permeability and has been defined by numerous geological investigations.

The easternmost extent of the E-Clay marks the vertical western boundary on the geologic map. The E-clay is assumed to be relatively impermeable, continuous, and any wells drilled through it to be properly sealed with minimal to no vertical mixing of groundwater above and below the layer. Based on these assumptions, the E-Clay is treated as a subsurface barrier to vertical flow. The vulnerability boundary on the geologic map covers 240,649-acres within the TBWQC boundary.

3. **Relative Permeability – ATTACHMENT R.1: RELATIVE PERMEABILITY OF SOILS**

Relative permeability of surface soil and lower water-bearing deposits was also one of the geologic bases for determination of the high vulnerability model. The model boundary was created by overlapping permeability maps as multiple layers of relative

permeability to a depth of 200 feet below ground surface. Attachment R.1 shows young alluvial fan and basin rim surface soils as permeable to moderately permeable. The old alluvial fan soils are described as moderately to poorly permeable. The basin soils are described as poorly permeable to nearly impermeable. There is no description of permeability for the dissected uplands and mountain soils. From these general permeability descriptions, an outline of the permeable deposits was created around the young alluvial-fan and old alluvial-fan soils. The basin soils and dissected upland and mountain soils were excluded from the high vulnerability area on this map. The high vulnerability area identified from the relative permeability of surface soils covers 365,116-acres within the TBWQC boundary.

ATTACHMENT R.2: RELATIVE PERMEABILITY 10 – 50 FEET DEPTH BELOW GROUND SURFACE shows relative permeability (Attachment R.2) as created by Davis (*1959*) and reproduced by Davis (*1964*) that includes zones of relatively permeable gravel, sand, or sand and gravel deposits. The gravel, sand and sand and gravel deposits are mostly located within the older alluvial-fan deposits; the majority of them closer to the dissected uplands near the base of the foothills. The relatively permeable deposits in the 10 to 50-foot depth interval include the young alluvial-fan and basin rim soils, older alluvial-fan soils, gravel, sand, and sand and gravel deposits. The high vulnerability area of the relative permeability of deposits for 10 to 50-feet below ground surface covers 372,251-acres within the TBWQC boundary.

ATTACHMENT R.3: RELATIVE PERMEABILITY 50 TO 100 FEET DEPTH BELOW GROUND SURFACE presents relatively permeable deposits in the 50 to 100-foot depth range below ground surface. These deposits consist of gravel or sand or sand and gravel and are essentially vertically continuous from the 10 to 50-foot interval of **ATTACHMENT R.2**. The only exception is an additional lens of permeable sand and gravel near the northwest corner of the area. An east-west trending permeable deposit is situated just north of White River at the base of the dissected uplands/foothills area just west of the Town of Ducor. A second permeable zone is located between Deer Creek and Tule River near the base of the dissected uplands/foothills area between the Town of Terra Bella and City of Porterville. A third zone of permeability is located near the northwest corner of the TBWQC area below the western reach of the Tule River. Davis (1959) states the gravel strata are largely confined in the 50 to 100-foot depth zone near the Tule River. The high vulnerability area of the relative permeability of deposits for 50 to 100 feet below ground surface covers 53,273-acres within the TBWQC boundary.

ATTACHMENT R.4: RELATIVE PERMEABILITY 100 TO 200 FEET DEPTH BELOW GROUND SURFACE shows relatively permeable and relatively impermeable deposits beneath the TBWQC area. The gravel, sand and sand and gravel deposits are delineated as relatively impermeable deposits (*where gravel, sand, and sand and gravel constitute less than one-third of the deposits as estimated from well logs*). The major permeable deposits are found vertically continuous along the northerly side of White River just west of the Town of Ducor. Permeable deposits are identified south of the Tule River just west of the City of Porterville. A larger linear permeable deposit extends from the north side of Deer Creek northwest toward the TBWQC boundary and covers a large portion of the western extent of the Tule River service area within the TBWQC boundary. The high vulnerability boundary of the relative permeability deposits for 100 to 200-feet below ground surface covers 94,353-acres within the TBWQC area.

4. **Nitrate in Groundwater Wells - ATTACHMENT N: NITRATE CONCENTRATIONS IN WELLS FROM 1945-2014**

Using the Nitrate Concentration Map, **ATTACHMENT N: NITRATE CONCENTRATIONS IN WELLS FROM 1945-2014**, a boundary was drawn around those areas where nitrates exceeded the MCL of 45-mg/l. A major portion of nitrate exceedances trend across the northern half of the TBWQC area. This may be due to more groundwater well data-points in the area. A total of 3,841 data points were used from 3,377 wells within the TBWQC area from years 1945 through 2014 (*some wells had multiple sample points and the maximum value was identified on the map*). The sources of data are summarized in **APPENDIX F: NITRATE DATA SOURCE**. The high vulnerability area based on the Nitrate concentrations map covers 229,553-acres within the TBWQC area.

5. **Electrical Conductivity in Groundwater Wells - ATTACHMENT O: ELECTRICAL CONDUCTIVITY IN WELLS, 1945-2014**

Using the EC Concentration Map, **ATTACHMENT O: ELECTRICAL CONDUCTIVITY IN WELLS, 1945-2014**, a boundary was drawn around the areas where EC exceeded the secondary MCL of 1,000-µmhos/cm. A majority of the EC exceedances trend across the northern portion of the TBWQC area. A total of 1,471 data points were used from 1,253 wells within the TBWQC area from years 1945 through 2014 (*some wells had multiple sample points and the maximum value was identified on the map*). The data are summarized in **APPENDIX G: ELECTRICAL CONDUCTIVITY DATA SOURCE**. As with nitrate, the clustering in the northern portion may be due to more data points. The high vulnerability area based on the EC measurements map covers 108,394-acres within the TBWQC boundary.

D. TBWQC High Vulnerability Area

The vulnerability elements were overlaid onto the TBWQC boundary map and combined into a composite high vulnerability area (*HVA*) map. The composite HVA map is presented in **ATTACHMENT S: COMPOSITE HIGH VULNERABILITY AREAS MAP** indicating each high vulnerability area for the groundwater vulnerability elements. The TBWQC High Vulnerability Area Map was prepared based on the composite high vulnerability areas map and is provided on **ATTACHMENT T: TBWQC HIGH VULNERABILITY AREA MAP**. The TBWQC High Vulnerability Area covers 404,158-acres within the 599,879-acre TBWQC area (67 %).

VII. PRIORITIZATION OF HIGH VULNERABILITY GROUNDWATER AREAS

To help focus the efforts of future monitoring and management plan efforts, the high vulnerability areas will be prioritized based upon the following factors:

- Groundwater quality trends of degradation for EC and NO_3 with priority consideration given to the following:
    - Proximity to the urban and rural communities that rely on groundwater
    - The largest acreage commodity types comprising of 80% of the TBWQC member irrigated agriculture.

The factors to be considered for prioritization and determination of the focus of where Groundwater Quality Management Plans should occur are the historical trends of water quality of Nitrate and Salts, based upon the results collected by the TBWQC during the annual groundwater monitoring, along with the criteria approved under the Groundwater Trend Monitoring Workplan. High priority areas will be determined based on an increasing trend of salts or nitrates in a particular well or area consecutively over a three year period.

When the high priority areas are established within the high vulnerability area, essential data provided by the TBWQC Members from the Farm Evaluation Survey and Nitrogen Management Plan Summary will be available to assist in identifying the potential source(s) that might affect the local groundwater quality.

A. Proximity to Urban and Rural Communities that Rely on Groundwater

Communities which are reliant on groundwater in the urban and rural locations within the TBWQC boundary, as well as disadvantaged unincorporated communities and disadvantaged communities that have been identified in proximity to the high vulnerability areas (**ATTACHMENT C**). As the trends in Nitrate and Salts are developed, the areas with increasing trends around these communities will become of highest priority.

B. Largest Acreages of Commodity Types Comprising 80% of Irrigated Agriculture

The TBWQC 2014-2015 Member crops as of January 31, 2014 comprising up to at least 80% of the irrigated agricultural acreage of all the crops are citrus, deciduous fruits and nuts, and vineyards. A summary of the total irrigated acres of the TBWQC members is identified in **TABLE 10: TBWQC 2014-2015 MEMBER IRRIGATED ACRES BY CROP CATEGORY**.

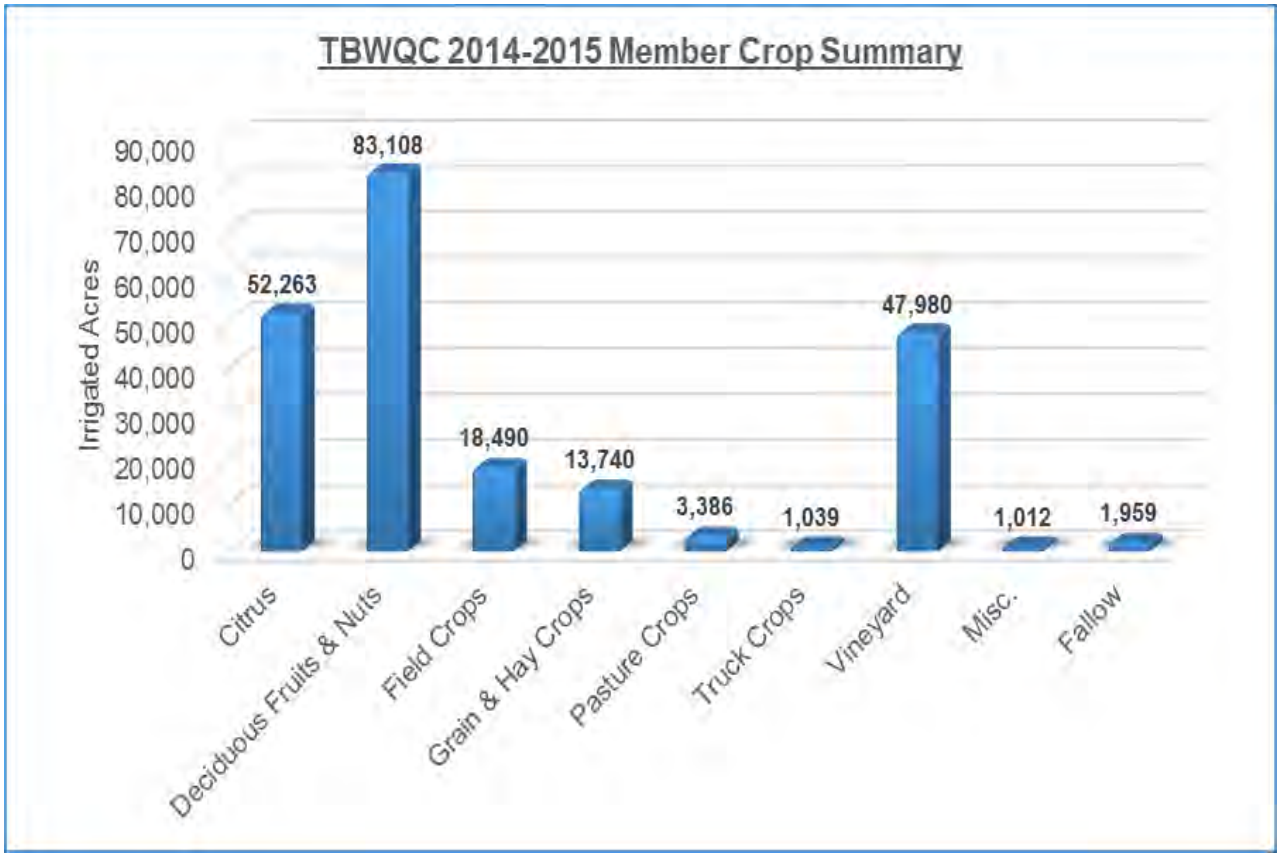
TABLE 10: TBWQC 2014-2015 MEMBER IRRIGATED ACRES BY CROP CATEGORY

TBWQC 2014-2015 Crop Chart

Crop	*Area (acres)*	*Parcels*
Citrus	52,263	1,966
Deciduous Fruits & Nuts	83,108	1,330
Field Crops	18,490	193
Grain & Hay Crops	13,740	254
Pasture Crops	3,386	93
Truck Crops	1,039	20
Vineyard	47,980	709
Misc.	1,012	47
Fallow	1,959	331
TOTAL:	**222,976**	**4,944**

Based upon the data in **TABLE 10**, approximately 183,351 irrigated acres *(82.2%)* are Citrus, Deciduous Fruits and Nuts, and Vineyard crops, which also includes 4,005 parcels *(81.0%)* of the total irrigated parcels. **FIGURE 11: TBWQC 2014-2015 MEMBER IRRIGATED ACRES** displays the crop categories within the TBWQC area.

FIGURE 11: TBWQC 2014-2015 MEMBER IRRIGATED ACRES



The lands covered by these commodities will be a focus of high priority in determining the effectiveness of management practices associated with the irrigation and fertilization practices of the members, as part of the Management Practice Evaluation Plan.

C. Basis for Development of Management Practice Evaluation Program

The TBWQC has elected to participate in the group option for developing the Management Practice Evaluation Workplan required under the General Order. The participants of the group plan include all of the Coalitions within the Tulare Lake Basin except the Buena Vista Water Quality Coalition and the Westside Coalition.

The basis for developing a workplan to evaluate the effectiveness of current agricultural management practices for protection of groundwater quality is consistent with the General Order requirements and include:

1. Identify whether existing site-specific and/or commodity-specific management practices are protective of groundwater quality within the high vulnerability groundwater areas
2. Determine if newly implemented management practices are improving or may result in improving groundwater quality
3. Develop an estimate of the effect of the Members' discharges of constituents of concern on groundwater quality in high vulnerability areas
4. Utilize the results of evaluated management practices to determine whether practices implemented, as represented by Members, need to be improved.

The workplan may include the following tools or methods used to associate management practice activities on the land surface with the effect of those activities on underlying groundwater.

- Outreach to members
- Best management practices review and modification (*if necessary*)
- Wellhead protection
- Vadose zone sampling
- Groundwater monitoring
- Groundwater quality statistical analyses and modeling.
- Soil Analysis

D. Basis for Evaluation of Groundwater Quality Management

The basis for evaluation of Groundwater Quality Management Practices will be focused on those areas within the high vulnerability areas and the following criteria:

- A trend in degradation of Nitrate and/or Salts based upon three (3) consecutive years of data from the wells identified within the approved Groundwater Trend Monitoring Workplan

The main elements of the Groundwater Quality Management Practices evaluation will include the following:

- Investigation of potential sources of waste discharges to groundwater
- Review the physical setting information for the high priority areas such as geologic factors and existing water quality data.

- Considering the above elements, develop a strategy with schedules and milestones to implement management practices identified by the MPEP
- Develop a focused monitoring strategy to provide feedback on GQMP progress
- Develop methods to evaluate data collected under the GQMP
- Provide reports to the Central Valley Water Board on progress.
- Provide outreach to those TBWQC members within a GQMP high priority area

VIII. GROUNDWATER QUALITY TREND MONITORING WORKPLAN

Upon receiving the RWQCB Executive Officer written approval of this report, a Groundwater Quality Trend Monitoring Workplan (*Workplan*) will be prepared and submitted within one (*1*) year of that date. The overall objectives of groundwater trend monitoring are to determine current water quality conditions of groundwater relevant to irrigated agriculture and develop a long-term groundwater quality dataset that can be used to evaluate the regional effects of irrigated agriculture management practices within the TBWQC area.

A. Existing Groundwater Monitoring Programs

Following is a summary of the current depth to groundwater monitoring programs within the TBWQC area, which wells and data will be used for the initial development of the monitoring well network:

Bureau of Reclamation- Friant Division: The United States Department of the Interior, Bureau of Reclamation (USBR) Central Valley Project, Friant-Kern Canal system was completed in the 1950's. Several Irrigation Districts within the TBWQC area are contractors with the USBR and receive surface water from the Project when available. Each contractor is required to monitor depths to groundwater and submit the data to the USBR annually.

Deer Creek and Tule River Authority Groundwater Management Plan: The Deer Creek and Tule River Authority (*DCTRA*) implemented a Groundwater Management Plan for monitoring the depth of existing groundwater of approximately 200 existing wells, and for the development and management of the surface waters and groundwater resources of the Authority area. The original Groundwater Management Plan was adopted by the DCTRA Board on March 24, 1995, updated in July 2006, and updated again in November 2012. The Groundwater Management Plan meets the statutory requirements of the California State Legislature passed Assembly Bill 255 (*AB 255*) passed in 1989, allowing local public agencies in any of the 11 groundwater basins that were identified by DWR Bulletin 118-80, as critically overdrafted, to undertake management of groundwater. On January 1, 1993, AB 3030 became effective, superseding AB 255. AB 3030 authorized local agencies that are within the groundwater basins, as defined by DWR Bulletin 118, to prepare and adopt groundwater management plans. The DWR Bulletin 118-80 identified the Tule Basin to be a Basin subject to critical overdraft. The Legislature found and declared that additional study of groundwater is necessary to better understand how to manage groundwater effectively to ensure the safe production, and to maintain high quality and proper storage of groundwater. In September of 2002, the California State Legislature adopted Senate Bill 1938, which amended California Water Code Section 10750 requiring new groundwater management plans to include documentation "describing the manner in which interested parties may participate in developing the groundwater management plan". In 2003, DWR Bulletin 118, Appendix C was updated to include recommended components for a Groundwater Management Plan. The original DCTRA Groundwater Management Plan was adopted in 1995 per AB 3030 and updated to meet the requirements of SB 1938 and DWR Bulletin 118 in 2006 and again updated in 2012.

California Statewide Groundwater Elevation Monitoring (CASGEM): On November 4, 2009 the State Legislature amended the Water Code with SBx7-6, which mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. The DCTRA provides the monitoring for CASGEM for the Tule Basin and submits spring and fall groundwater depths data each year.

Data from these existing programs will be incorporated into the development of the Workplan, and when possible, include those existing wells as candidates of the TBWQC area groundwater monitoring network.

B. Methodology for Establishing Groundwater Monitoring Well Network

The objectives of the Workplan are (*1*) to determine current water quality conditions of groundwater relative to adequacy for irrigated agriculture, and (*2*) to develop long term groundwater quality information that can be used to evaluate regional effects of irrigated agriculture. To implement the objectives, a groundwater monitoring well network will be developed that covers both the high and low vulnerability areas within the TBWQC boundary and includes existing wells at depths where drinking water is pumped. The proposed methodology to establish the monitoring network will be as follows:

- Within the High Vulnerability Area, identify four (4) wells per Township, one (1) well in each quadrant (*nine Section area*).
- Within the Low Vulnerability Area, identify two (2) wells per Township, one (1) well in each half of the Township.
- The primary wells will be monitored for water quality one time annually to assist in understanding the local variations of groundwater quality and depth.
- A secondary well will be identified for each primary well selected, to be monitored if the primary well is no longer in operation or abandoned. The secondary well will be monitored once every 5 years to verify the primary well groundwater quality and depth.

C. Basis for Selecting Groundwater Monitoring Well Network

As part of the development of the Workplan, identification of the existing wells to be candidates within the monitoring network for depth to groundwater are as follows:

- TBWQC Member well which will allow for site access
- Availability of a Well Completion Report for the well to verify the construction including the well seal, casing depth, and perforations.
- Select domestic wells. In areas where there are no domestic wells, identify an agriculture well that has a similar construction and depth as a domestic well.
- Field verify that the well is properly maintained and has adequate wellhead protection.
- Wells in the existing groundwater monitoring program will be evaluated for inclusion.

Note that each well selected to be a part of the monitoring network will be surveyed by a licensed land surveyor to determine the exact location and ground elevation of the well.

IX. SUMMARY AND RECOMMENDATIONS

A. Summary and Map of High Vulnerability Areas

This GAR provides the technical basis for the scope and level of effort for implementation of the General Order's groundwater monitoring and implementation provisions. The TBWQC area covers approximately 599,880-acres within the watersheds of the natural water courses of Tule River, Deer Creek, and White River and contains approximately 365,680-acres of irrigated agriculture, including the dairies, of the Tule Basin.

The intent and purpose of the high vulnerability area analyses is to define an approximate area within the boundary of the TBWQC that has high vulnerability for reduced groundwater quality by reviewing hydrogeologic conditions and existing groundwater quality data. The high vulnerability area within the Tule Basin was determined qualitatively through readily available geologic and hydrogeologic information. The process and methodology used to determine the high vulnerability areas included a literature review of previous geologic and hydrogeologic studies as well as data compilation and analyses of available existing groundwater quality information. The analyses represents broad-based qualitative analyses, created from recent work by the USGS and others. It is anticipated that future groundwater monitoring in the TBWQC area will refine the analysis taking into account variables such as growers' best management practices, groundwater statistical analyses, field investigations, and laboratory analyses of groundwater quality.

A series of high vulnerability area maps were prepared based on geomorphic and geologic boundaries, irrigated acreage, relative permeability of alluvial deposits, existing nitrate concentrations, and existing electrical conductivity measurements within the TBWQC area. From these maps, a composite high vulnerability map was prepared to encompass the groundwater vulnerability elements. A total of 404,158-acres are within the TBWQC high vulnerability area as indicated on **ATTACHMENT T: TBWQC HIGH VULNERABILITY AREA MAP**.

B. Groundwater Quality Trend Monitoring Workplan Program

The methodology proposed for preparation of the Groundwater Quality Trend Monitoring Workplan for establishing the groundwater monitoring well network will include the monitoring of existing wells, primarily domestic, within the TBWQC Boundary. The monitoring network will have four (*4*) wells per Township covering lands within the High Vulnerability Areas and (*2*) wells per Township covering lands within the Low Vulnerability Areas. Based upon the High Vulnerability Area identified within this report, the total estimated number of existing wells planned to be included in the groundwater monitoring network is 72 wells.

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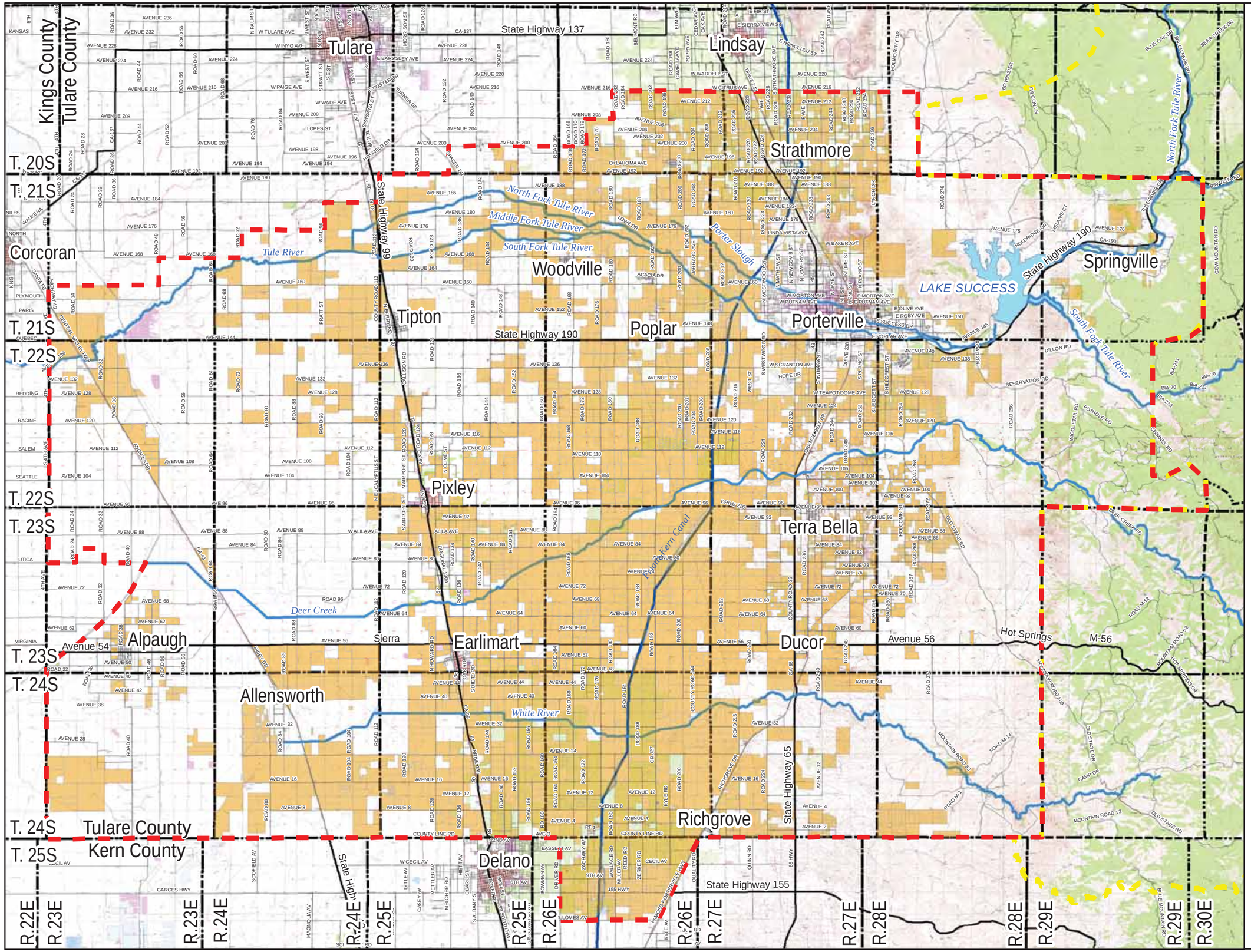
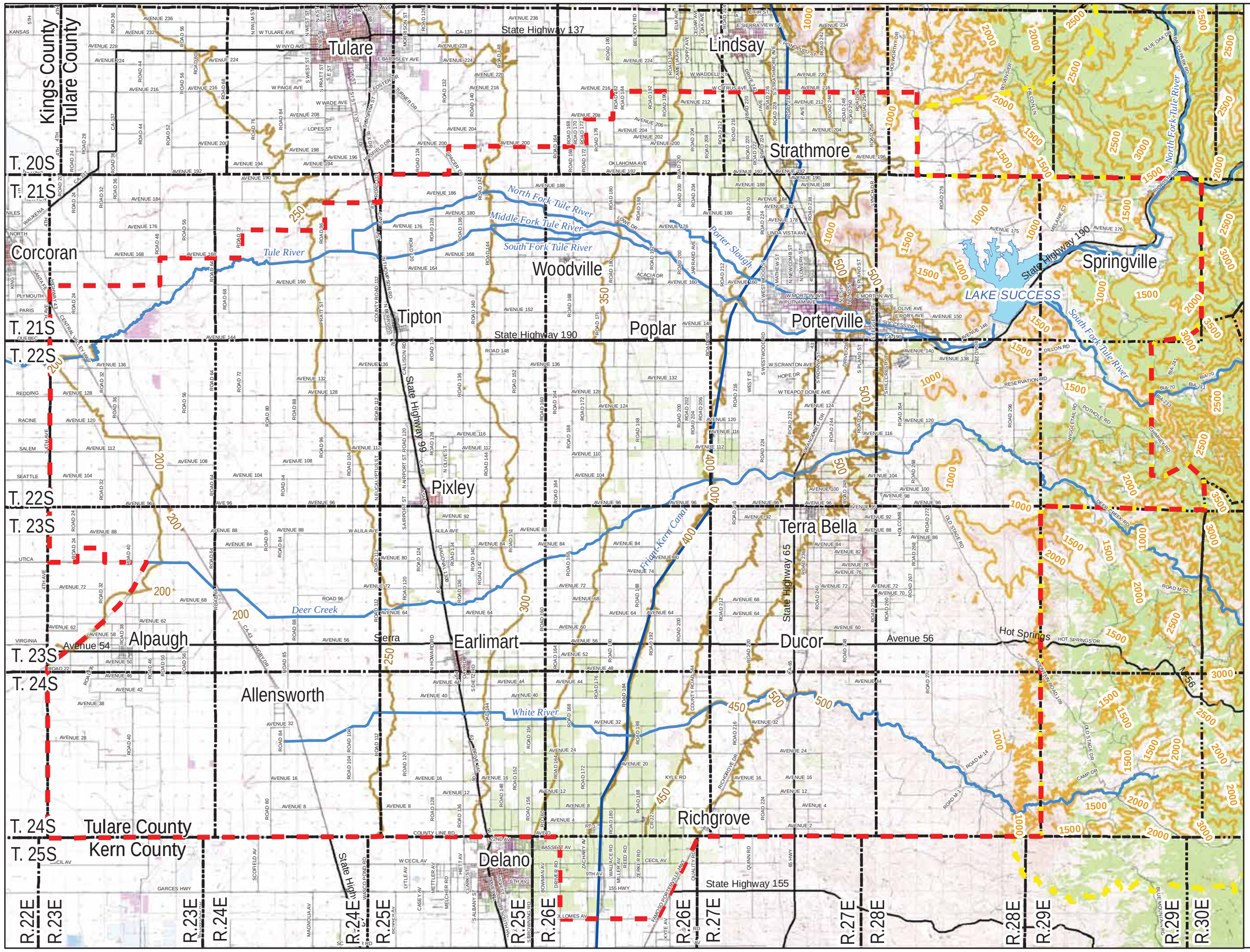
ATTACHMENT A
TBWQC Current Member Parcels 2014-2015



ATTACHMENT B
USGS Quadrangle Map



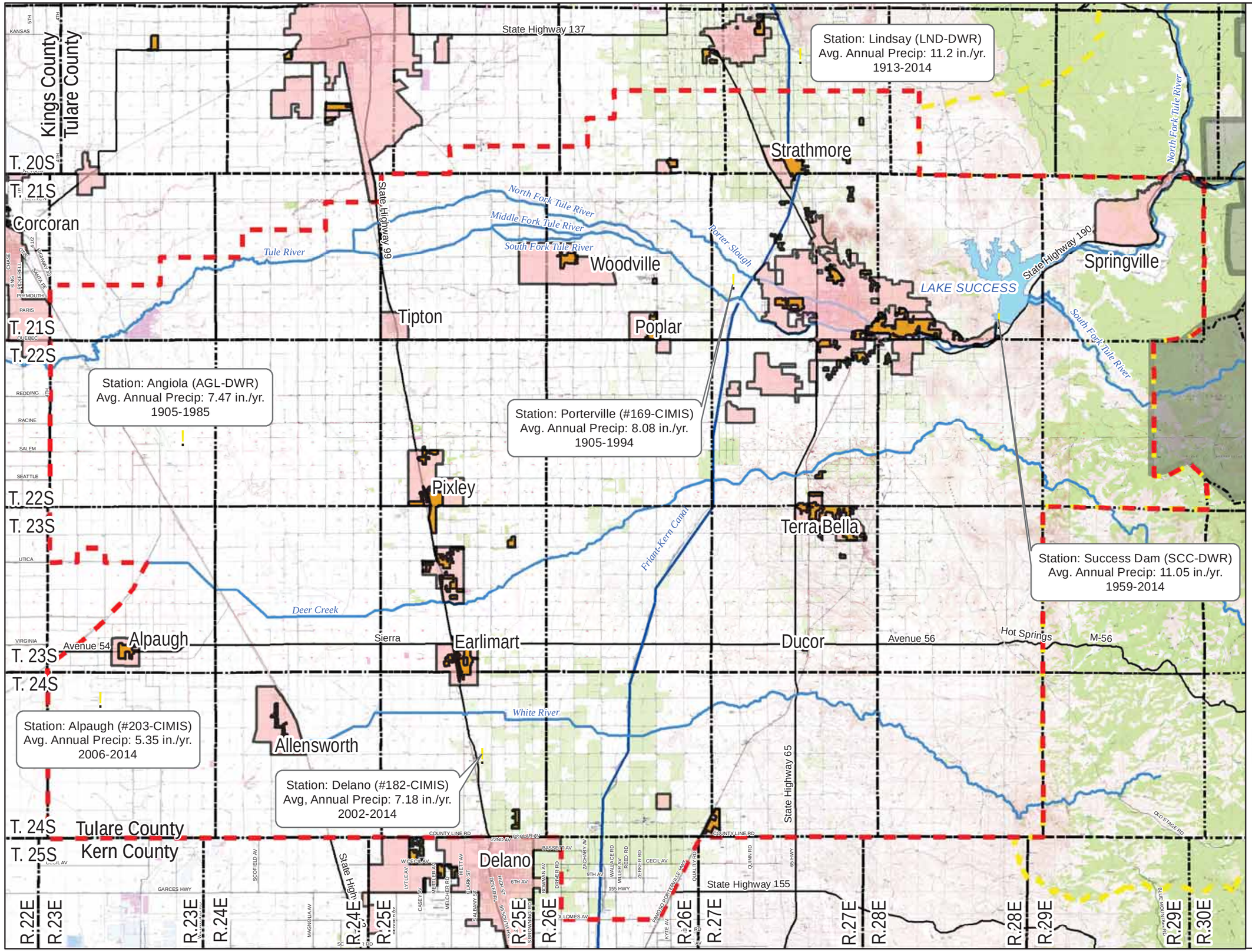
Legend

- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads
- 50' Contour Interval (Valley Floor)
- 500' Contour Interval

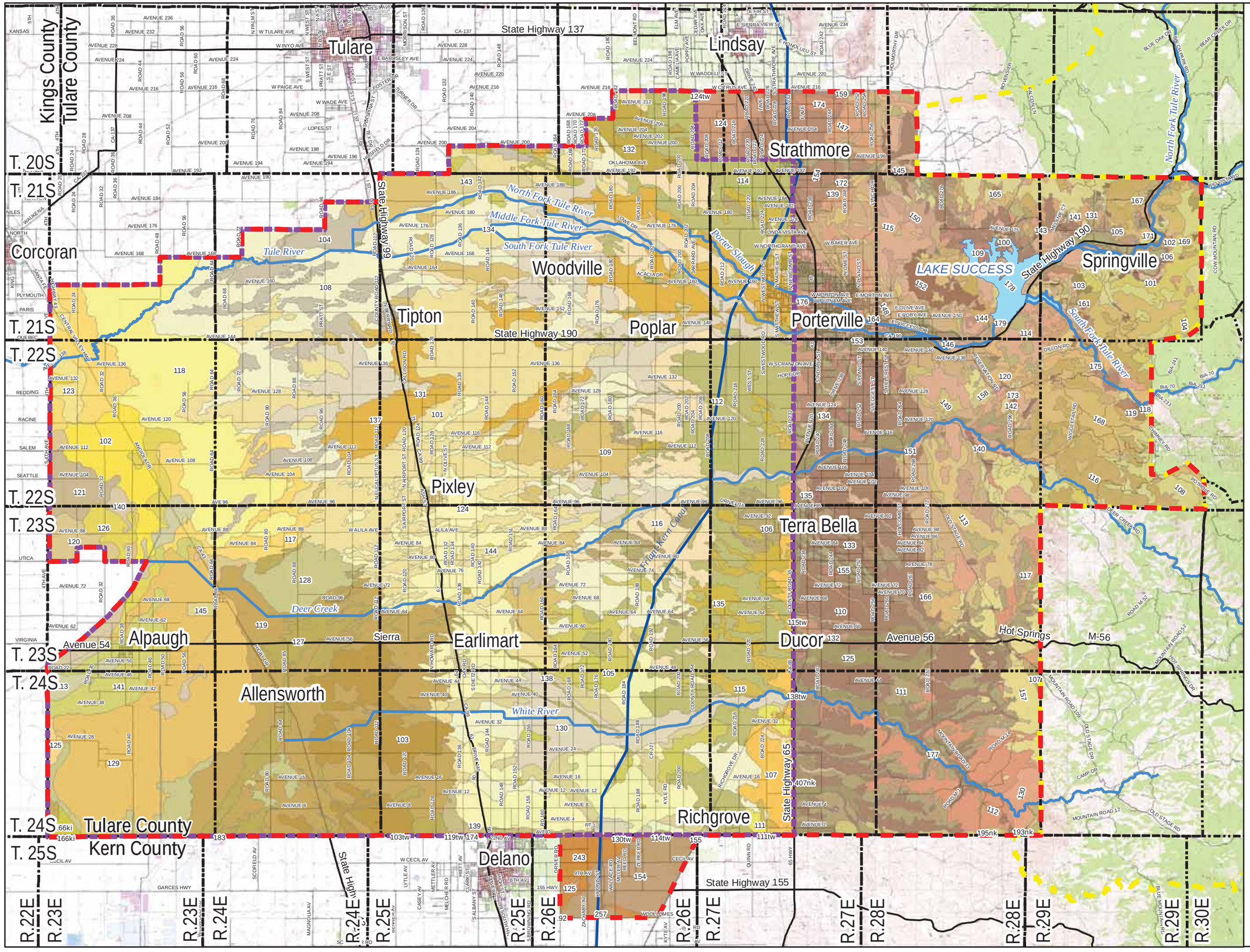
N

1 in = 4 miles

ATTACHMENT C
TBWQC Climate and Demographics Map



ATTACHMENT D
NRCS Soil Survey Map of TBWQC



Legend

- TBWQC Boundary
- Supplemental TBWQC Boundary
- Soil Map Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads

1 in = 4 miles

ATTACHMENT D.1
NRCS Soil Survey
Soil Type Legend

Map Units-Central Tulare County

- 100 - Auberry sandy loam, 5 to 9 percent slopes
- 101 - Auberry sandy loam, 9 to 15 percent slopes
- 102 - Auberry sandy loam, 15 to 30 percent slopes
- 103 - Auberry sandy loam, 30 to 50 percent slopes
- 104 - Auberry-Rock outcrop complex, 9 to 50 perce*
- 105 - Blasingame sandy loam, 9 to 15 percent slop*
- 106 - Blasingame sandy loam, 15 to 30 percent slo*
- 107 - Blasingame sandy loam, 30 to 50 percent slo*
- 108 - Blasingame-Rock outcrop complex, 9 to 50 pe*
- 109 - Centerville clay, 0 to 2 percent slopes
- 110 - Centerville clay, 2 to 9 percent slopes
- 111 - Centerville clay, 9 to 15 percent slopes
- 112 - Centerville clay, 15 to 30 percent slopes
- 113 - Cibo clay, 15 to 30 percent slopes
- 114 - Cibo clay, 30 to 50 percent slopes
- 115 - Cibo-Rock outcrop complex, 15 to 50 percent*
- 115tw - Exeter loam, 2 to 5 percent slopes
- 116 - Cieneba-Rock outcrop complex, 15 to 75 perc*
- 117 - Clear Lake clay, drained
- 118 - Coarsegold loam, 15 to 30 percent slope
- 119 - Coarsegold loam, 30 to 50 percent slopes
- 120 - Coarsegold-Rock outcrop complex, 15 to 50 p*
- 124 - Exeter loam, 0 to 2 percent slopes
- 124tw - Hanford sandy loam, 0 to 2 percent slopes
- 125 - Exeter loam, 2 to 9 percent slopes
- 130 - Friant-Rock outcrop complex, 15 to 75 perce*
- 131 - Grangeville silt loam, drained
- 132 - Greenfield sandy loam, 0 to 2 percent slopes
- 133 - Greenfield sandy loam, 2 to 5 percent slopes
- 134 - Havala loam, 0 to 2 percent slopes
- 135 - Havala loam, 2 to 5 percent slopes
- 138tw - Tujunga loamy sand, 0 to 2 percent slopes
- 139 - Honcut sandy loam, 0 to 2 percent slopes
- 140 - Honcut sandy loam, 2 to 5 percent slopes
- 141 - Las Posas loam, 9 to 15 percent slopes
- 142 - Las Posas loam, 15 to 30 percent slopes
- 143 - Las Posas loam, 30 to 50 percent slopes
- 144 - Las Posas-Rock outcrop complex, 9 to 50 per*
- 145 - Lewis clay loam
- 146 - Pits
- 147 - Porterville clay, 0 to 2 percent slopes
- 148 - Porterville clay, 2 to 9 percent slopes
- 149 - Porterville clay, 9 to 15 percent slopes
- 150 - Porterville cobbly clay, 2 to 15 percent sl*
- 151 - Riverwash
- 152 - Rock outcrop
- 153 - San Emigdio loam
- 154 - San Joaquin loam, 0 to 2 percent slopes
- 155 - San Joaquin loam, 2 to 9 percent slopes
- 157 - Sesame sandy loam, 15 to 30 percent slopes
- 158 - Sesame sandy loam, 30 to 50 percent slopes
- 159 - Seville clay
- 161 - Trabuco loam, 15 to 30 percent slopes
- 164 - Tujunga sand
- 165 - Vista coarse sandy loam, 9 to 15 percent sl*
- 166 - Vista coarse sandy loam, 15 to 30 percent s*
- 167 - Vista coarse sandy loam, 30 to 50 percent s*
- 168 - Vista-Rock outcrop complex, 9 to 50 percent*
- 169 - Walong sandy loam, 15 to 30 percent slopes
- 171 - Walong-Rock outcrop complex, 15 to 50 perce*
- 172 - Wyman loam, 0 to 2 percent slopes
- 173 - Wyman loam, 2 to 5 percent slopes
- 174 - Wyman gravelly loam, 0 to 2 percent slopes
- 175 - Xerofluvents, flooded
- 176 - Yettem sandy loam, 0 to 2 percent slopes
- 177 - Yettem sandy loam, 2 to 5 percent slopes
- 178 - Water
- 179 - Dam
- 193nk - Chanac-Pleito complex, 2 to 5 percent slo*
- 195nk - Centerville-Delvar complex, 9 to 30 perce*
- 407nk - Centerville clay, 2 to 5 percent slopes

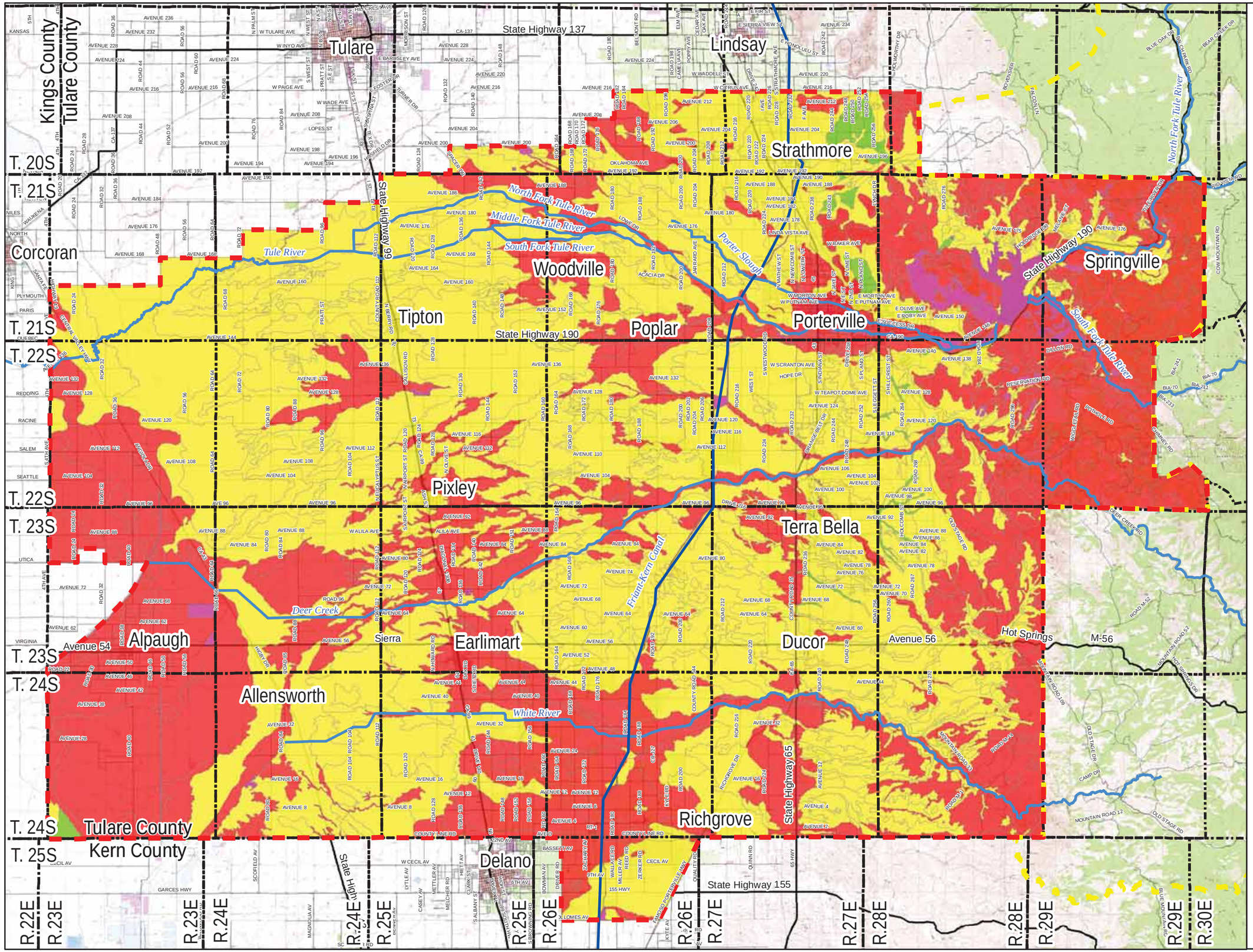
Map Units-Western Tulare County

- 101 - Akers-Akers, saline-Sodic, complex, 0 to 2 percent slopes
- 102 - Armona sandy loam, partially drained, 0 to 1 percent slopes
- 103 - Atesh-Jerryslu association, 0 to 2 percent slopes
- 104 - Biggriz-Biggriz, saline-Sodic, complex, 0 to 2 percent slopes
- 105 - Calgro-Calgro, saline-Sodic, complex, 0 to 2 percent slopes
- 106 - Centerville clay, 0 to 2 percent slopes
- 107 - Centerville clay, 2 to 5 percent slopes
- 108 - Colpien loam, 0 to 2 percent slopes
- 109 - Crosscreek-Kai association, 0 to 2 percent slopes
- 111 - Delvar clay loam, 2 to 9 percent slopes
- 112 - Dumps
- 113 - Excelsior fine sandy loam, 0 to 1 percent slopes
- 114 - Exeter loam, 0 to 2 percent slopes
- 115 - Exeter loam, 2 to 5 percent slopes
- 116 - Flamen loam, 0 to 2 percent slopes
- 117 - Gambogy loam, drained, 0 to 1 percent slopes
- 118 - Gambogy-Biggriz, saline-Sodic, association, drained, 0 to 2 percent slopes
- 119 - Gareck-Garces association, 0 to 2 percent slopes
- 120 - Gepford silty clay, partially drained, 0 to 1 percent slopes
- 121 - Gepford silty clay, partially drained, sandy substratum , 0 to 1 percent slopes
- 123 - Grangeville fine sandy loam, saline-sodic, 0 to 1 percent slopes
- 124 - Hanford sandy loam, 0 to 2 percent slopes
- 125 - Houser fine sandy loam, drained, 0 to 1 percent slopes
- 126 - Houser silty clay, drained, 0 to 1 percent slopes
- 127 - Kimberlina fine sandy loam, 0 to 2 percent slopes MLRA 17
- 128 - Lethent silt loam, 0 to 1 percent slopes
- 129 - Nahrub silt loam, overwashed, 0 to 1 percent slopes
- 130 - Nord fine sandy loam, 0 to 2 percent slopes
- 131 - Pits
- 132 - Quonal-Lewis association, 0 to 2 percent slopes
- 134 - Riverwash
- 135 - San Joaquin loam, 0 to 2 percent slopes
- 137 - Tagus loam, 0 to 2 percent slopes
- 138 - Tujunga loamy sand, 0 to 2 percent slopes
- 139 - Wasco sandy loam, 0 to 2 percent slopes
- 140 - Westcamp silt loam, partially drained, 0 to 2 percent slopes
- 141 - Posochanet silt loam, 0 to 2 percent slopes
- 143 - Yettem sandy loam, 0 to 2 percent slopes
- 144 - Youd loam, 0 to 1 percent slopes
- 145 - Water-perennial
- 166ki - Twisselman silty clay, saline-alkali

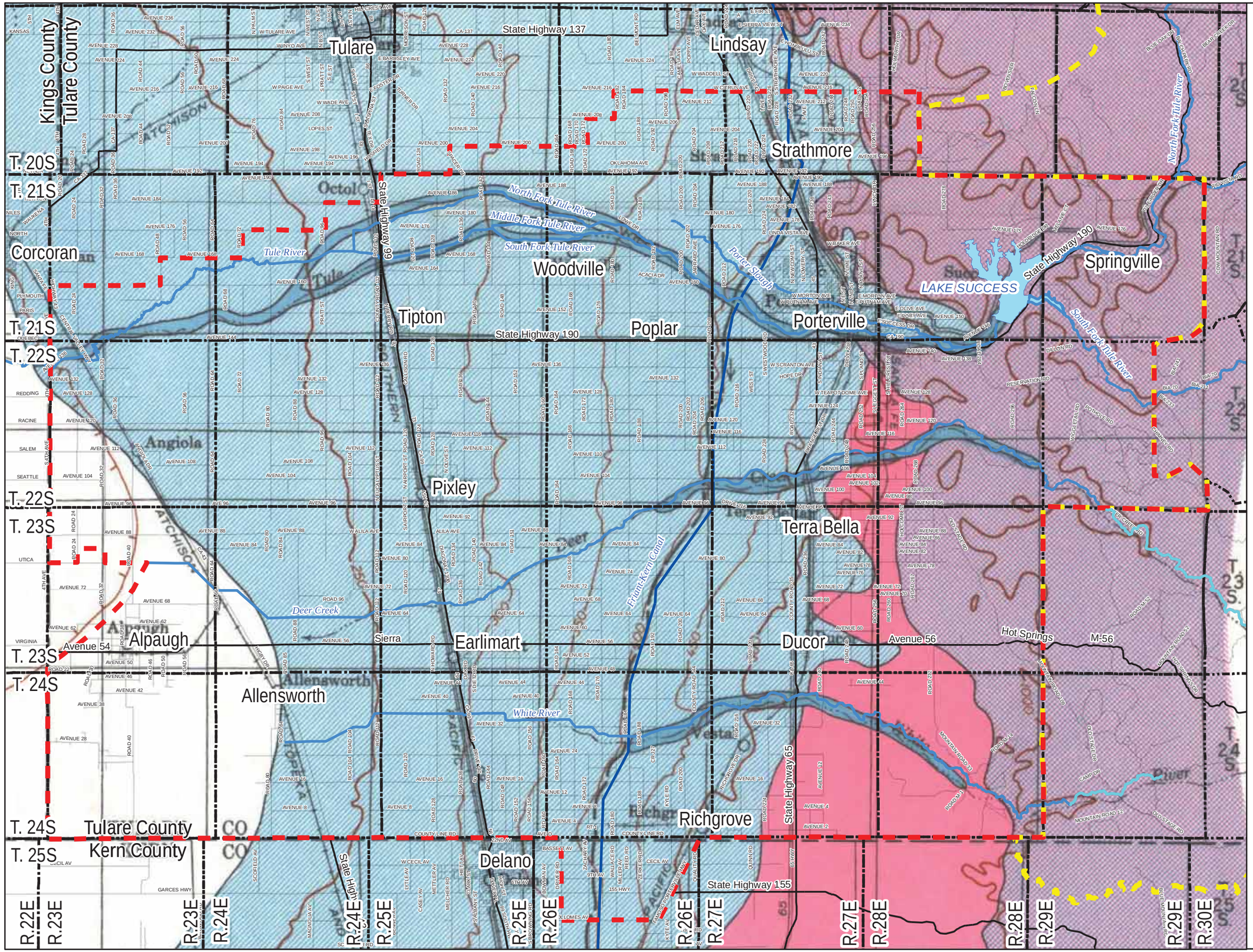
Map Units-NW Kern County

- 103tw - Atesh-Jerryslu association, 0 to 2 percen*
- 111tw - Delvar clay loam, 2 to 9 percent slopes
- 114tw - Exeter loam, 0 to 2 percent slopes
- 119tw - Gareck-Garces association, 0 to 2 percent*
- 125 - Granoso loamy sand, 0 to 2 percent slopes
- 129tw - Nahrub silt loam, overwashed, 0 to 1 perc*
- 130tw - Nord fine sandy loam, 0 to 2 percent slop*
- 154 - Exeter sandy loam, 0 to 2 percent slopes
- 155 - Exeter sandy loam, 2 to 9 percent slopes
- 166ki - Twisselman silty clay, saline-alkali
- 174 - Kimberlina fine sandy loam, 0 to 2 percent *
- 183 - Lethent silt loam
- 192 - McFarland loam
- 243 - Wasco sandy loam
- 257 - Water

ATTACHMENT E
NRCS Soil Survey Irrigation Ratings



ATTACHMENT F
TBWQC Geomorphic Units Map



EXPLANATION

- Sierra Nevada
- Coast Ranges
- Dissected uplands
- Low alluvial plains and fans
- River flood plains and channels
- Overflow lands and lake bottoms

Legend

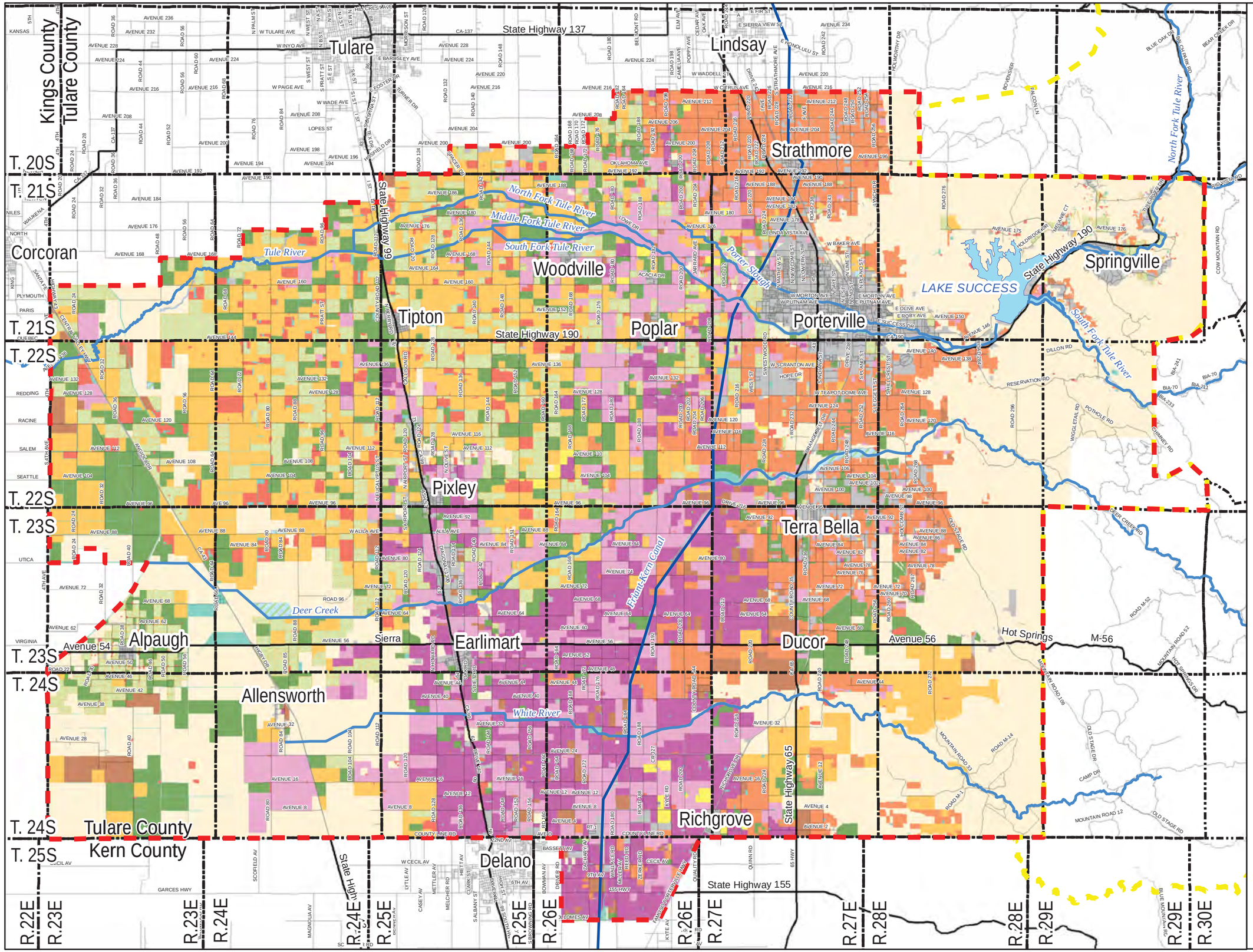
- TBWQC Boundary
- Supplemental TBWQC Boundary
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads

N

1 in = 4 miles

USGS Water-Supply Paper 1469, Plate 1 1959

ATTACHMENT G
TBWQC DWR
2007 Land Use Map



Legend

- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads

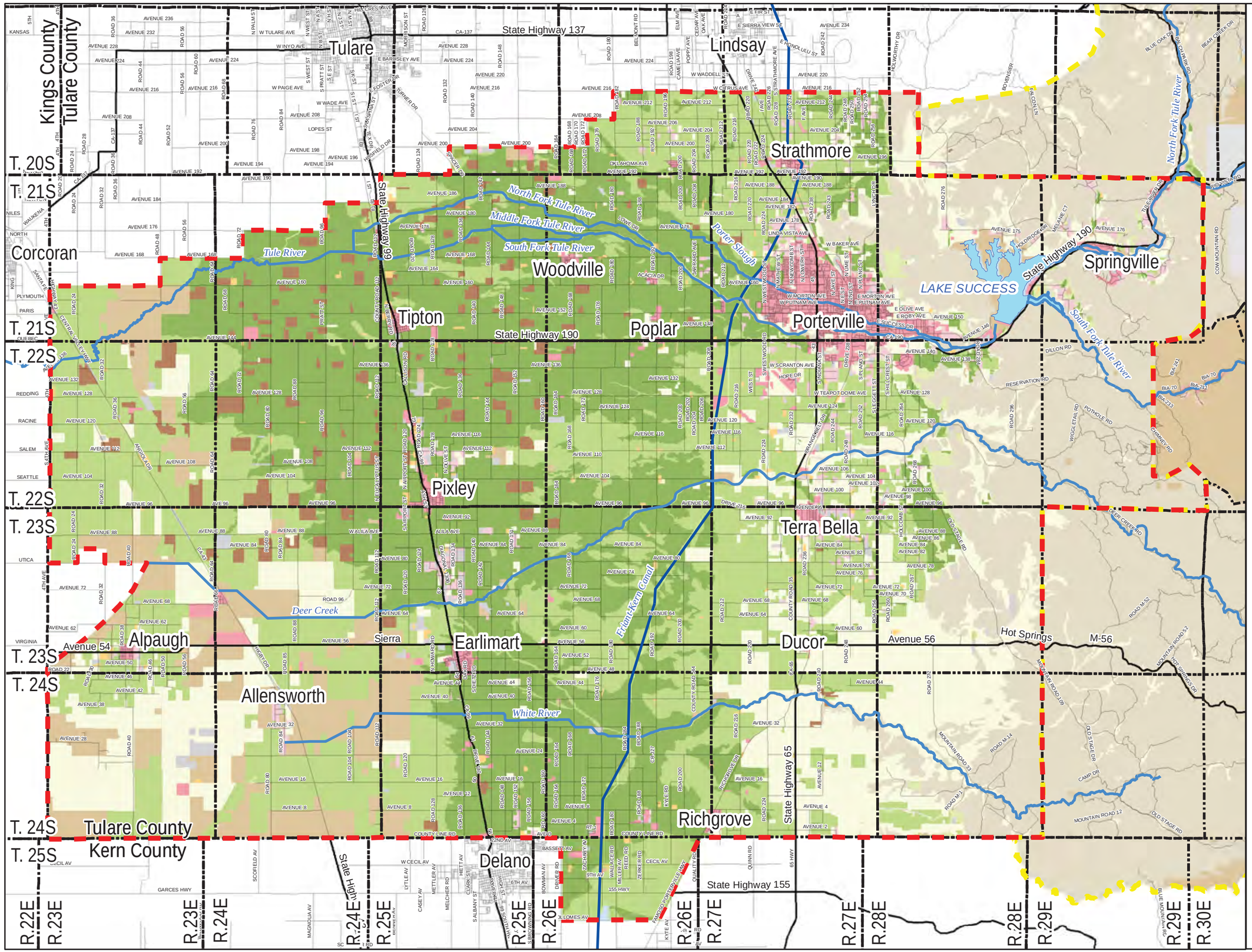
DWR 2007 Land Use

- Idle(11,578.5ac)
- Citrus And Subtropical(54,779.5ac)
- Deciduous Fruits And Nuts(59,647.0ac)
- Field Crops(53,215.8ac)
- Grain and Hay Crops(84,524.0ac)
- Pasture(49,176.3ac)
- Truck and Berry Crops(1,749.8ac)
- Barren(49.6ac)
- Riparian Vegetation(1,598.1ac)
- Incidental to Agriculture(15,350.2ac)
- Vineyard(35,892.5ac)
- Native Vegetation(165,776.9ac)
- Urban, Commercial, Industrial, Residential(35,892.5 ac.)
- Water Surface(9,747.5ac)

N

1 in = 4 miles

ATTACHMENT H
2010 FMMP Land Identification Map



Legend

- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads

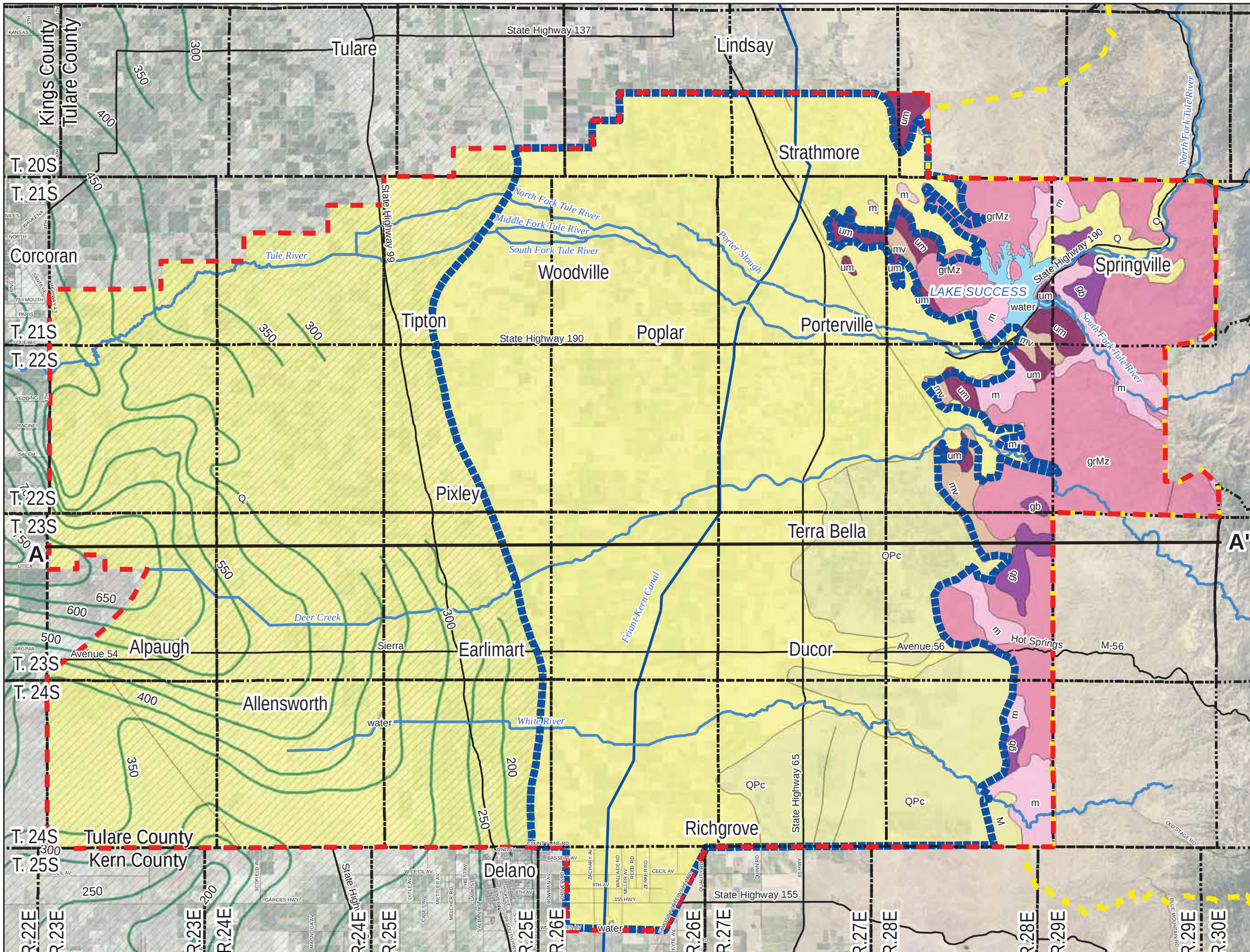
FMMP 2010 Land Use

- Other Land (145,349.8 Ac.)
- Water (2,561.1 Ac.)
- Prime Farmland (179,817.5 Ac.)
- Farmland of Statewide Importance (164,585.3 Ac.)
- Unique Farmland (4,965.6 Ac.)
- Farmland of Local Importance (93,554.1 Ac.)
- Grazing Land(214,147.8 Ac.)
- Confined Animal Land (11,987.4 Ac.)
- Natural Vegetation (95,461.4 Ac.)
- Semi-Agricultural and Rural Commercial Land (2,746.1 Ac.)
- Vacant or Disturbed (5,093.0 Ac.)
- Rurual Residential (9,314.7 Ac.)
- Urban and Built-Up Land (17,225.0 Ac.)

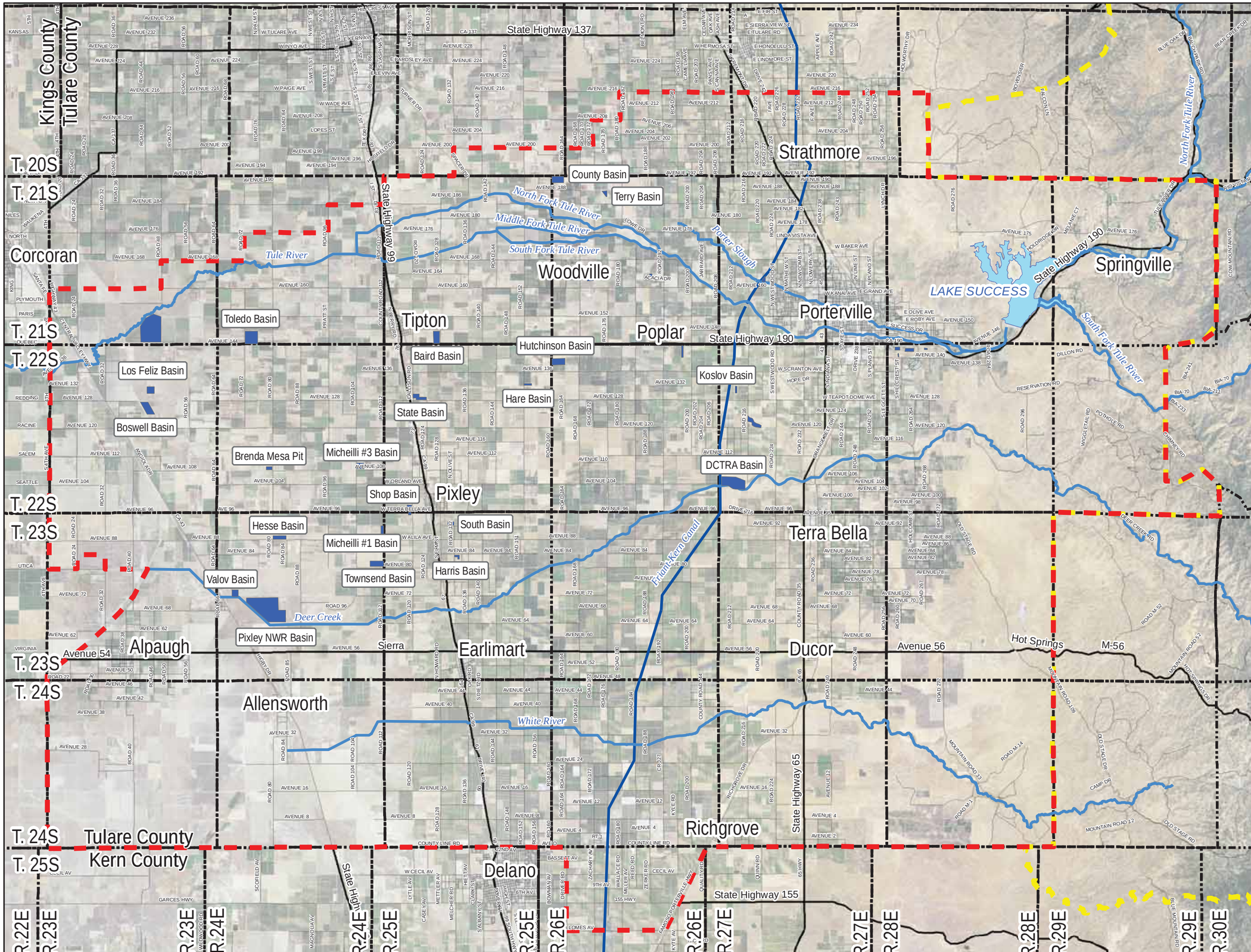
N

1 in = 4 miles

ATTACHMENT I
Geologic Map of the TBWQC Area



ATTACHMENT J
Recharge Basins Map



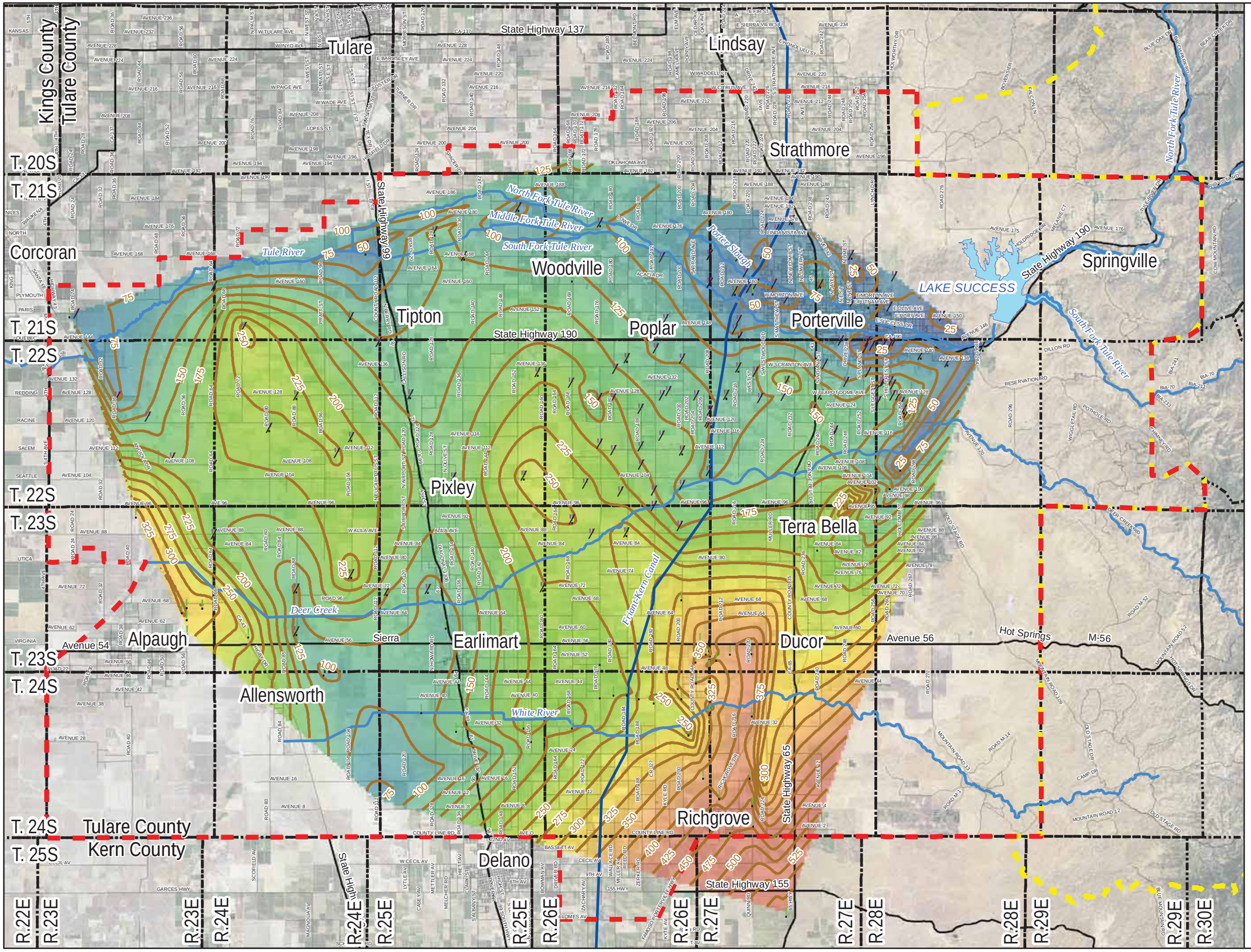
Legend

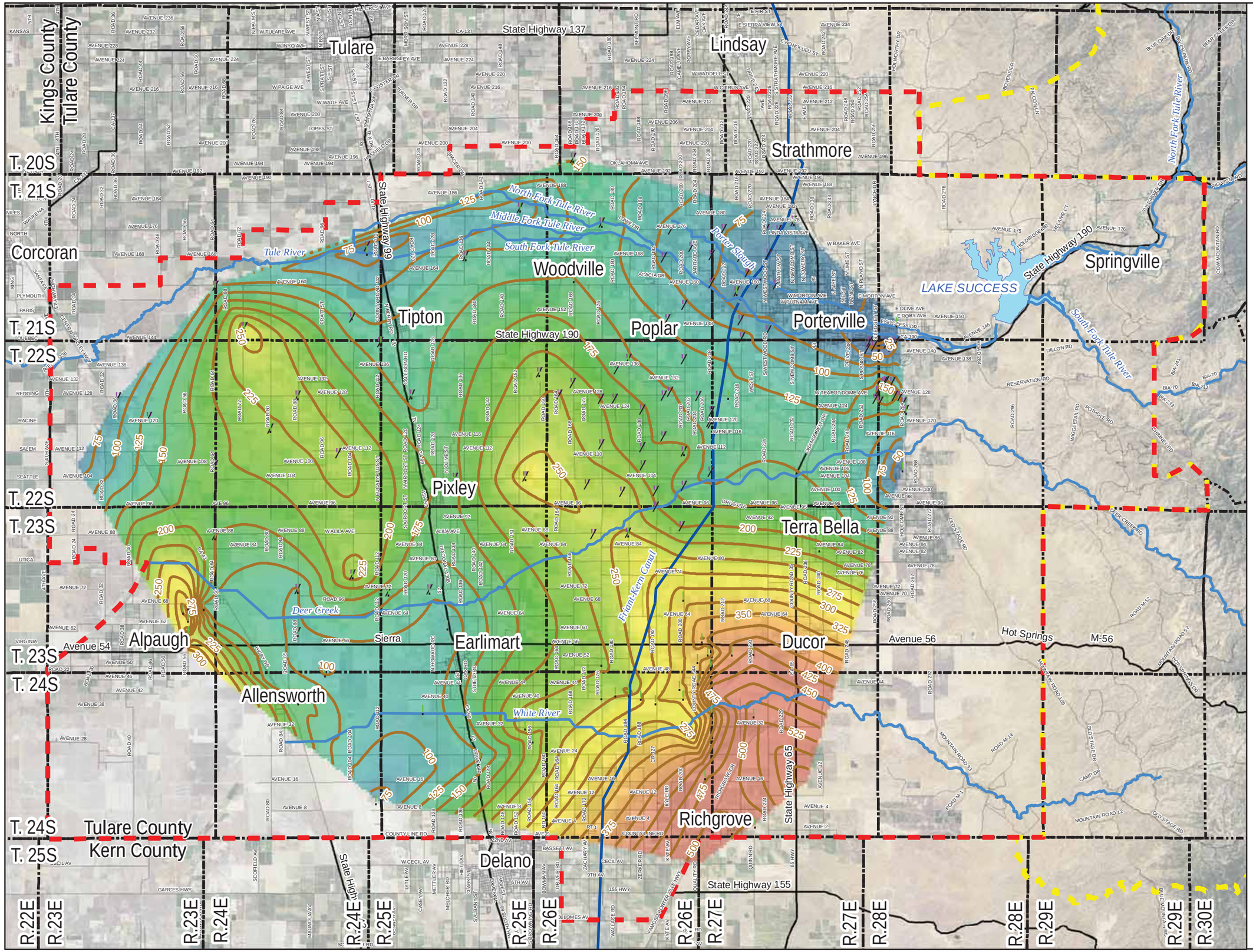
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways (166.6 Miles)
- Friant-Kern Canal
- Roads
- Recharge Basins (2,102.3 Ac.)

N

1 in = 4 miles

ATTACHMENT K
2013 Spring
Depth to Groundwater Map





ATTACHMENT L
2014 Spring
Depth to Groundwater Map

Legend

- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads
- 25' Contours
- DWR Wells (81 Total)
- DCTRA Wells (90 Total)

Spring 2014 Depth to Groundwater

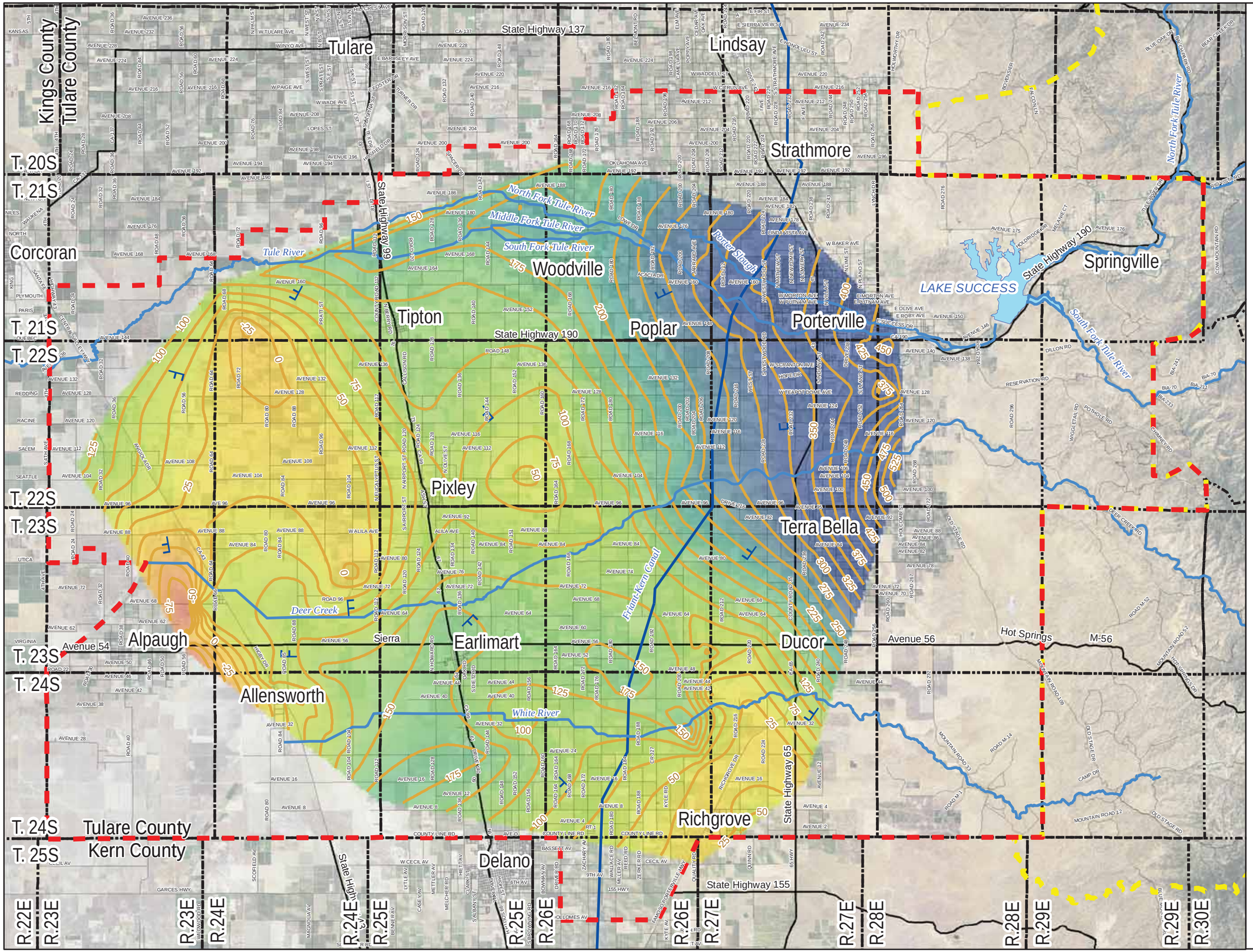
High : > 575'

Low : < 25'

N

1 in = 4 miles

ATTACHMENT M
2014 Spring Groundwater Elevation Map



Legend

- Supplemental TBWQC Boundary
- TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads
- 25' Contours
- Groundwater Flow Direction

Spring 2014 Groundwater Elevation

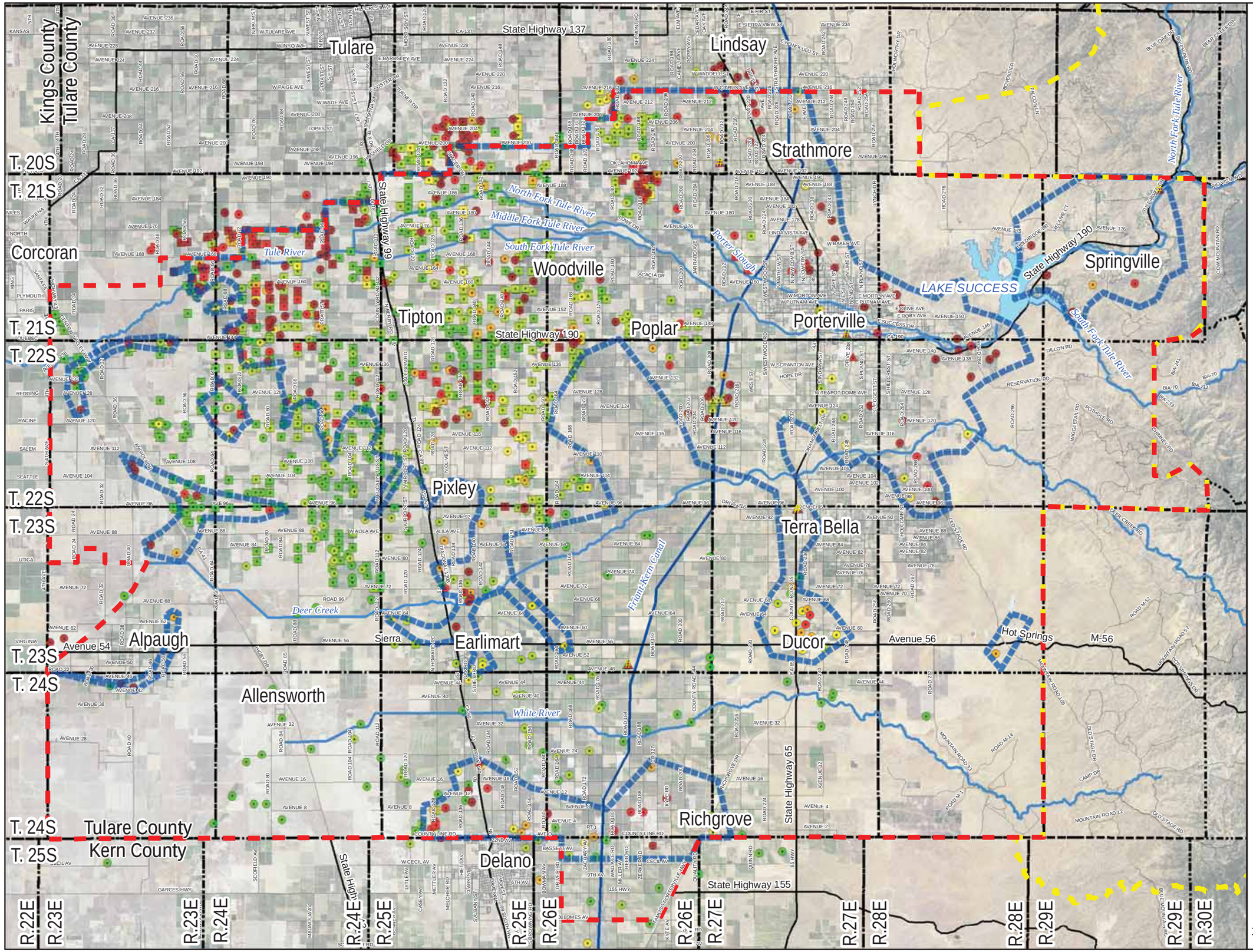
High: > 525'

Low : < -75'

N

1 in = 4 miles

ATTACHMENT N
Nitrate Concentrations in Wells from 1945-2014
45-mg/L Limit



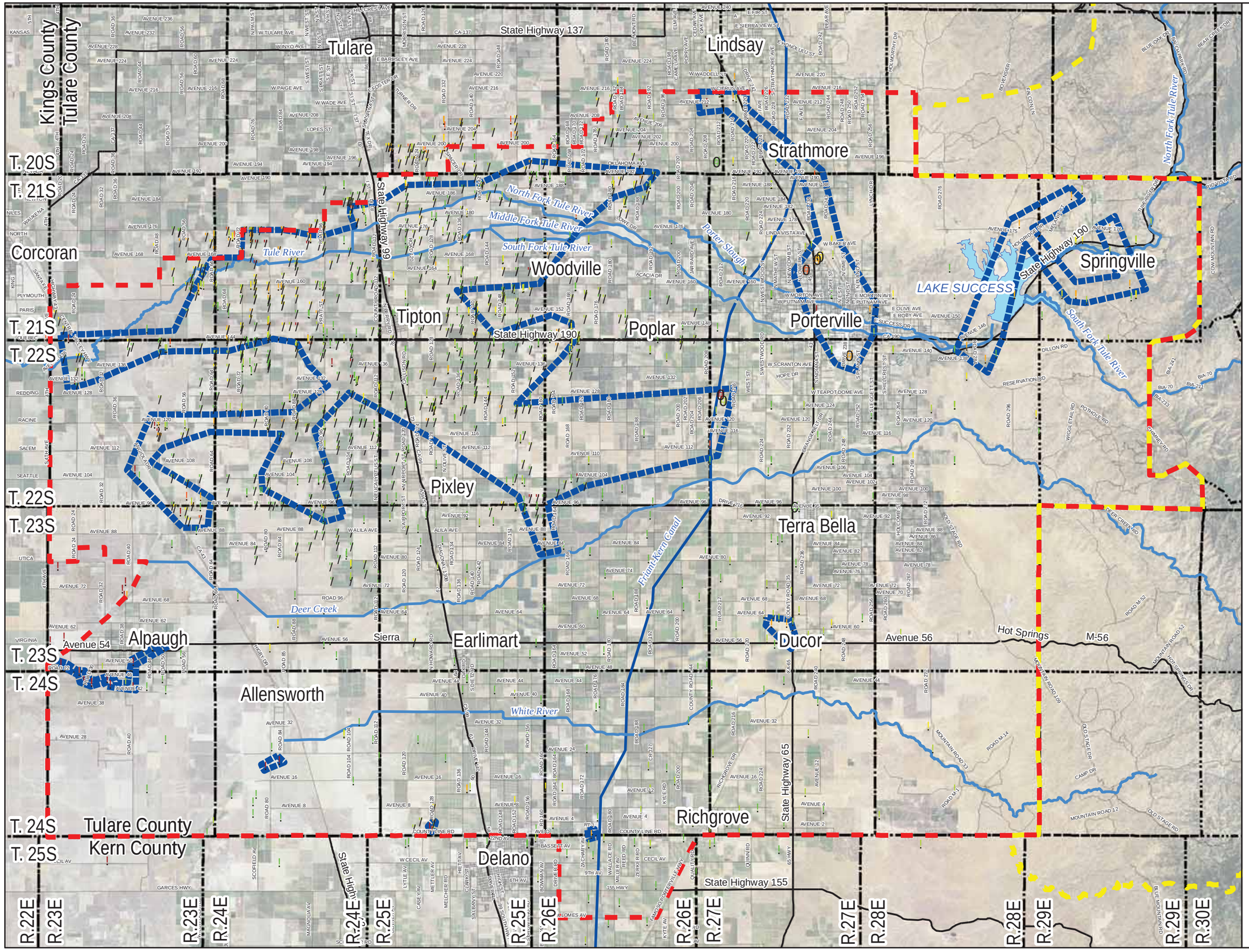
Legend

- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads
- Nitrate Boundary (229,553 Ac.)
- Domestic Well, NO3 < 15 mg/L
- Domestic Well, NO3 < 30 mg/L
- Domestic Well, NO3 < 45 mg/L
- Domestic Well, NO3 < 60 mg/L
- Domestic Well, NO3 < 75 mg/L
- Domestic Well, NO3 < 100 mg/L
- Domestic Well, NO3 > 100 mg/L
- Irrigation Well, NO3 < 15 mg/L
- Irrigation Well, NO3 < 30 mg/L
- Irrigation Well, NO3 < 45 mg/L
- Irrigation Well, NO3 < 60 mg/L
- Irrigation Well, NO3 < 75 mg/L
- Irrigation Well, NO3 < 100 mg/L
- Irrigation Well, NO3 > 100 mg/L
- Monitoring Well, NO3 < 15 mg/L
- Monitoring Well, NO3 < 30 mg/L
- Monitoring Well, NO3 < 45 mg/L
- Monitoring Well, NO3 < 60 mg/L
- Monitoring Well, NO3 < 75 mg/L
- Monitoring Well, NO3 < 100 mg/L
- Monitoring Well, NO3 > 100 mg/L

N

1 in = 4 miles

References:
- Tulare County Well Database
- Regional Water Quality Control Board - Dairy Annual Reports Well Data
- Tulare County Groundwater Ambient Monitoring and Assesment (GAMA) Program Data
- Kern County Groundwater Ambient Monitoring and Assesment (GAMA) Program Data
- UC Davis Well Data
- California Department of Health Well Data
- USGS Well Data



ATTACHMENT O
Electrical Conductivity in Wells 1950-2014 1,000 umhos/cm Limit

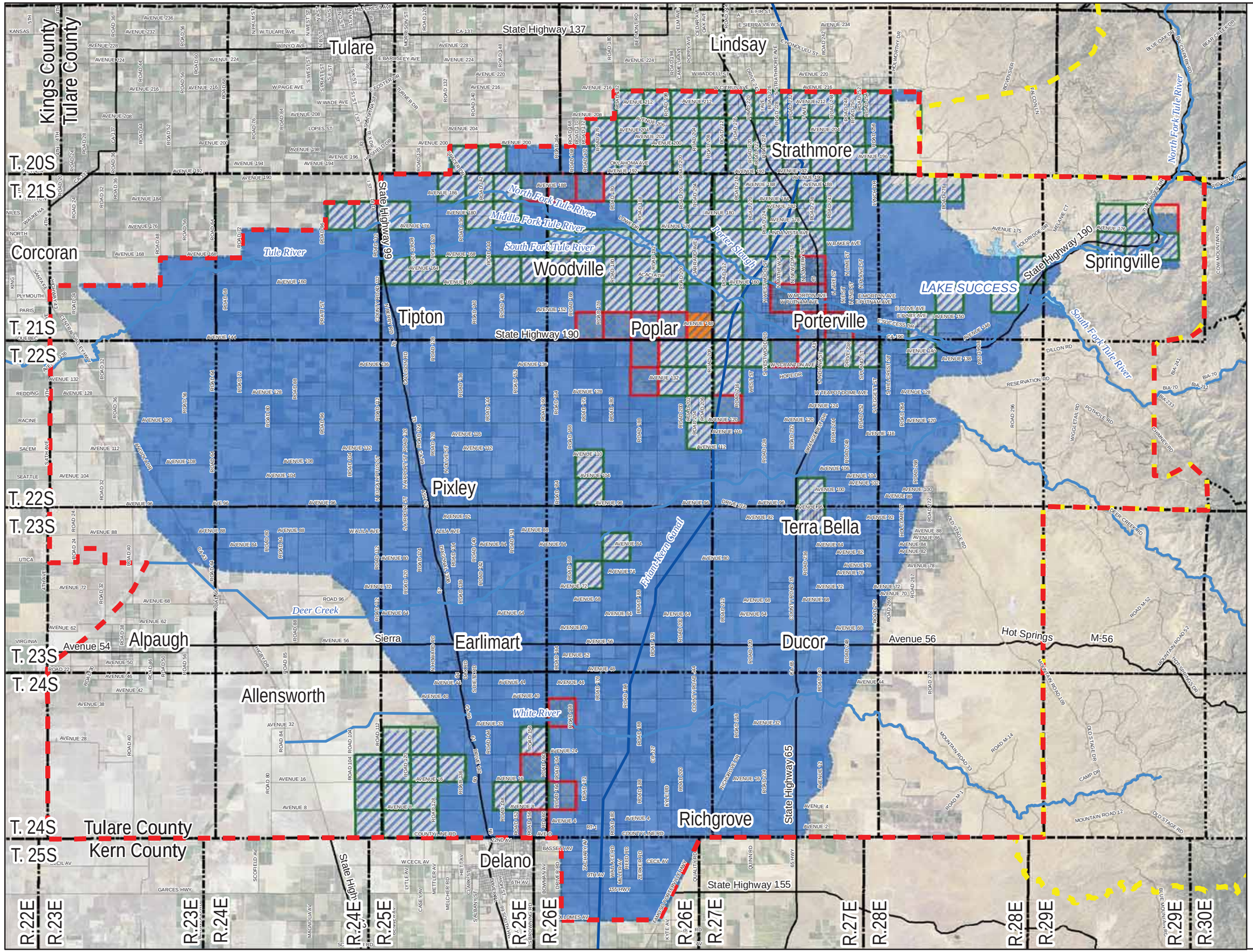
Legend

- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads
- Electrical Conductivity Boundary (108,394 Ac.)
- Domestic Well, EC < 500 umhos/cm
- Domestic Well, EC < 750 umhos/cm
- Domestic Well, EC < 1000 umhos/cm
- Domestic Well, EC < 1500 umhos/cm
- Domestic Well, EC < 2000 umhos/cm
- Domestic Well, EC > 2000 umhos/cm
- Irrigation Well, EC < 500 umhos/cm
- Irrigation Well, EC < 750 umhos/cm
- Irrigation Well, EC < 1000 umhos/cm
- Irrigation Well, EC < 1500 umhos/cm
- Irrigation Well, EC < 2000 umhos/cm
- Irrigation Well, EC > 2000 umhos/cm
- Monitoring Well, EC < 500 umhos/cm
- Monitoring Well, EC < 750 umhos/cm
- Monitoring Well, EC < 1000 umhos/cm
- Monitoring Well, EC < 1500 umhos/cm
- Monitoring Well, EC < 2000 umhos/cm
- Monitoring Well, EC > 2000 umhos/cm

N

1 in = 4 miles

References:
- Tulare County Well Database
- Regional Water Quality Control Board - Dairy Annual Reports Well Data
- Tulare County Groundwater Ambient Monitoring and Assesment (GAMA) Program Data
- Kern County Groundwater Ambient Monitoring and Assesment (GAMA) Program Data
- California Department of Health Well Data
- USGS Well Data



ATTACHMENT P
State Water Resources Control Board (SWRCB) Hydrogeologically Vulnerable Area and Department of Pesticide (DPR) Groundwater Protection Areas

Legend

- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads
- SWRCB High Vulnerability Area (401,037 Ac.)

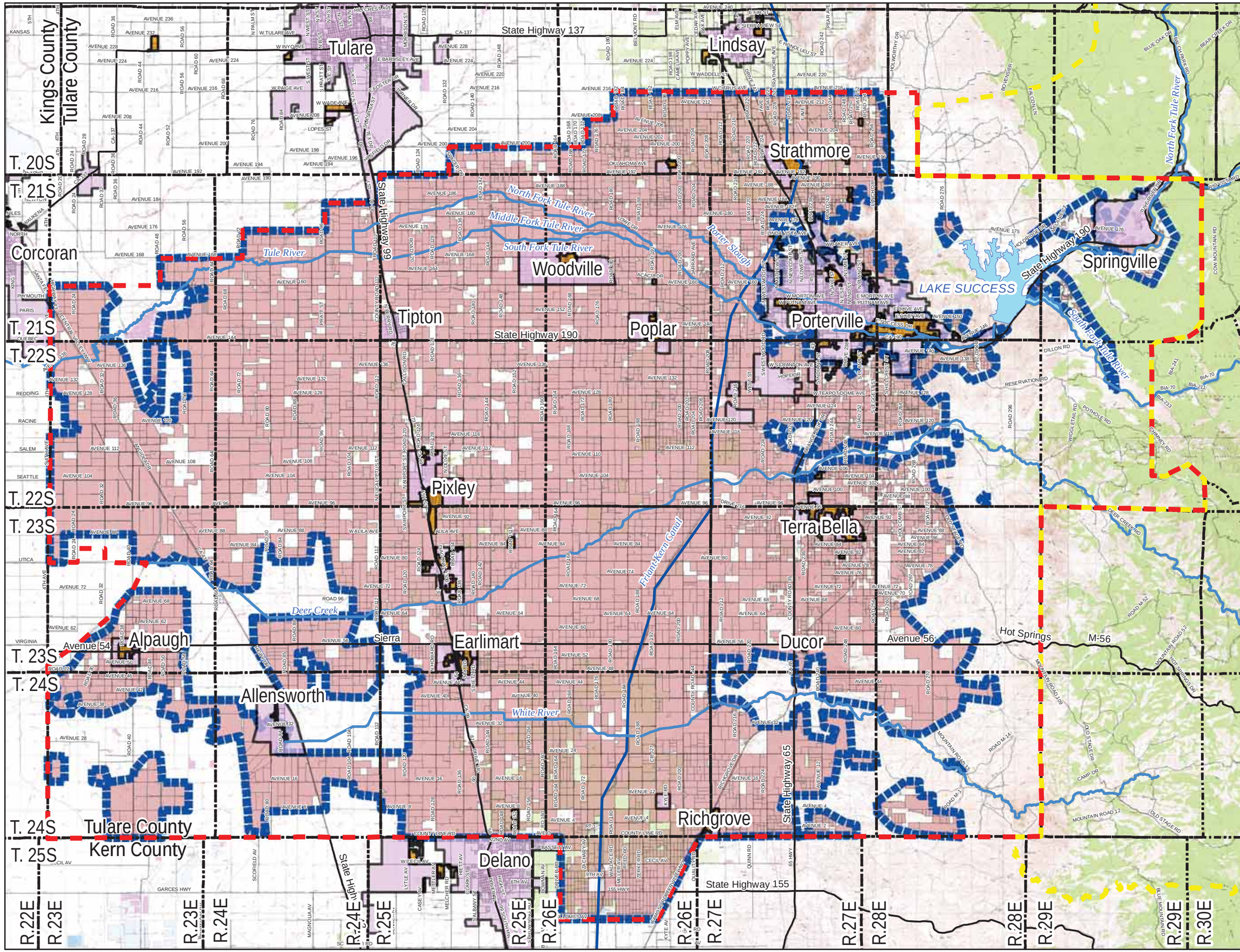
DPR Groundwater Protection Area (98,956 Ac.)

- Leaching
- Runoff
- Runoff or Leaching

N

1 in = 4 miles

ATTACHMENT Q
Irrigated Lands Map



Legend

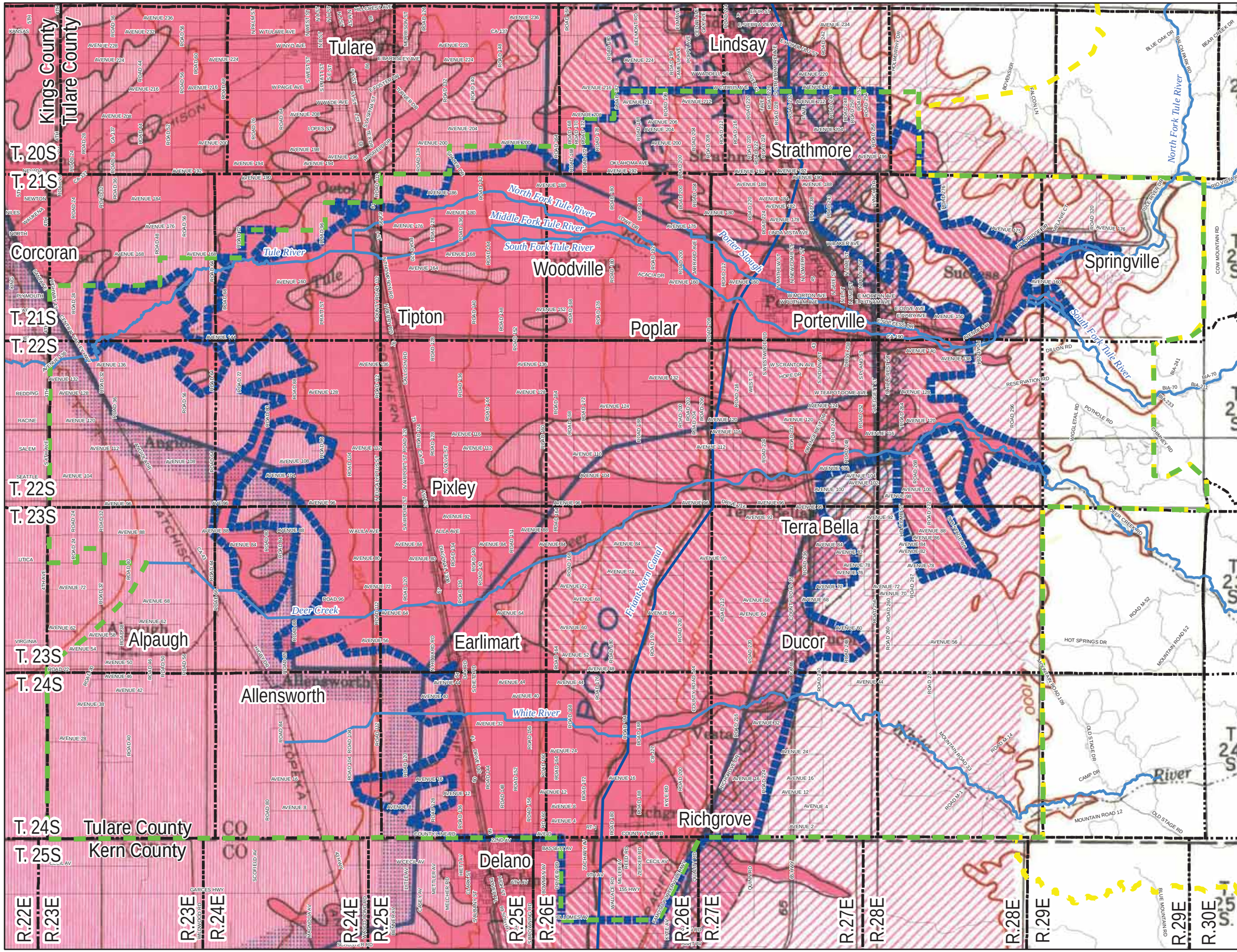
- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads
- Disadvantaged Unincorporated Communities (DUC)
- Disadvantaged Communites (DAC)
- Irrigated Parcels Boundary (426.099 Ac.)
- Irrigated Acres (354,696 Acres)

N

1 in = 4 miles

Reference:
2007 DWR Land Use Data

ATTACHMENT R.1
Relative Permeability of Soils Map at Surface



EXPLANATION

Young alluvial-fan and basin rim soils
Permeable to moderately permeable

Old alluvial-fan soils
Moderately to poorly permeable

Basin soils
Poorly permeable to nearly impermeable

Dissected upland and mountain soils

Contact
Dashed where inferred or gradational

Boundary of storage unit

Boundary of excluded area outside main valley

Boundary of excluded area within main valley

Legend

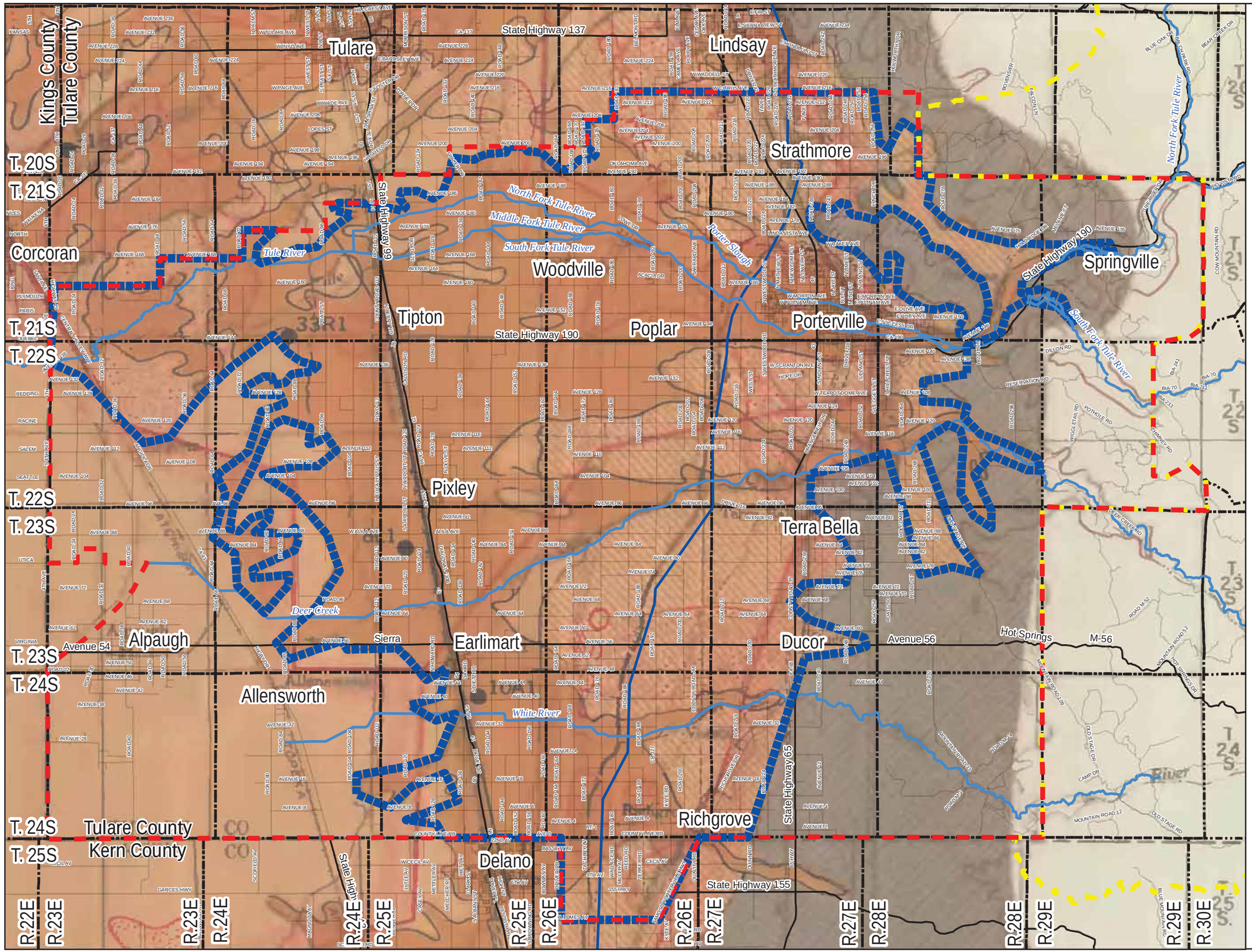
- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- Waterways
- Friant-Kern Canal
- Roads
- Permeability Area Boundary (365,251 Ac.)

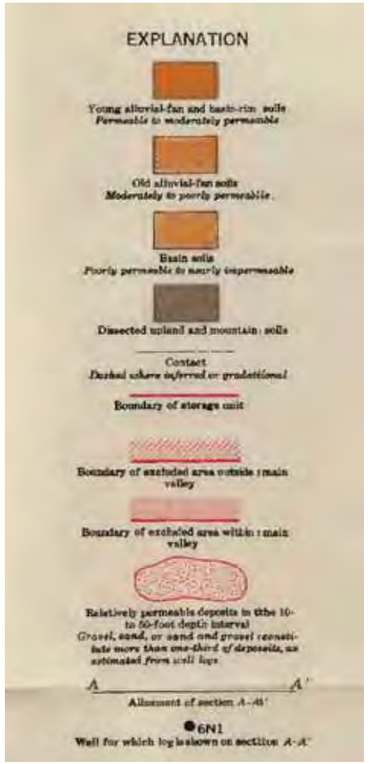
N

1 in = 4 miles

USGS Water-Supply Paper 1469, Plate 29
1959

ATTACHMENT R.2
Relative Permeability
10 to 50 Feet
Depth Below Ground Surface





Legend

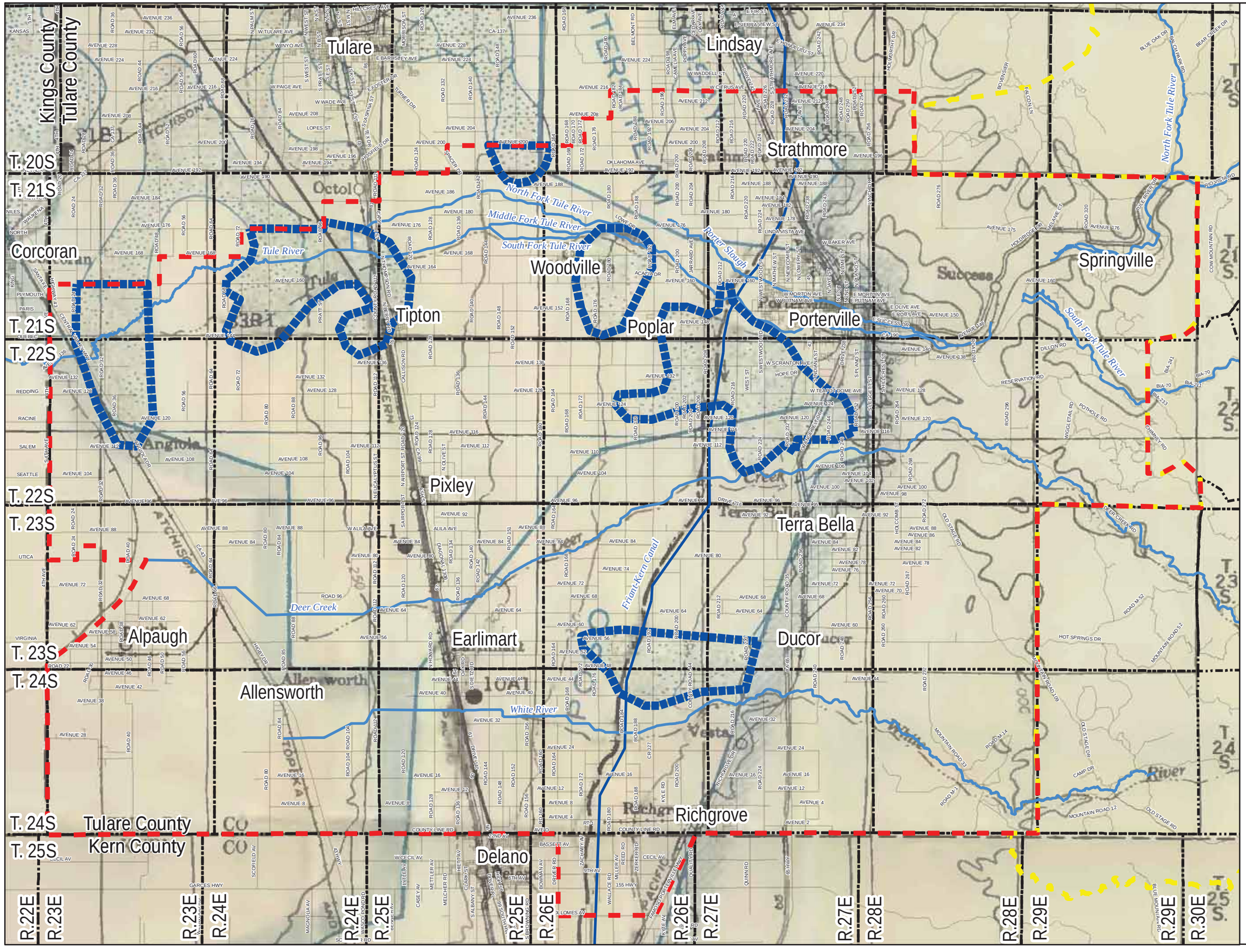
- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- Waterways
- Friant-Kern Canal
- Roads
- Permeability Boundary (372,251 Ac.)

N

1 in = 4 miles

USGS Water-Supply Paper 1618, Plate 3
1964

ATTACHMENT R.3
Relative Permeability
50 to 100 Feet
Depth Below Ground Surface



EXPLANATION

Boundary of storage unit

Boundary of excluded area outside main valley

Boundary of excluded area within main valley

Relatively permeable deposits in the 50- to 100-foot depth interval

Gravel, sand, or sand and gravel constitute more than one-third of deposits, as estimated from well logs

A——————A'

Alinement of section A-A'

33N1

Well for which log is shown on section A-A'

Delineation of relative permeability of deposits by Seymour Mack

Legend

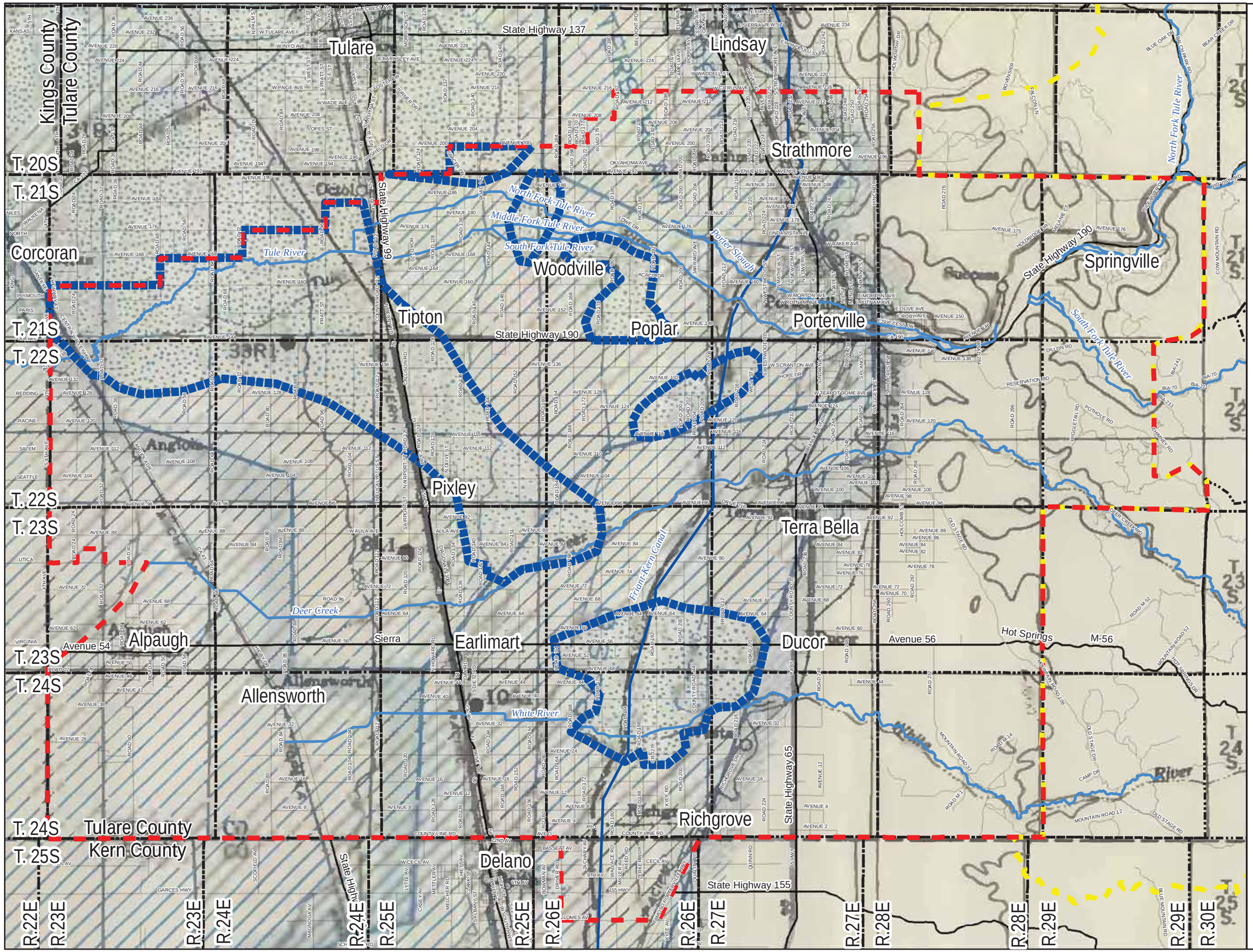
- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- Waterways
- Friant-Kern Canal
- Roads
- Permeability Area Boundary (53,273 Ac.)

N

1 in = 4 miles

USGS Water-Supply Paper 1618, Plate 3
1964

ATTACHMENT R.4
Relative Permeability
100 to 200 Feet
Depth Below Ground Surface



EXPLANATION

Boundary of storage unit

Boundary of excluded area outside main valley

Boundary of excluded area within main valley

Relatively permeable deposits in the 100- to 200-foot depth interval
Gravel, sand, or sand and gravel constitute more than one-third of deposits, as estimated from well logs

Relatively impermeable deposits in the 100- to 200-foot depth interval
Gravel, sand, or sand and gravel constitute less than one-third of deposits, as estimated from well logs

Relative permeability of deposits not estimated because well-log data are insufficient

Boundaries dotted where inferred, dashed where indefinite

A——A'
Alinement of section A-A'

33M1
Well for which log is shown on section A-A'

Delineation of relative permeability of deposits by Seymour Mack

Legend

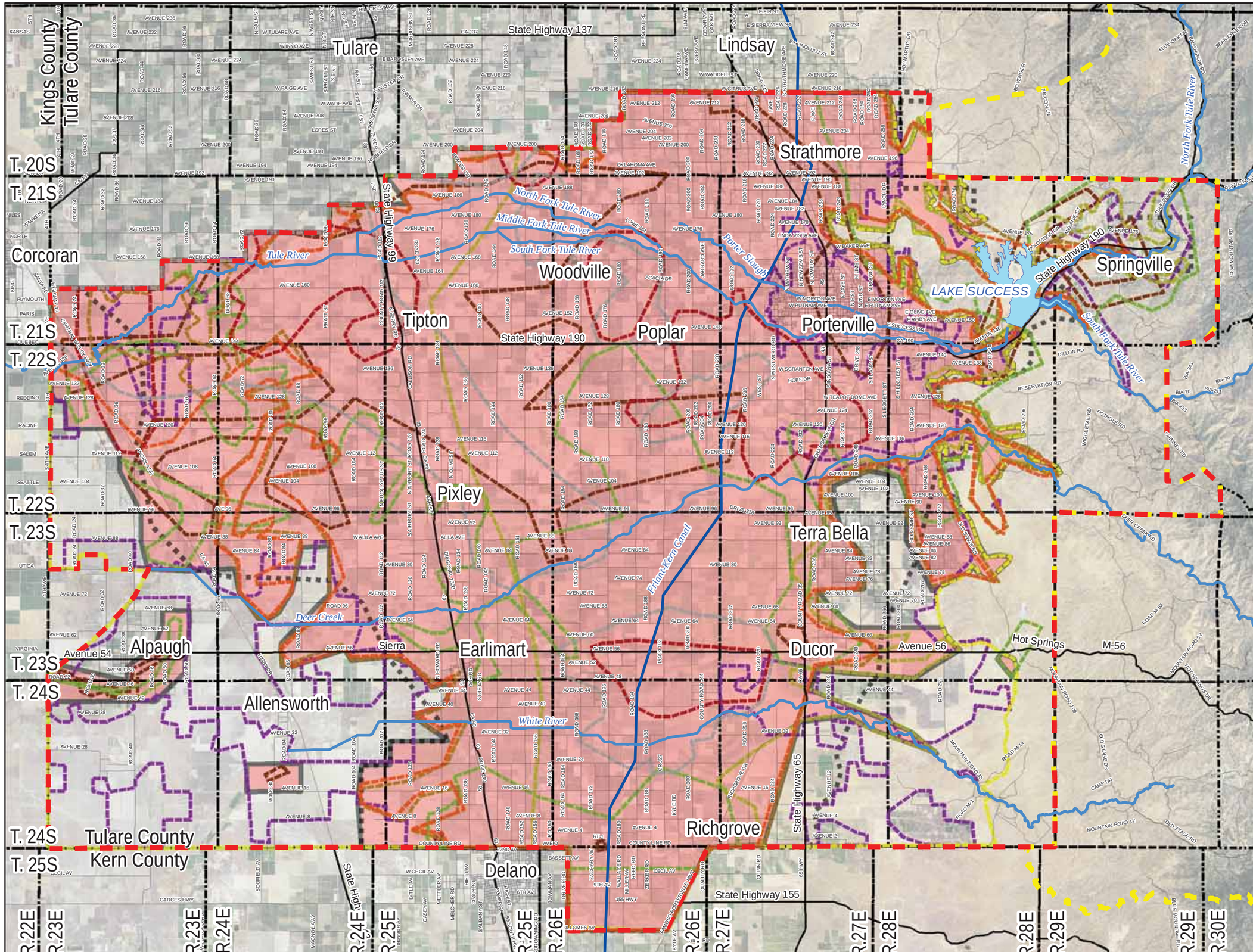
- TBWQC Boundary
- Supplemental TBWQC Boundary
- Townships
- Waterways
- Friant-Kern Canal
- Roads
- Permeability Area Boundary (94,353 Ac.)

N

1 in = 4 miles

USGS Water-Supply Paper 1618, Plate 3
1964

ATTACHMENT S
Composite High Vulnerability Areas Map



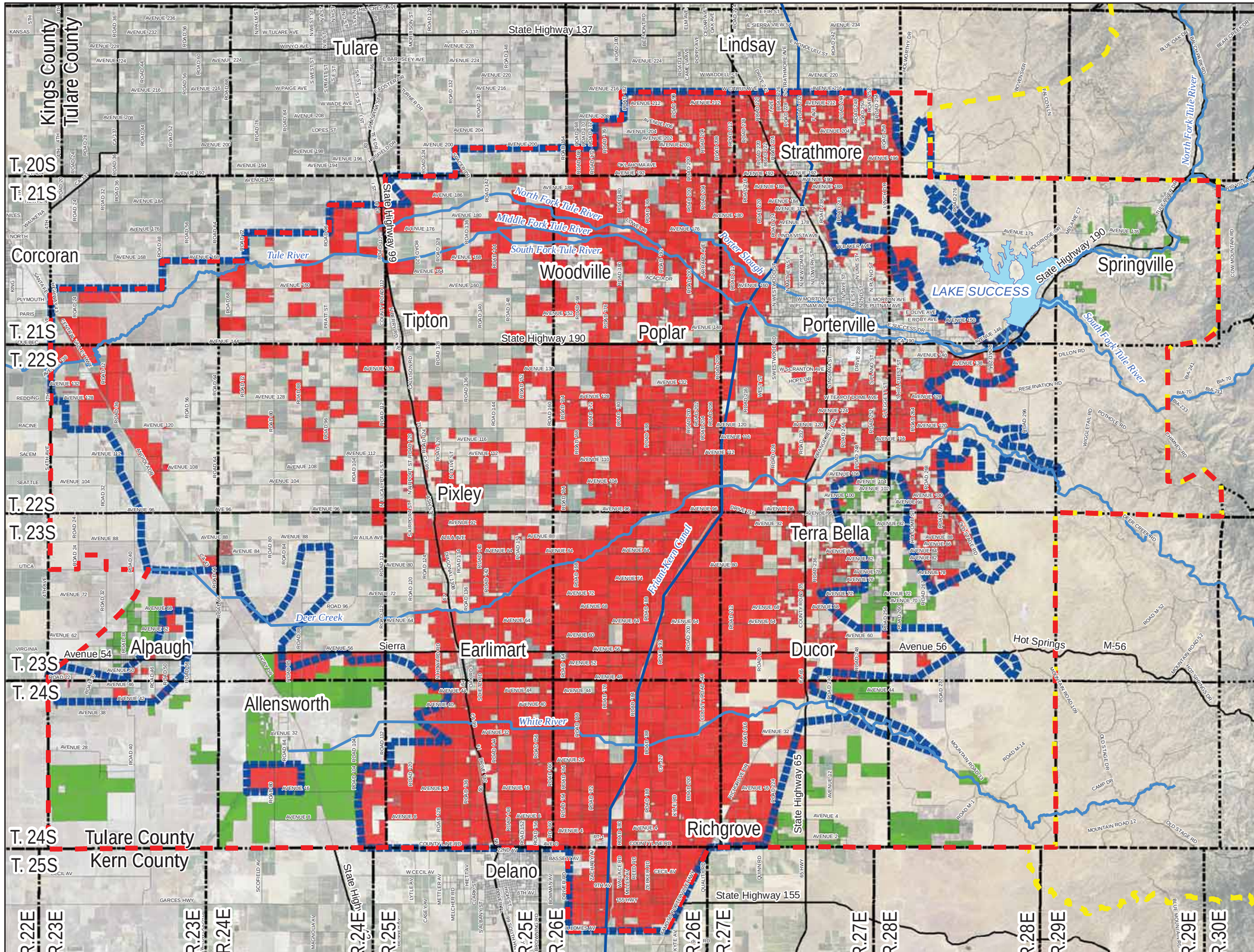
Legend

- TBWQC Boundary (599,878.87 Acres)
- Supplemental TBWQC Boundary
- Townships
- LakeSuccess
- Waterways
- Friant-Kern Canal
- Roads
- TBWQC High Vulnerability Area (404,158 Ac.)
- High Vulnerability Area (100-200 ft BGS)
- High Vulnerability Area (50-100 ft VBGS)
- High Vulnerability Area (10-50 ft BGS)
- High Vulnerability Area (Relative Permeability)
- High Vulnerability Area (Geologic Map)
- High Vulnerability Area (NO3 All Years)
- High Vulnerability Area (EC All Years)
- High Vulnerability Alluvial Boundary
- High Vulnerability Area (Irrigated Acres)
- SWRCB High Vulnerability Area (401,037 Ac.)

N

1 in = 4 miles

ATTACHMENT T
TBWQC High Vulnerability Area Map



APPENDIX A

CURRENT MEMBER PARCELS - TBWQC

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
4901003	0	40
4901007	80	79
4901013	38	38
4901014	39	39
4901019	1	1
4901020	160	162
4901029	333	334
4901035	0	138
4901038	19	19
4901040	18	19
4901042	4	4
4901043	3	3
4901051	163	164
4901052	20	20
4901053	59	62
4901054	81	40
4902006	81	79
4902007	73	38
4902009	39	37
4902010	40	37
4902012	155	142
4902013	158	126
4902013	158	159
4902014	76	77
4902015	80	80
4902016	117	110
4902017	119	107
4902018	152	152
4903201	79	80
4903202	39	40
4903204	20	10
4903207	40	39
4903208	15	8
4903208	15	77
4903210	14	15
4904003	19	19
4904004	38	38
4904005	39	39
4905001	8	9
4905002	9	10
4905003	100	99
4905004	9	10
4905005	18	18

APN	TotalAcres	Irrigated Acres
302170020	61	61
302170022	27	15
302170024	19	0
302170029	48	48
302170034	236	236
302170036	39	39
302170038	32	32
302180010	20	20
302180019	12	12
302180031	5	2
302180036	6	6
302180042	22	22
302180045	17	15
302180046	19	13
302190015	0	4
302190027	2	2
302190028	3	2
302190029	3	2
302190030	3	2
302190035	11	11
302200005	6	0
302200006	7	5
302200038	11	11
302220007	16	16
302230003	20	20
302230004	20	15
302230005	40	40
302230027	80	80
302230028	80	76
302240013	50	50
302240014	35	35
302240015	77	77
302240016	22	21
302240017	21	21
302250003	80	80
302250004	25	25
302250006	188	188
302260001	131	131
302260006	125	125
302260007	158	158
302260008	157	157
302260013	41	41
302260014	41	41

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
4905006	9	10
4905006	9	10
4905016	79	61
4905022	36	26
4905023	21	4
4906001	37	37
4906002	249	253
4906003	30	30
4906004	10	10
4906005	10	10
4906006	19	20
4906007	39	39
4906008	39	39
4906009	9	10
4906010	9	9
4906011	10	10
4906012	10	10
4908001	22	23
4908007	18	18
4908008	17	14
4908010	2	2
4908011	2	2
4908012	3	3
4911011	10	10
4911012	10	10
4911013	10	10
4911014	9	9
4911015	9	10
4911016	20	20
4911017	9	10
4911018	5	6
4911020	6	6
4911022	20	20
4911023	9	10
4911025	8	8
4911028	10	9
4911031	38	38
4911032	10	10
4911034	38	38
4911037	10	6
4911046	10	10
4911048	10	10
4911049	10	10

APN	TotalAcres	Irrigated Acres
302260017	118	118
302260023	40	38
302260025	42	42
302260026	0	0
302260027	37	37
302260028	53	51
302270002	80	76
302270003	40	38
302270004	40	38
302270005	40	38
302270006	40	38
302270008	40	38
302270009	160	160
302270010	160	152
302270011	160	152
302270012	60	57
302270014	320	304
302270015	80	76
302270016	10	10
302270019	39	36
302280002	20	17
302280003	15	14
302280004	25	24
302280005	80	80
302280009	19	10
302280010	10	9
302280011	10	6
302280012	30	29
302280013	80	80
302280016	5	5
302290007	69	69
302290008	10	10
302290009	15	15
302290011	99	93
302290015	19	19
302290017	10	10
302290018	30	30
302290019	25	25
302290021	4	4
302290022	49	44
302300001	78	78
302300006	10	10
302300007	15	15

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
4912001	9	9
4912003	20	20
4912005	6	5
4912007	10	10
4912008	9	10
4912009	9	9
4912010	10	10
4912011	10	10
4912012	10	10
4912014	6	6
4912015	10	10
4912016	20	20
4912017	28	28
4912018	10	10
4912019	39	39
4912020	12	11
4912023	29	28
4912024	29	29
4912036	9	10
4912037	10	10
4913002	0	9
4913005	9	9
4913006	9	9
4913007	10	10
4913008	10	10
4913009	0	10
4913010	0	10
4913011	9	10
4913012	10	10
4913013	38	38
4913014	9	9
4913015	10	10
4913016	9	9
4913018	19	19
4913020	18	18
4913023	0	8
4913028	19	19
4913029	19	19
4913030	18	18
4913035	29	29
4913036	17	17
4914001	58	58
4914002	9	10

APN	TotalAcres	Irrigated Acres
302300008	20	19
302300012	20	19
302300017	0	0
302300023	19	18
302300025	126	126
302300027	8	8
302310001	20	20
302310002	10	9
302310003	10	9
302310004	10	10
302310005	10	10
302310006	5	5
302310007	10	10
302310008	0	0
302310009	20	20
302310010	20	20
302310011	30	29
302310012	10	9
302310014	9	8
302310015	10	19
302310016	5	5
302310019	10	10
302310020	15	15
302310021	10	10
302310022	10	10
302310023	10	10
302310024	10	10
302310025	20	19
302310026	10	10
302310028	10	10
302310029	10	10
302310030	0	0
302310031	10	10
302310032	5	5
302310034	5	5
302310035	5	5
302320008	5	3
302320020	80	70
302320026	10	10
302320031	35	35
302320032	20	20
302320033	56	56
302330001	158	157

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
4914003	9	9
4914006	20	20
4914007	10	10
4914008	38	38
4914009	87	87
4914010	20	20
4914011	10	10
4914012	19	20
4914013	10	10
4914014	18	19
4915008	77	76
4915009	78	78
4915010	79	77
4915011	76	72
4915015	78	77
4915022	96	97
4915023	135	108
4916001	157	158
4916006	79	70
4917001	1	3
4918001	17	15
4918010	79	79
4918011	18	20
4918015	18	20
4918020	7	4
4924001	38	38
4924002	39	39
4924004	99	99
4924007	77	78
4924010	20	20
4924011	40	40
4924012	20	20
4924013	49	49
4924014	48	49
4924020	39	40
4924022	76	70
4925001	19	19
4925002	15	15
4925003	9	10
4925004	6	5
4925005	9	10
4925006	10	10
4925007	9	9

APN	TotalAcres	Irrigated Acres
302330004	6	5
302330007	5	2
302330015	5	5
302330016	5	5
302330018	65	30
302340001	18	18
302340002	3	3
302340026	10	10
302350001	10	0
302350001	10	0
302350002	10	0
302350002	10	0
302350003	10	0
302350004	9	0
302350021	9	9
302350023	10	10
302350024	58	58
302360006	18	18
302360010	10	10
302360033	8	8
302360034	8	8
302360035	26	12
302370001	70	65
302370003	33	40
302370006	53	53
302370007	16	16
302370015	19	14
302380002	24	24
302380010	19	19
302380011	19	19
302410001	9	9
302410002	14	10
302410003	10	8
302410004	10	2
302410006	10	9
302410007	15	15
302410008	59	59
302410009	50	50
302410010	51	49
302410011	29	29
302410012	48	46
302420001	20	19
302420002	218	207

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
4925008	10	10
4925009	23	23
4925011	2	2
4925012	10	10
4925013	10	10
4925015	19	19
4925017	9	10
4925018	61	60
4925019	71	73
4926001	19	19
4926002	10	10
4926003	9	9
4926006	6	6
4926007	10	10
4926008	9	10
4926009	19	20
4926010	6	6
4926013	3	3
4926014	10	10
4926015	48	48
4926016	10	10
4926017	9	9
4926020	16	16
4926026	9	9
4926027	10	10
4926036	4	3
4926038	9	9
4927011	81	77
4927012	79	78
4927017	20	20
4927017	20	20
4927022	82	79
4927023	40	39
4927024	32	34
4927025	4	4
4927026	40	40
4927027	74	78
4927032	73	77
5016017	0	20
5109037	2	1
5109040	2	2
196040024	71	71
196040025	77	77

APN	TotalAcres	Irrigated Acres
302420003	49	49
302420004	14	14
302420005	13	13
302430001	170	162
302430002	10	9
302430003	38	38
302430005	10	10
302430006	10	10
302430007	0	0
302430008	74	70
302440009	36	36
302440010	79	75
302440011	70	77
302440013	20	19
302450001	92	55
302450005	8	4
302460003	156	80
302460007	50	50
302460008	5	5
302460009	5	5
302460010	5	5
302460011	5	5
302460012	5	5
302460013	5	5
303010001	20	20
303010006	20	20
303010007	40	40
303010010	15	15
303010012	20	17
303010013	18	18
303010014	12	12
303010018	25	25
303010021	77	77
303010026	31	31
303010027	28	28
303020001	50	47
303020002	20	19
303020003	10	10
303020005	48	49
303020014	16	8
303020015	0	4
303030005	10	11
303030014	1	13

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
196040026	1	1
196050019	18	1
196050067	3	0
196050069	5	0
198010001	80	38
198010002	70	65
198020002	91	90
198020003	56	56
198020006	40	40
198020007	80	62
198020008	40	40
198030004	39	38
198030007	79	79
198030008	40	40
198030009	38	38
198030010	115	115
198040003	166	128
198040004	158	130
198050001	23	20
198050007	49	49
198050010	74	74
198050021	20	20
198050025	35	35
198050026	97	97
198090002	40	76
198090003	160	158
198120017	5	5
198120018	20	20
198120020	29	29
198120023	20	20
198120028	14	14
198120048	28	28
198130003	35	35
198130004	39	39
198130006	20	20
198130007	80	80
198130008	40	40
198130009	46	46
198130010	38	38
198140003	20	16
198140004	60	58
198140006	40	40
198140007	40	40

APN	TotalAcres	Irrigated Acres
303030015	69	67
303030021	7	5
303030027	20	19
303030035	8	8
303030037	5	5
303030038	5	5
303030040	5	4
303030043	6	5
303030049	15	15
303030051	9	8
303030053	10	10
303030054	19	19
303040001	40	40
303040003	20	20
303040016	40	39
303040043	15	15
303040044	5	3
303050002	38	37
303050006	15	15
303050008	39	39
303050018	19	19
303050019	19	19
303050020	19	19
303050023	5	6
303050024	12	12
303050031	9	9
303050034	5	5
303050036	5	6
303050041	18	18
303050043	17	17
303050044	2	2
303050045	20	20
303050046	19	19
303060001	36	36
303060002	0	3
303060005	20	20
303060006	20	20
303060007	20	20
303060010	13	13
303060019	20	20
303060020	39	39
303060021	20	20
303060032	13	13

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
198140008	40	40
198140009	20	20
198140010	40	40
198140011	40	40
198150001	38	38
198150005	38	40
198150006	38	38
198150010	10	10
198150011	5	5
198150012	5	5
198150013	38	38
198150021	4	4
198150022	3	3
198150024	20	20
198150030	5	5
198150036	5	5
198150037	5	5
198150040	24	25
198150041	9	8
198150042	9	10
198150046	10	10
198160004	19	19
198160005	38	38
198160011	16	16
198160014	16	20
198160015	18	20
198160026	5	3
198160029	80	72
198160029	80	4
198160036	36	35
198160037	9	10
198160038	9	10
198170007	10	10
198170010	20	19
198170022	9	9
198170024	11	10
198170025	10	10
198170030	19	19
198170031	20	19
198170032	21	17
198170038	26	30
198170039	9	10
198170040	11	10

APN	TotalAcres	Irrigated Acres
303060034	5	5
303060035	5	5
303060039	8	8
303060042	12	12
303070002	49	49
303070008	20	20
303070009	39	39
303070014	60	60
303070019	17	17
303070025	15	14
303070026	22	22
303070029	49	49
303070032	29	29
303070033	5	5
303080004	20	20
303080005	19	19
303080010	39	39
303080011	40	40
303080012	10	10
303080013	10	10
303080014	20	20
303080016	30	30
303080019	10	10
303080020	19	19
303080021	10	10
303080036	10	10
303080037	14	13
303090001	13	13
303090005	91	91
303090006	0	4
303090007	24	24
303090009	79	79
303090010	80	80
303090011	12	12
303090012	12	12
303100004	25	25
303100006	44	44
303100007	24	24
303100010	23	22
303100011	40	40
303100014	22	22
303100017	11	11
303100018	24	24

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
198170042	12	12
198170043	41	41
198180011	29	27
198180012	158	158
198180014	83	83
198180017	29	27
198180029	8	8
198190005	20	20
198190006	23	20
198190012	44	40
198190013	24	24
198190014	38	38
198190015	37	37
198190018	62	62
198200007	9	9
198200010	50	42
198200013	40	35
198200022	5	5
198200023	35	35
198200025	10	10
198200026	9	9
198210001	20	15
198210002	20	19
198210004	20	18
198210012	9	18
198210013	28	18
198230002	19	19
198240001	10	10
198240002	29	29
200180006	90	91
200180007	64	64
200220005	478	478
200220006	159	50
200220013	7	4
200220015	10	6
200220016	279	275
200230005	0	291
200230006	30	30
214010005	40	20
214010005	40	40
214010007	80	80
214010009	20	20
214010013	20	20

APN	TotalAcres	Irrigated Acres
303100020	12	12
303100021	11	11
303100022	43	43
303100023	10	10
303100024	10	10
303110001	20	20
303110002	82	82
303110007	79	79
303110008	79	79
303110010	45	45
303110011	8	7
303120001	19	17
303120002	20	20
303120016	79	79
303120021	10	10
303120022	14	14
303120024	1	0
303120025	29	29
303120027	20	20
303120028	19	18
303120032	7	7
303120033	10	9
303120034	10	9
303120035	0	37
303120036	0	15
303130002	59	59
303130007	5	4
303130011	113	113
303140005	30	30
303140006	3	2
303140007	6	5
303160002	12	12
303160003	10	10
303160013	79	79
303160014	61	61
303160016	4	4
303160018	78	78
304010053	19	19
304010054	37	37
304010054	37	30
304010058	19	19
304020012	10	10
304030001	38	37

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
214010016	5	5
214010017	17	17
214010020	27	26
214020002	39	39
214020004	40	40
214020007	40	40
214020010	5	5
214020011	5	6
214020014	20	20
214020015	20	20
214020016	20	20
214020017	20	20
214020019	27	27
214020020	20	20
214020021	20	20
214020022	20	20
214020023	20	20
214030001	19	19
214030002	19	19
214030003	40	40
214030004	79	77
214030005	140	140
214030006	20	20
214040001	10	10
214040006	19	19
214040007	20	20
214040008	39	39
214040009	20	20
214040012	19	20
214040013	10	10
214040016	38	39
214040018	9	9
214040020	18	18
214040021	2	2
214040022	6	6
214040024	20	20
214040025	19	20
214040026	18	18
214050001	80	80
214050003	20	5
214050007	20	20
214050008	20	20
214050009	20	20

APN	TotalAcres	Irrigated Acres
304030002	104	104
304030006	0	39
304030009	20	20
304030010	9	9
304030013	10	10
304030015	9	9
304040010	19	0
304040011	19	10
304040012	19	18
304040014	57	34
304040015	19	0
304040016	19	18
304040017	4	0
304040018	5	3
304040019	4	2
304040019	4	0
304040020	5	4
304040027	10	7
304050006	10	10
304050011	10	0
304050012	40	40
304050022	10	10
304050027	10	10
304050029	59	15
304050032	13	13
304050037	5	5
304050039	5	5
304050042	5	5
304050043	5	5
304050043	5	5
304050046	5	5
304050047	5	5
304050048	5	5
304050049	5	5
304050051	3	2
304050054	20	20
304050055	10	10
304050056	0	10
304050057	0	10
304060003	7	0
304060005	10	10
304060006	60	40
304060013	10	9

CURRENT MEMBERSHIP PARCELS
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APN	TotalAcres	Irrigated Acres
214050010	20	20
214050011	40	40
214050012	20	20
214050013	40	40
214050014	40	40
214060003	80	80
214060005	10	10
214060006	20	20
214060012	20	20
214060013	140	139
214060014	10	10
214060015	20	20
214060015	20	8
214060018	19	19
214070001	10	10
214070002	9	9
214070005	0	2
214070007	22	22
214070008	40	40
214070010	10	9
214070014	39	39
214070015	19	19
214070016	19	19
214070033	8	8
214070034	10	10
214070035	13	13
214070036	38	40
214070038	19	19
214070041	19	19
214080005	20	20
214080006	40	40
214080009	24	24
214080013	21	21
214080014	10	10
214080015	10	10
214080017	10	8
214080018	0	0
214080019	29	30
214080020	39	39
214080021	16	16
214080022	2	1
214080023	37	37
214080024	2	2

APN	TotalAcres	Irrigated Acres
304070002	60	50
304070008	40	25
304070014	15	0
304070016	9	9
304070023	5	5
304070024	4	4
304070029	3	3
304070030	15	15
304070032	20	20
304070033	5	5
304070034	5	5
304080001	40	38
304080003	20	20
304080005	39	39
304080006	21	21
304080008	7	7
304080018	60	60
304080019	4	4
304080020	5	5
304080021	5	5
304080022	4	4
304080027	2	2
304080028	19	19
304080031	18	18
304090004	10	10
304090012	16	9
304090013	19	19
304090014	10	10
304090017	5	5
304090020	15	15
304090021	18	18
304090035	44	20
304090048	7	7
304090049	6	6
304090050	6	6
304090051	7	7
304110003	100	100
304110004	100	100
304120002	10	10
304120009	21	21
304120017	5	5
304120018	4	4
304120019	5	5

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APN	TotalAcres	Irrigated Acres
214080025	14	14
214080026	19	18
214090001	39	39
214090002	39	37
214090003	40	40
214090004	20	20
214090005	20	20
214090006	20	20
214090010	15	15
214090011	15	15
214090012	10	10
214090013	20	20
214090016	38	38
214100001	25	25
214100003	20	20
214100006	40	40
214100007	40	40
214100008	40	40
214100010	20	20
214100013	5	5
214100016	20	20
214100017	9	10
214100018	11	10
214100023	36	36
214100025	13	13
214110004	10	10
214110005	19	19
214110008	20	20
214110009	4	4
214110010	5	4
214110011	10	10
214110012	19	19
214110015	10	10
214110016	7	7
214110017	7	7
214110018	15	15
214110020	10	10
214110032	19	18
214110039	10	8
214110040	10	9
214110042	5	4
214110043	5	4
214110046	5	4

APN	TotalAcres	Irrigated Acres
304120033	20	20
304120038	10	10
304120039	9	9
304120040	10	10
304120041	10	10
304130004	10	10
304130005	40	40
304130007	19	19
304130011	29	29
304130013	20	20
304130014	22	22
304130016	12	22
304130020	0	10
304130021	68	68
304130022	10	9
304140001	20	20
304140002	10	10
304140005	20	20
304140011	11	11
304140015	10	10
304140016	20	20
304140017	20	20
304140022	5	5
304140023	5	5
304140024	7	7
304140027	5	5
304140028	5	4
304150006	6	3
304150056	5	5
304150057	20	20
304150058	5	5
304150059	5	5
304150060	5	5
304150067	10	8
304150069	10	10
304150079	14	14
304150084	20	20
304160001	22	22
304160009	10	10
304160010	9	5
304160011	10	10
304160017	10	10
304160018	11	11

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APN	TotalAcres	Irrigated Acres
214110049	19	19
214110054	0	15
214120009	40	40
214120011	40	40
214120012	40	40
214120014	10	10
214120016	39	40
214120022	10	10
214120023	10	10
214120033	5	5
214120044	19	19
214120045	19	19
214130001	38	38
214130002	38	38
214130003	13	13
214130004	26	26
214130007	19	19
214130009	19	16
214130010	19	19
214130011	19	19
214130012	18	18
214130013	19	18
214130016	19	19
214130019	5	5
214130020	5	5
214130027	12	12
214140001	20	17
214140004	39	39
214140005	78	72
214140009	20	18
214140010	18	18
214140012	18	18
214140014	18	18
214150003	20	20
214150006	5	4
214150008	19	19
214150012	19	19
214150013	39	39
214150015	39	40
214150017	10	10
214150018	10	10
214150019	18	18
214150022	13	13

APN	TotalAcres	Irrigated Acres
304160019	0	0
304160025	19	19
304160026	41	40
304160031	19	19
304160032	0	2
304160039	5	0
304160040	6	0
304160046	1	1
304160060	9	3
304160061	10	0
304160062	10	4
304160063	10	0
304160064	31	30
304170003	20	4
304170003	20	20
304170003	20	18
304170008	10	8
304170010	12	12
304190003	2	2
304190010	19	19
304190014	4	3
305030014	29	29
305040011	114	114
305040014	205	115
305060016	32	32
305060017	20	20
305060018	20	20
305060019	21	21
305060020	20	20
305060021	20	20
305060022	21	21
305060023	21	21
305060024	20	20
305060025	21	21
305060026	21	21
305060027	19	19
305060028	30	30
305060029	20	20
305070017	164	49
305080019	160	49
305170005	10	10
305170006	10	10
305170009	23	23

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APN	TotalAcres	Irrigated Acres
214150028	38	38
214150030	19	19
214150033	18	18
214150035	19	19
214160011	20	20
214160012	39	39
214160015	20	20
214160019	20	20
214160026	20	20
214160027	38	0
214160043	19	19
214160046	59	60
214170001	58	56
214170008	40	40
214170009	40	40
214170010	0	0
214170011	19	20
214170012	19	20
214170013	37	37
214170017	38	39
214180003	10	10
214180006	77	73
214180014	10	10
214180015	9	0
214180025	19	17
214180026	28	26
214180027	41	36
215010001	39	39
215010003	9	9
215010004	10	10
215010007	30	30
215010008	9	10
215010009	40	38
215010010	31	31
215010012	20	19
215010013	0	0
215010015	32	32
215010025	19	19
215020001	38	40
215020002	0	28
215020003	38	36
215020005	37	37
215020008	19	19

APN	TotalAcres	Irrigated Acres
305170010	10	10
305170015	8	8
305170020	13	13
305170022	9	9
305170023	8	8
305170024	14	14
305170030	6	6
305170031	10	10
305170032	9	9
305170034	5	5
305170035	3	1
305190009	26	26
305190017	19	19
305190019	54	54
305190022	0	18
305200023	0	18
307270006	11	8
311040023	25	25
311040025	79	44
311040026	80	0
311050013	102	102
311070006	29	28
311070015	40	39
311070016	40	40
311070022	40	40
311070023	39	33
311070023	39	0
311070026	43	44
311070032	20	0
311070035	79	80
311070039	17	17
311070040	10	10
311070042	40	30
311070046	20	20
311070047	20	16
311070048	19	18
311070049	20	0
311070051	78	78
311080011	286	285
311090003	20	20
311090004	100	100
311100031	20	20
311100032	20	20

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APN	TotalAcres	Irrigated Acres
215020010	30	17
215020011	19	19
215020014	19	19
215020015	5	5
215020017	3	2
215020018	1	1
215020020	15	15
215030004	19	19
215030006	19	19
215030007	20	20
215030008	24	24
215030011	41	38
215030020	6	4
215030034	5	5
215030039	5	4
215030049	10	10
215030050	31	34
215040004	20	20
215040005	10	10
215040007	10	10
215040008	20	20
215040009	10	10
215040011	40	40
215040025	19	19
215040026	20	18
215040027	18	18
215040028	18	18
215040031	29	30
215050003	6	6
215050004	18	18
215050007	6	6
215060008	38	35
215060009	27	24
215200002	0	5
215200003	10	10
215260005	5	4
215260006	20	20
215270004	15	11
215270005	10	10
215270007	7	6
215270008	13	11
215270010	0	10
215270011	0	10

APN	TotalAcres	Irrigated Acres
311110001	19	18
311110016	20	15
311110026	19	16
311110027	18	20
311120009	65	30
311130001	10	10
311130004	40	36
311130005	40	36
311130010	60	55
311130011	10	10
311130015	10	10
311140002	20	15
311140003	40	35
311140004	40	40
311140005	20	20
311140006	20	20
311140009	20	17
311140010	60	49
311150009	30	28
311150012	80	70
311150024	9	8
311160002	10	10
311160003	10	10
311160004	30	27
311160005	10	7
311160006	19	17
311160007	19	18
311160008	10	10
311160009	10	10
311160010	19	20
311160011	39	36
311160021	5	5
311160022	15	15
311160025	28	28
311160028	19	20
311250006	6	6
311250007	10	6
311250009	7	9
311250010	9	10
311250015	9	10
311250021	0	1
311260010	18	20
311270005	30	20

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APN	TotalAcres	Irrigated Acres
215280001	41	41
215280002	41	41
215300023	9	13
215310003	0	5
215320031	7	7
215330001	9	9
215330003	20	20
215330008	19	19
215330009	10	10
215330010	10	10
215330018	7	7
215330031	29	29
215330038	4	5
215330040	4	3
215330041	5	3
215330044	7	7
215330055	22	21
215330056	3	3
215330059	20	20
215340004	5	5
215340005	35	35
215340006	67	67
215340007	78	78
215340008	33	33
215340009	13	13
215340011	20	20
215340014	9	9
215340018	10	10
215350001	20	20
215350005	9	10
215350008	18	17
215350009	47	47
215350014	9	9
215350016	17	18
215350026	10	10
215350027	11	11
215350028	11	11
215350029	15	15
215350033	0	0
215350034	4	4
215350035	8	8
215350040	9	9
215350042	18	17

APN	TotalAcres	Irrigated Acres
311300023	20	20
311300027	5	5
311300028	5	5
311340009	20	20
313030001	323	288
313030002	323	230
313030003	400	172
313030004	160	150
313030005	80	80
313040007	225	204
313040008	15	15
313120004	3	0
313120005	8	0
313120006	3	3
313120007	1	3
313120007	1	3
313120008	1	1
313120008	1	1
313120010	1	1
313120010	1	1
313120011	1	1
313120011	1	1
313120012	1	0
313120013	3	0
313120016	1	0
313120017	3	0
313120018	2	0
313120019	1	0
313120022	1	0
313120023	2	0
313120025	8	0
313120026	2	0
313120027	3	0
313120030	2	0
313120031	5	0
313120032	17	0
313130003	0	0
313130004	3	0
313130005	1	0
313130007	3	0
313130009	1	0
313130015	1	0
313130016	1	0

CURRENT MEMBERSHIP PARCELS
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APN	TotalAcres	Irrigated Acres
215360003	39	39
215360004	10	10
215360007	10	10
215360009	23	24
215360010	14	13
215360016	20	20
215360028	19	19
215360030	19	19
215360032	22	22
215360035	19	19
215360040	22	23
215370002	61	60
215370004	30	30
215370006	29	29
215370008	41	41
215370009	44	44
215370010	20	20
215370011	40	37
215392002	2	2
215392004	5	5
216010003	10	10
216010004	35	35
216010005	20	20
216010007	10	10
216010008	20	20
216010009	10	10
216010010	47	47
216010011	25	25
216010012	15	15
216010013	30	30
216010014	20	20
216010018	29	29
216010019	5	5
216010023	5	5
216010025	5	5
216010026	5	20
216010026	5	5
216010032	3	3
216010034	0	1
216020001	24	23
216020002	8	8
216020004	68	68
216020009	9	9

APN	TotalAcres	Irrigated Acres
313130017	4	0
313130018	1	0
313130019	1	0
313130023	2	0
313130024	1	0
313130027	1	0
313130028	3	0
313130029	2	0
313130030	10	0
313130031	1	0
313130032	1	0
313130033	10	0
313130034	15	0
313200004	157	150
313270001	160	155
313270002	160	152
313270005	120	112
313270006	40	24
313270007	320	307
313270008	320	320
314010006	80	80
314010006	80	75
314010007	40	36
314040014	120	120
314060002	166	166
314070004	44	36
314070012	94	94
314070013	3	0
314070014	114	110
314080016	0	35
314080017	0	18
314090007	39	39
314090008	40	40
314090010	40	40
314090017	40	40
314090018	40	32
314090021	8	7
314090022	91	81
314100001	79	79
314100002	79	80
314100003	40	40
314100004	79	79
314100005	40	39

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APN	TotalAcres	Irrigated Acres
216020010	20	19
216020016	6	6
216020018	32	32
216020019	36	36
216020026	33	33
216020027	5	5
216020032	3	2
216020033	7	7
216020034	2	1
216020035	1	1
216020036	1	1
216030001	20	20
216030002	13	13
216030003	3	3
216030005	11	11
216030006	3	3
216030008	39	40
216030009	19	20
216030013	19	19
216030015	39	39
216030018	22	22
216030021	37	37
216030023	9	9
216030024	5	5
216030029	4	4
216030032	2	2
216030033	2	2
216030034	2	2
216030036	39	39
216040003	19	4
216040005	10	10
216040005	10	10
216040005	10	9
216040010	9	9
216040013	58	60
216040014	38	40
216040015	10	9
216040017	19	19
216040018	10	10
216040019	10	10
216040024	5	4
216040030	7	7
216040033	17	17

APN	TotalAcres	Irrigated Acres
314110001	109	109
314110003	5	5
314110005	133	133
314110007	5	5
314110008	35	35
314120002	0	0
314120007	37	37
314120019	40	40
314120025	146	131
314130005	157	142
314130006	239	228
314130012	160	144
314140007	40	36
314150007	40	36
314190006	60	54
314190007	40	36
314190008	40	36
314190009	10	9
314200009	80	80
314200010	40	40
314200011	100	80
314240013	0	0
314250003	18	14
314250018	57	51
314250019	9	0
314250021	18	17
314250022	149	141
314260002	223	212
314260005	67	59
315010009	77	75
315040006	0	2
315050002	20	18
315050003	15	13
315050004	11	10
315050005	20	18
315050006	41	39
316010009	0	2
316080001	40	38
316090003	79	78
316090004	79	75
316090007	139	130
316110004	40	36
316130004	10	9

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APN	TotalAcres	Irrigated Acres
216040043	10	10
216040045	0	27
216050022	9	8
216050023	8	8
216050035	10	10
216050036	9	9
216050037	9	9
216050038	10	10
216050039	9	9
216050040	0	54
216060003	39	39
216060008	15	15
216060036	5	5
216060037	5	5
216060038	5	5
216060039	4	4
216060040	5	5
216060041	5	5
216060046	10	9
216060048	19	19
216070001	19	19
216070009	20	20
216070013	20	20
216070016	10	10
216070023	8	8
216070031	10	8
216070038	10	9
216070040	9	9
216070041	10	10
216070042	10	10
216070043	10	8
216070045	20	20
216070056	11	11
216070057	2	2
216070058	18	18
216070060	9	9
216080001	30	30
216080002	10	0
216080007	20	12
216080011	40	40
216080033	10	10
216080034	10	10
216080038	5	5

APN	TotalAcres	Irrigated Acres
316130005	10	10
316130009	0	32
316130010	0	19
316160001	50	44
316180001	90	90
316180002	49	51
316200001	2	2
316200010	0	2
316200016	26	23
316210014	11	9
318010002	39	39
318010004	79	79
318010005	49	49
318010006	30	29
318010007	38	35
318010008	39	35
318020002	9	9
318020003	48	48
318020005	39	40
318020009	0	5
318020011	0	0
318020013	147	147
318020016	38	38
318030003	40	60
318030004	19	19
318030008	0	2
318030009	19	18
318030010	78	78
318030011	39	39
318030012	19	18
318030013	19	18
318030014	33	33
318040002	100	93
318040003	58	58
318040004	79	73
318040005	79	79
318050008	17	17
318050009	78	74
318050010	80	75
318050011	40	40
318050016	10	10
318090005	38	36
318090006	19	19

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APN	TotalAcres	Irrigated Acres
216080043	5	0
216080051	10	10
216080061	19	20
216080064	10	10
216090002	20	20
216090004	60	60
216090005	10	9
216090006	30	30
216090010	9	8
216090019	8	8
216090032	39	39
216090033	19	6
216090034	5	5
216090036	19	19
216090037	3	3
216100001	15	14
216100003	30	20
216100004	25	4
216100005	56	56
216100007	25	25
216100012	15	12
216100019	31	31
216100022	19	12
216110012	20	19
216110014	30	30
216110020	10	10
216110020	10	10
216110029	9	9
216110032	25	25
216110039	20	20
216110052	10	10
216110058	9	10
216120001	10	10
216120003	10	10
216120004	14	14
216120007	19	20
216120008	19	19
216120009	9	9
216120009	9	10
216120011	9	9
216120011	9	10
216120021	27	26
216120022	4	3

APN	TotalAcres	Irrigated Acres
318090007	40	36
318090008	18	14
318090009	38	38
318090031	37	37
318090032	39	38
318100001	78	77
318100002	80	74
318100003	80	77
318100004	77	77
318110001	40	35
318110002	80	80
318110003	40	39
318110004	30	29
318110009	10	10
318110010	60	53
318110011	50	46
318120004	40	25
318120005	40	22
318120006	20	10
318130005	279	265
318140001	80	80
318140009	77	80
318140016	37	37
318140018	39	38
318140019	37	36
318150005	40	39
318150006	158	159
318150007	9	9
318150008	7	9
318150011	40	38
318150012	38	37
318150014	12	15
318160001	60	54
318160002	100	88
318160003	160	148
318170001	160	150
318170002	160	151
318180013	2	2
318180032	39	39
318180033	39	22
318180034	59	59
318180035	19	19
318180036	44	42

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APN	TotalAcres	Irrigated Acres
216120030	11	11
216120033	19	19
216120034	19	19
216120037	8	8
216120038	10	10
216120041	18	18
216120042	24	24
216120043	11	11
216120044	12	12
216120045	10	10
216120046	9	9
216130002	150	149
216130006	47	47
216130007	1	0
216130010	55	55
216130014	26	26
216130018	9	9
216140006	19	0
216140009	32	31
216140010	17	16
216140011	15	13
216140012	19	19
216140013	20	19
216140016	9	8
216140018	8	8
216140019	3	3
216140022	129	129
216140023	4	0
216150008	5	3
216150010	75	64
216150011	74	71
216150013	19	17
216150023	39	39
216150027	5	5
216150035	5	5
216150036	5	5
216150037	5	5
216150039	10	10
216150040	5	5
216150041	5	5
216160009	37	37
216160011	13	15
216160012	20	20

APN	TotalAcres	Irrigated Acres
318180037	39	58
318190001	40	40
318190005	120	120
318220001	160	152
318230001	160	152
318230003	5	5
318230004	5	5
318230007	20	19
318230015	95	90
318240001	40	31
318240002	25	24
318240003	94	89
318240005	23	21
318240021	18	17
318250001	159	151
318250002	157	157
318260002	159	150
318260003	159	159
318270001	10	3
318270006	80	75
318270007	80	75
318270009	20	23
318270010	120	124
318280001	160	152
318280003	20	20
318280004	20	20
318280006	40	40
318280008	640	608
318280009	40	39
318280010	40	39
318280011	40	39
318280012	40	39
318280013	40	40
318280014	40	40
318280015	40	40
318280016	40	40
318280018	40	40
318290001	320	290
318290002	320	287
318290003	160	152
318290004	160	152
318290005	40	40
318290006	40	40

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APN	TotalAcres	Irrigated Acres
216160015	77	80
216160016	35	35
216160017	18	18
216160021	0	3
216160022	0	1
216160025	0	5
216160033	4	4
216160037	19	19
216160038	3	3
216160039	12	12
216160042	3	4
216170001	40	40
216170002	24	24
216170005	9	9
216170006	24	24
216170008	5	4
216170011	8	8
216170013	20	20
216170016	40	20
216170026	13	15
216170027	5	5
216180002	19	19
216180002	19	19
216180003	18	18
216180006	20	20
216180007	36	36
216180008	18	18
216180009	20	20
216180012	10	8
216180013	18	18
216180017	20	20
216180018	20	15
216180030	19	19
216180031	20	20
216180037	8	6
220420011	141	100
225030006	0	0
228010008	38	38
228010034	32	32
228010034	32	33
228010035	32	32
228010035	32	33
228020015	20	20

APN	TotalAcres	Irrigated Acres
318290007	40	38
318290008	40	38
318300022	40	38
318310019	40	38
318320001	160	160
318320002	160	160
318330002	39	38
318330003	80	80
318330005	39	39
318340001	79	79
318340004	29	29
318340005	29	29
318350002	18	16
318350003	0	2
318350004	20	18
318350006	20	19
318350009	20	20
318350010	119	107
318350011	76	71
319010001	40	0
319010002	80	76
319010004	160	152
319010005	80	76
319010006	80	80
319010006	80	80
319010007	160	160
319010008	40	40
319010009	40	40
319010010	60	60
319010011	101	101
319010012	34	35
319010013	80	80
319010018	40	40
319010019	40	40
319010021	40	150
319010022	160	36
319020005	120	120
319020006	20	20
319020010	113	113
319020011	77	77
319020013	100	100
319020014	76	76
319020015	160	160

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APN	TotalAcres	Irrigated Acres
228030002	374	374
228080012	38	38
228080014	134	134
228080034	167	167
228080035	39	39
228080036	40	40
228080037	40	40
228080038	160	160
228090008	4	4
228090012	78	78
228090013	316	300
228120003	36	31
228120005	55	53
228130010	41	40
228130012	10	9
228130013	12	11
228150007	189	189
228160028	78	58
228170005	316	300
228170006	160	160
228170006	160	160
228170010	160	160
228170011	160	160
228170015	157	157
228170017	0	79
228170019	0	80
228180001	80	75
228180002	80	75
228180009	30	27
228190001	120	113
228190004	39	39
228200002	317	301
228210002	45	45
228210003	100	100
228210004	160	160
228220001	160	160
228220002	80	72
228230001	158	158
228230003	80	73
228230004	40	36
228230005	40	36
228240013	160	160
228240015	153	153

APN	TotalAcres	Irrigated Acres
319020016	64	63
319020017	81	81
319020019	155	155
319020020	0	119
319020021	0	121
319020040	0	0
319030001	160	160
319030005	39	38
319030006	39	38
319030007	39	39
319030008	40	40
319030009	56	56
319030012	269	269
319030013	39	39
319030014	10	10
319030015	40	40
319030016	0	2
319030017	90	90
319030018	10	10
319030019	10	10
319030022	79	78
319030023	80	80
319030024	68	68
319030025	19	19
319030026	53	53
319030027	85	85
319040001	80	73
319040004	78	78
319040005	77	72
319040007	158	147
319040008	119	110
319040009	39	40
319040011	320	286
319040012	77	77
319040013	0	1
319040014	155	155
319040016	57	56
319040017	20	20
319050001	40	40
319050003	40	40
319050004	153	153
319050011	10	10
319050012	10	10

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APN	TotalAcres	Irrigated Acres
228240016	35	35
228250011	78	77
228260004	160	160
228260012	156	156
228270005	80	79
228270007	40	35
228270018	78	78
228270019	80	77
228270023	36	36
228280003	0	37
228280004	0	38
230010001	21	15
230010006	31	30
230020001	36	35
230020007	44	40
232010022	161	156
232010024	76	75
232010025	10	9
232010026	67	60
232010042	4	0
232010043	41	35
232010044	168	162
232030011	157	140
232030016	20	16
232030028	20	20
232030029	60	60
232040001	40	30
232040003	40	40
232040006	40	38
232040007	40	40
232040008	40	40
232040010	80	80
232040012	80	80
232040014	80	80
232040016	80	71
232040017	40	40
232040018	37	37
232040019	2	2
232040021	239	239
232040024	40	38
232040025	40	40
232040026	120	120
232060009	258	245

APN	TotalAcres	Irrigated Acres
319050015	20	20
319050016	80	76
319050017	78	78
319050018	39	39
319050019	39	39
319050020	80	80
319050022	80	80
319050023	80	76
319050026	39	40
319050027	40	40
319050028	77	78
319050029	76	77
319050030	1	2
319050033	77	80
319050036	40	39
319050037	20	17
319050038	40	39
319050039	20	20
319050040	81	81
319060014	157	148
319060023	74	68
319060024	80	73
319060026	120	119
319060027	40	38
319060028	20	19
319060029	20	20
319060030	283	261
319060031	317	317
319060032	20	20
319060033	19	20
319060034	29	30
319060035	10	10
319060036	39	40
319070001	153	145
319070002	471	448
319070003	640	588
319080001	37	35
319080002	264	251
319080003	320	320
319080005	400	400
319080006	240	240
319090011	158	151
319100002	160	160

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APN	TotalAcres	Irrigated Acres
232060019	181	85
232060020	197	179
232070007	17	17
232080007	40	38
232080008	0	228
232080009	40	38
232080015	40	40
232080017	120	120
232080019	0	120
232090002	240	218
232090012	50	50
232090016	40	40
232090019	117	109
232090020	50	50
232090021	56	56
232090024	120	120
232100004	0	80
232100006	40	40
232100007	40	40
232100008	160	160
232110004	74	45
232110007	20	13
232110009	154	73
232110009	160	29
232110015	60	60
232110016	39	40
232110017	39	40
232110018	39	40
232110019	39	40
232110020	40	41
232110021	40	41
232120001	226	226
232120002	79	79
232120029	38	38
232130004	320	306
232150004	78	75
232150006	158	150
232150007	155	140
232160008	38	37
232160013	160	151
232160014	80	71
232180005	55	44
232190008	50	50

APN	TotalAcres	Irrigated Acres
319100003	39	39
319100004	39	39
319100005	236	236
319100009	158	158
319100010	160	160
319100014	64	64
319100020	61	61
319100021	99	99
319110001	137	137
319110002	183	183
319110003	17	17
319110004	9	9
319110005	77	77
319110006	140	140
319110007	80	80
319110009	120	120
319110011	9	9
319110013	147	147
319110016	80	80
319110017	80	80
319110018	78	78
319110019	78	78
319110019	78	80
319120001	160	156
319120002	160	147
319120003	160	160
319120004	100	100
319120005	40	40
319120006	20	20
319120007	158	158
319120010	40	40
319120011	39	39
319120012	38	38
319120014	40	40
319120015	160	160
319120016	39	39
319120018	40	40
319120019	78	78
319130002	318	318
319130007	44	44
319130012	28	28
319130013	294	294
319130016	100	100

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APN	TotalAcres	Irrigated Acres
232200001	78	67
232200002	119	107
232200003	116	113
233020005	9	0
233030003	19	0
233030042	1	0
233040001	80	62
233040003	40	40
233040006	79	69
233050001	160	136
233050002	80	72
233050003	80	71
233060001	80	80
233060002	120	106
233070001	58	58
233070020	69	69
233160005	40	30
233170004	159	159
236010004	78	75
236010009	161	148
236010012	75	75
236010013	3	4
236010014	79	79
236010020	39	39
236010023	40	36
236010025	38	39
236010026	81	81
236010027	78	72
236010028	59	59
236010036	77	77
236010039	77	77
236020002	160	160
236020006	40	40
236020007	23	19
236020008	17	17
236020009	70	70
236020010	90	90
236020011	158	158
236020014	40	38
236020016	160	145
236020017	123	116
236020019	118	116
236020020	0	0

APN	TotalAcres	Irrigated Acres
319130017	145	145
319130018	77	77
319130019	78	78
319130020	127	127
319140001	61	56
319140015	42	40
319140018	82	0
319140019	84	0
319140021	162	162
319140025	81	82
319140028	9	8
319140029	215	198
319140030	237	237
319140031	8	7
319140032	74	74
319140033	39	0
319140035	42	0
319140036	81	0
319150006	160	152
319150009	97	97
319150010	12	12
319150014	77	74
319150016	151	143
319150020	54	53
319150021	0	40
319150022	56	56
319150023	54	54
319150024	55	55
319150025	55	55
319150026	53	53
319150027	53	53
319150028	59	59
319150029	269	250
319160005	164	154
319160006	164	154
319160007	327	287
319160010	79	79
319160011	20	20
319160012	20	20
319160013	80	80
319160014	79	79
319160015	158	158
319170002	80	80

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APN	TotalAcres	Irrigated Acres
236020021	155	155
236020022	119	100
236030004	80	80
236030008	40	40
236030010	30	30
236030018	19	19
236030021	37	34
236030024	40	39
236030027	160	160
236030029	158	144
236030030	39	39
236030039	40	40
236030040	20	20
236030042	74	74
236030043	7	4
236030044	33	33
236030048	66	66
236030049	10	10
236030050	10	10
236030054	7	4
236030057	58	58
236030058	22	22
236040017	82	80
236040019	20	20
236040023	40	40
236040029	29	28
236040030	68	68
236040045	40	40
236040047	18	18
236040051	118	118
236050009	20	16
236050012	19	19
236050018	20	20
236050019	20	20
236050020	60	60
236050022	100	92
236050026	18	18
236050035	43	43
236050039	65	65
236050046	77	72
236050058	1	1
236050069	78	78
236050069	78	78

APN	TotalAcres	Irrigated Acres
319170003	40	40
319170004	40	40
319170005	80	80
319170007	406	344
319170012	260	260
319170017	160	155
319180010	311	311
319180011	322	303
319180015	147	147
319180016	40	38
319180017	179	72
319180018	176	174
320010003	160	160
320010005	160	160
320010007	40	40
320010013	200	192
320020001	158	158
320020002	160	154
320030005	15	15
320030006	304	297
320040003	10	10
320040019	20	20
320040020	20	20
320040021	20	20
320050002	116	116
320050003	10	10
320050004	10	10
320050005	10	10
320050006	0	10
320050012	20	20
320050013	20	20
320050014	41	41
320060005	10	10
320060006	20	20
320060009	10	10
320060010	10	10
320060011	10	10
320060012	10	10
320060013	5	3
320060023	10	10
320060024	30	22
320060025	10	10
320060026	10	10

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APN	TotalAcres	Irrigated Acres
236050073	114	114
236050075	18	17
236050076	16	10
236050079	19	24
236050083	19	19
236050084	20	16
236050085	20	18
236050086	20	20
236050087	19	20
236050089	20	20
236050090	57	57
236050091	27	27
236050093	58	58
236050094	38	38
236050096	19	0
236050098	39	39
236050099	20	20
236050101	38	38
236050101	38	38
236060004	125	125
236060005	35	35
236060007	77	70
236060008	25	25
236060009	15	13
236060010	40	40
236060011	60	60
236060012	20	20
236060016	40	40
236060017	75	75
236060018	39	39
236060022	158	158
236060038	39	37
236060039	38	35
236070002	40	35
236070003	160	160
236070004	80	80
236070006	20	20
236070009	20	0
236070010	10	8
236070012	40	40
236070013	40	40
236070014	40	40
236070017	120	105

APN	TotalAcres	Irrigated Acres
320060027	5	5
320060028	5	15
320060029	10	10
320060035	10	10
320060036	66	62
320060037	40	37
320070003	10	9
320070004	10	9
320070005	9	9
320070008	20	20
320070010	29	29
320070014	20	20
320070020	30	27
320080005	40	40
320080006	40	40
320090006	40	40
320090026	22	0
320090028	17	17
320090029	17	17
320090032	12	0
320090033	10	0
320100013	40	40
320100014	5	5
320100015	5	5
320100016	19	19
320100017	9	9
320100026	10	10
320100029	20	20
320100033	4	4
320100040	9	2
320100046	2	2
320100047	5	5
320110006	10	10
320110012	10	10
320110013	10	10
320110014	15	15
320110017	10	10
320110019	9	8
320110032	8	8
320110054	2	2
320110057	2	2
320110058	5	6
320110059	5	5

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APN	TotalAcres	Irrigated Acres
236070019	19	19
236070020	6	6
236070021	8	8
236070022	12	12
236070024	39	39
236070025	196	196
236070026	80	80
236070027	20	20
236070029	10	10
236070032	79	74
236070035	34	34
236070036	19	19
236080005	11	9
236080007	49	49
236080008	64	64
236080012	17	17
236080017	80	80
236080019	123	0
236080023	39	39
236080025	21	21
236080026	57	57
236080033	33	33
236080034	104	102
236080035	95	90
236080037	125	121
236080040	37	37
236080042	70	70
236080043	50	50
236080044	59	59
236080045	42	42
236090005	158	159
236090008	11	11
236090009	19	19
236090010	17	17
236100005	40	38
236100006	40	37
236110003	38	38
236120005	20	20
236120006	18	18
236120013	117	117
236120016	75	75
236130002	80	80
236130003	30	30

APN	TotalAcres	Irrigated Acres
320110060	6	6
320121001	7	7
320121002	7	7
320121003	28	28
320121004	10	10
320130005	16	0
320192026	3	4
320193024	10	0
320193034	8	8
320194016	5	5
320194017	5	4
320194018	10	10
320194019	25	25
320200025	19	14
320200066	115	28
320200073	7	0
320210006	0	20
320210007	10	8
320210008	10	0
320210009	10	10
320210010	10	10
320210019	12	12
320210021	10	10
320210022	10	10
320210024	10	10
320210026	40	40
320210032	4	4
320210036	2	2
320210037	13	13
320210042	4	4
320210043	5	5
320210044	5	5
320210045	5	5
320210056	9	9
320210057	10	10
320210058	25	25
320210060	9	8
320210061	18	19
320220002	10	10
320220004	29	29
320220005	10	10
320220015	0	0
320220016	0	0

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APN	TotalAcres	Irrigated Acres
236130006	40	40
236130021	160	160
236130033	14	9
236130034	20	17
236130072	20	20
236130077	16	15
236140008	80	80
236140015	37	35
236140016	48	48
236140023	10	10
236140024	10	10
236140026	10	10
236140027	10	10
236140029	79	79
236140032	10	2
236140040	20	20
236140043	39	39
236140044	79	79
236140045	78	73
236140047	20	15
236140048	0	147
236140055	26	26
236140059	140	140
236140060	155	136
236140063	2	2
236140069	77	28
236140071	39	39
236160017	37	29
236170001	79	79
236170003	80	73
236170010	80	74
236170013	38	34
236170014	30	27
236180003	78	78
236180004	79	79
236190002	80	80
236200001	79	79
236200006	21	20
236200008	63	60
236200010	17	17
236200011	5	0
236210009	78	78
236210014	73	73

APN	TotalAcres	Irrigated Acres
320220020	10	10
320220021	38	38
320220023	10	10
320220024	10	10
320220025	10	10
320220039	5	3
320220047	10	10
320220049	19	19
320220052	20	20
320220053	10	10
320220054	10	10
320220055	29	29
320230006	10	3
320230015	11	11
320230023	20	20
320230025	10	10
320230026	30	30
320230037	2	2
320230040	5	0
320230054	4	4
320230060	4	4
320230070	10	10
320230072	15	15
320230076	3	2
320230077	5	5
320240001	9	10
320240002	19	18
320240003	49	41
320240017	39	33
320240018	38	32
320240025	6	6
320240026	6	6
320240027	5	5
320240035	9	8
320240037	10	10
320240038	0	0
320250009	10	4
320250014	10	10
320250015	30	30
320250020	10	10
320250023	10	10
320250027	10	10
320250032	20	20

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APN	TotalAcres	Irrigated Acres
236230003	77	77
236230004	76	78
236230015	39	39
236230017	160	160
236230019	41	41
236230027	39	39
236230028	40	40
236240001	159	159
236240009	40	37
236240010	40	38
236240011	319	300
236240013	80	75
236250005	77	77
236250007	40	37
236250010	29	28
236250011	4	4
236250012	5	5
236250013	5	3
236250014	5	5
236250021	19	19
236250027	20	20
236260002	53	53
236260006	10	3
236260010	10	0
236260011	10	10
236260016	5	5
236260017	5	4
236260019	5	5
236260020	5	4
236260021	5	4
236260022	5	4
236260023	5	5
236260024	47	47
236260027	29	19
236260028	27	21
236260029	2	1
236260030	2	2
237010015	97	96
237010017	20	20
237010018	38	38
237010021	35	35
237010022	20	20
237010023	20	20

APN	TotalAcres	Irrigated Acres
320250033	20	20
320250043	5	3
320250051	5	5
320250061	3	2
320260001	10	10
320260002	30	30
320260003	10	10
320260013	7	7
320260014	15	15
320260015	10	10
320260017	10	10
320260018	10	10
320260019	56	56
320260021	5	5
320260022	5	5
320260023	5	5
320260027	5	5
320260028	5	5
320270001	59	59
320270003	7	7
320270006	10	10
320270007	10	10
320270010	33	33
320270011	9	9
320270018	9	10
320270020	32	32
320270021	34	34
320270022	10	10
320270023	11	11
320270029	5	5
320270031	9	9
320280002	5	6
320280003	10	10
320280007	10	10
320280010	10	10
320280015	10	10
320280023	39	39
320280037	9	9
320280049	9	8
320290001	51	51
320290002	10	10
320290003	10	10
320290004	10	10

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APN	TotalAcres	Irrigated Acres
237050015	6	6
237060005	80	80
237060006	80	80
237060008	120	120
237060010	28	28
237140001	39	39
237140006	60	60
237140024	20	11
237140025	37	37
237150050	15	15
237190002	12	12
240010002	43	35
240010003	14	14
240010008	11	11
240010019	4	3
240010021	5	5
240010026	71	71
240010027	52	52
240010030	19	19
240010032	89	89
240020001	10	9
240020012	80	75
240020013	25	22
240020017	29	29
240020018	0	1
240020021	13	13
240020022	10	8
240020025	10	10
240020027	10	2
240020027	10	6
240020043	22	22
240020044	2	2
240030003	80	68
240030005	70	0
240030006	10	10
240030008	20	20
240030009	20	19
240030010	20	16
240030011	36	30
240030013	24	24
240030014	39	39
240030015	16	16
240040001	80	70

APN	TotalAcres	Irrigated Acres
320290007	10	10
320290008	10	10
320290009	10	10
320290010	10	10
320290011	9	9
320290012	10	10
320290015	30	30
320290016	51	51
320290017	40	40
320290018	40	40
320290020	9	9
320300006	19	19
320300011	10	10
320300014	10	10
320300015	8	8
320300017	37	37
320300021	10	10
320300022	20	20
320300025	10	10
320300026	9	9
320300031	10	10
320300032	10	10
320300043	17	16
320300044	10	10
320310005	34	34
320310006	36	36
320310007	41	36
320310008	40	34
320310010	36	35
320310011	41	35
320310012	40	34
320320007	30	30
320320008	35	36
320320009	41	40
320320010	40	40
320320011	34	34
320320012	36	36
320320013	41	35
320320014	40	40
320330007	147	152
320330008	156	160
320340001	10	10
320340002	29	29

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APN	TotalAcres	Irrigated Acres
240040014	13	13
240050002	30	30
240050003	46	46
240050010	8	6
240050011	18	10
240050013	0	1
240050017	29	29
240050018	29	29
240050025	4	0
240050033	2	0
240050034	14	0
240060001	30	30
240060004	111	111
240060005	79	79
240070013	20	16
240070016	28	28
240070017	69	45
240070018	80	80
240110056	20	0
240130032	68	68
240140002	63	53
240140005	9	6
240140007	64	64
240140008	78	78
240140010	17	1
240140011	28	26
240140013	63	36
240150004	25	23
240150005	38	38
240150010	60	60
240150020	48	48
240150023	44	45
240150024	67	64
240190010	92	92
240190011	30	30
240190033	9	9
240190035	31	31
240190042	20	20
240190043	20	20
240190044	21	21
240310001	4	4
243010001	81	80
243010002	60	60

APN	TotalAcres	Irrigated Acres
320340003	39	39
320340004	40	40
320340006	82	82
320340008	23	23
320340012	10	10
320340014	10	10
320340017	10	10
320340018	10	10
320340019	10	10
320340021	10	10
320360005	321	276
320360011	159	155
320360012	165	165
320360013	158	158
320360014	19	19
320360015	138	129
320360016	199	174
320390001	22	22
320410013	9	9
320410018	2	2
320410019	2	2
320410020	2	2
320410021	2	2
321010001	332	151
321010002	318	278
321010003	198	118
321010004	4	0
321010007	317	293
321010008	16	12
321010009	101	100
321020002	10	0
321020003	10	0
321020004	10	10
321020005	10	10
321020015	10	10
321020017	20	0
321020017	20	19
321020024	10	7
321020025	20	9
321020033	5	3
321020040	10	10
321020041	10	10
321020050	10	10

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APN	TotalAcres	Irrigated Acres
243010003	174	174
243010004	4	4
243010006	80	80
243010007	80	80
243010015	312	300
243010018	77	77
243010059	37	38
243020001	71	71
243020005	21	21
243020006	42	41
243020009	19	19
243020013	119	119
243020014	40	40
243020015	158	158
243020016	40	40
243020017	39	39
243020019	94	90
243020020	33	32
243020021	16	16
243020023	17	17
243020025	24	23
243020028	80	80
243020029	77	77
243020030	33	30
243020031	46	44
243020033	98	74
243020035	10	8
243020055	5	5
243020056	5	4
243020058	5	5
243020059	5	5
243020060	40	40
243030012	14	14
243030018	39	39
243030039	10	10
243030040	11	11
243030050	41	41
243030051	11	11
243030052	14	14
243030053	10	8
243030054	2	2
243030055	21	21
243030056	13	13

APN	TotalAcres	Irrigated Acres
321030001	40	0
321030003	10	0
321030004	10	0
321030005	20	0
321030006	10	0
321030008	10	0
321030012	10	9
321030013	10	9
321030014	10	9
321030016	10	10
321030017	10	0
321030019	5	0
321030027	0	0
321030030	18	18
321030031	0	0
321040015	20	20
321040024	143	142
321040025	33	0
321040030	77	65
321040041	81	64
321040042	76	71
321040043	89	64
321040053	20	0
321040054	19	0
321050002	40	40
321050004	10	10
321050005	40	40
321050006	30	1
321050007	30	30
321050008	10	10
321050009	10	10
321050010	40	40
321050013	20	20
321050015	10	10
321050020	17	10
321060001	160	160
321070001	40	40
321070004	40	40
321070010	80	80
321070012	80	80
321070015	60	60
321070020	40	40
321070024	54	54

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APN	TotalAcres	Irrigated Acres
243030057	45	45
243040005	23	23
243040007	6	6
243040013	20	20
243040024	20	20
243040030	5	4
243040032	5	5
243040033	9	4
243040044	10	10
243040045	10	10
243040046	9	9
243050008	19	19
243050009	12	12
243050010	25	25
243050011	20	20
243050014	5	5
243050018	10	10
243050019	20	20
243050020	20	20
243050022	6	3
243050023	3	3
243050025	4	2
243050027	19	19
243050031	10	4
243050032	9	9
243050035	11	12
243050037	10	2
243050038	9	9
243060001	10	9
243060004	9	10
243060010	13	11
243060011	10	9
243060012	30	30
243060014	13	11
243060015	9	7
243060017	10	10
243060018	76	76
243060019	8	8
243060020	9	9
243060021	5	5
243060024	8	8
243060025	13	13
243060026	2	2

APN	TotalAcres	Irrigated Acres
321070025	6	6
321070030	0	0
321080009	10	10
321080010	20	17
321080011	10	10
321080013	10	9
321080017	5	5
321080018	5	5
321080020	24	24
321080039	8	8
321080043	15	0
321080049	6	6
321080057	6	6
321080069	18	18
321080070	10	9
321080071	16	15
321080072	6	5
321110004	7	0
321110007	14	0
321110008	22	0
321110009	20	20
321110010	20	20
321110011	0	1
321110012	16	15
321110018	23	23
321110034	70	68
321110035	13	11
321110036	13	10
321130001	10	10
321130002	10	19
321130003	60	57
321130004	80	75
321130009	13	13
321130010	0	1
321130014	0	1
321130018	19	19
321130019	15	15
321140001	252	177
321140002	85	75
321140003	316	293
321140016	160	0
321140017	79	34
321140018	151	106

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APN	TotalAcres	Irrigated Acres
243060030	1	2
243060031	3	3
243060032	1	1
243090018	5	5
243090029	9	10
243090037	5	5
243090039	5	5
243090050	5	5
243090059	0	1
243090063	16	16
243090069	15	17
243090071	18	18
243090072	18	18
243090078	8	8
243090081	18	19
243090085	18	15
243090092	9	9
243090093	4	4
243110012	14	14
243110020	17	0
243110024	17	17
243120044	0	18
243120045	0	18
243140002	9	8
243140003	9	9
243140021	0	34
243150067	15	15
243160012	14	14
243170009	2	0
243170014	7	0
243170015	28	0
243170018	3	0
243180003	2	2
243180007	4	4
243180015	1	1
243180033	6	0
243180034	5	0
243180035	5	0
243180036	6	0
243190008	4	4
243190014	0	1
243190019	2	0
243310002	9	0

APN	TotalAcres	Irrigated Acres
321140019	3	0
321150001	405	385
321150006	415	384
321150008	78	76
321160021	307	295
321160022	5	4
321160027	320	269
321160030	27	27
321160031	20	20
321190001	241	0
321190002	60	0
321200003	10	0
321200006	260	0
321210004	120	0
322190006	1	4
323010006	80	54
323010010	79	30
323010010	79	10
323010011	39	10
323020005	39	10
323040009	20	0
323040011	20	0
323040013	80	0
323040014	3	0
323040016	3	0
323040017	10	0
323060003	10	10
323060007	20	18
323060013	40	40
323060022	10	10
323060028	5	10
323060034	46	46
323060035	93	92
323060037	19	18
323060039	10	10
323060044	5	1
323060046	5	5
323060047	5	5
323060052	5	5
323060053	4	4
323060058	10	0
323060060	5	5
323060066	10	0

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APN	TotalAcres	Irrigated Acres
243310010	9	6
243340009	9	9
243340020	12	12
243340041	33	33
243340042	45	45
243340046	8	7
243340056	0	41
243340057	0	60
243350002	39	39
243350003	66	66
243350011	39	28
243350014	20	20
243350028	39	39
243360004	80	26
243360005	58	58
243360008	95	75
243360009	80	80
243360011	16	16
243370004	160	120
243370005	44	44
243370006	116	85
243370007	14	10
243380001	4	3
243380022	7	7
243380023	1	1
243390015	33	0
243410016	8	8
243410025	5	5
243420001	35	35
243420003	112	103
243420012	5	5
243420013	49	48
243420015	5	5
243420063	35	35
243430010	20	0
243430020	8	0
243440001	10	10
243440002	0	0
243440003	9	9
243440004	7	0
243440005	20	0
243440006	20	0
243440007	3	11

APN	TotalAcres	Irrigated Acres
323060067	10	0
323060068	10	10
323060069	10	10
323060074	9	5
323060075	5	5
323060081	10	9
323060090	21	20
323060091	24	20
323060092	9	10
323060093	37	20
323060094	68	60
323070001	40	20
323070002	30	35
323070007	10	10
323070008	10	10
323070012	20	20
323070017	34	34
323070018	52	52
323070025	15	15
323070026	10	10
323070033	38	20
323070035	6	4
323070043	30	29
323092009	18	18
323092011	40	40
323092012	20	20
323092013	40	39
323092014	20	20
323092015	20	20
323092036	15	13
323092038	14	14
323092047	6	6
323092051	21	19
323092052	0	39
323092053	8	8
323092055	39	39
323101001	10	10
323101002	28	28
323101004	21	5
323101006	30	30
323101007	20	20
323101010	20	10
323101013	18	18

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APN	TotalAcres	Irrigated Acres
243440008	3	0
243460002	10	9
243460003	5	5
243460004	5	5
243470004	10	9
243470007	10	10
243470019	5	5
243470020	3	3
243470022	3	1
243490001	20	20
243490005	2	1
243490006	8	8
243510001	67	64
245010050	10	10
245010087	59	55
245020027	77	71
246300001	5	3
246300003	0	0
246300004	0	0
246300006	0	1
246300007	0	0
246300008	0	1
246300009	0	1
246300011	0	1
246300012	0	1
246310001	12	0
246310002	0	1
246310003	0	0
246310004	0	3
246310005	0	1
246310006	0	1
246310007	0	1
247030042	4	0
247030044	5	0
247030059	6	0
247030060	13	0
247090025	7	0
248010017	9	9
248060005	20	20
248060009	13	13
248060019	120	45
248070004	11	11
248080018	10	9

APN	TotalAcres	Irrigated Acres
323102001	3	3
323102002	38	38
323102006	8	8
323102008	41	41
323151004	7	6
323151010	8	8
323151011	0	10
323151013	42	40
323151016	1	1
323151017	9	9
323152005	30	30
323152010	24	24
323160002	7	7
323160003	18	18
323160005	5	5
323160006	10	10
323160007	13	13
323160008	7	7
323160010	8	8
323160011	18	18
323160012	12	12
323160013	7	7
323160016	0	2
323160018	20	20
323160021	25	25
323160028	7	4
323160031	10	10
323160032	10	9
323160036	24	24
323160037	23	23
323160040	10	7
323160041	30	30
323170008	21	21
323170010	9	9
323170011	8	8
323170012	8	8
323170013	8	8
323190006	9	4
323190007	11	11
323190014	10	10
323190015	10	10
323190016	5	5
323190017	30	30

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APN	TotalAcres	Irrigated Acres
248100054	0	2
253070007	10	10
253080025	13	13
253080026	13	11
254010060	41	41
254010061	29	29
254040031	19	19
254040032	4	4
254040033	5	5
254040034	5	5
254040035	5	5
254050047	5	5
254050048	5	5
254050049	5	5
254050050	5	5
254050054	6	6
254060016	5	5
254060028	5	5
254060030	4	0
255010001	9	9
255010006	50	50
255020007	27	27
255020008	10	10
255020009	10	10
255020010	16	16
255030008	59	59
255030012	7	7
255030015	3	2
255030016	17	17
255030018	9	9
255030030	10	10
255030032	9	9
255030033	15	15
255030034	15	15
255030035	20	12
255030036	20	0
255040002	59	59
255040003	21	21
255040010	10	10
255040011	20	20
255040012	20	20
255040013	20	20
255040019	20	20

APN	TotalAcres	Irrigated Acres
323190028	10	10
323190036	10	10
323190038	9	9
323190039	9	9
323200001	41	41
323200002	40	40
323200004	5	5
323200010	5	5
323200011	5	2
323200015	10	10
323200016	40	0
323200018	6	6
323200019	5	5
323200020	5	5
323200021	0	0
323200022	20	2
323200023	19	19
323200024	20	20
323200027	10	10
323200028	10	10
323200029	10	10
323200030	10	10
323210001	4	4
323210002	12	12
323210004	50	50
323210005	25	25
323210007	42	12
323210008	20	20
323210014	51	51
323210015	34	34
323210017	8	8
323210018	5	5
323210019	4	4
323220008	19	19
323220009	19	19
323220010	19	19
323220011	9	9
323220012	9	10
323220013	10	10
323220014	10	10
323220015	9	9
323220016	28	28
323220017	28	28

CURRENT MEMBERSHIP PARCELS
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APN	TotalAcres	Irrigated Acres
255040028	6	6
255040029	6	6
255040036	1	1
255040038	6	6
255040040	17	17
255040042	47	47
255050002	11	11
255050003	19	19
255050005	40	40
255050008	10	9
255050009	10	6
255050010	20	20
255050011	20	20
255050012	20	20
255050015	40	40
255050016	18	17
255050017	9	0
255050020	30	27
255050021	10	9
255050022	60	60
255060009	40	35
255060010	40	39
255060011	40	36
255060012	40	34
255060013	40	35
255060014	40	39
255060015	40	40
255060016	39	39
255060018	2	0
255070008	0	0
255070009	0	0
255070023	40	38
255070024	40	39
255070025	77	10
255070026	40	28
255070027	40	40
255070030	26	26
255070032	10	10
255070033	10	10
255080001	50	50
255080006	20	20
255080007	30	30
255090014	33	0

APN	TotalAcres	Irrigated Acres
323220018	10	10
323220021	37	38
323230002	33	0
323230004	28	28
323230005	27	27
323230010	19	19
323230016	28	28
323230017	10	10
323230018	37	28
323230019	13	13
323230021	18	18
323230022	7	7
323230024	18	18
323230031	18	16
323240001	9	9
323240005	19	19
323240006	18	18
323240008	20	20
323240009	20	20
323240012	9	9
323240016	10	10
323240017	10	10
323240020	9	9
323240021	9	10
323240025	19	19
325100009	28	18
325210061	7	3
326030001	15	15
330010001	320	293
330050001	80	0
330050002	236	236
330050004	355	355
330050005	640	597
330060002	154	135
330060003	193	181
330060004	640	610
330060005	160	150
330060006	160	149
330091016	10	19
330091033	10	10
330100002	40	25
330100006	159	150
330100026	40	15

CURRENT MEMBERSHIP PARCELS
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APN	TotalAcres	Irrigated Acres
255090016	39	0
255090019	61	0
255100001	238	238
255130004	32	32
255170001	13	13
255170027	4	4
255170029	9	9
255190013	39	35
255190014	0	0
255190018	660	660
255190019	101	101
255200011	201	100
255210001	16	16
255210011	141	100
255210015	40	35
255210017	36	36
255210018	18	18
255220019	10	10
255220023	7	7
255220025	10	10
255230009	10	10
255230010	11	10
255230015	6	6
255230016	14	14
255240007	8	8
255250006	6	0
255250011	8	8
255250015	14	0
255250016	6	0
255250017	1	1
255260005	4	3
255260006	7	4
255260008	9	8
255260011	2	2
255260011	2	0
255260012	11	11
259030011	77	40
259030031	70	70
259040008	40	40
259040029	103	103
259040039	51	50
259040040	26	1
259270004	30	30

APN	TotalAcres	Irrigated Acres
330100027	20	10
330110007	40	15
330130003	20	20
330130005	40	0
330130006	40	0
330130007	30	10
330130011	40	6
330130029	20	20
330130030	10	10
330130030	10	10
330130031	10	10
330130031	10	0
330130033	40	40
330150007	106	106
330150008	100	100
330150009	160	160
331060001	80	0
331070001	70	0
331090001	140	135
331090002	155	40
331100023	30	28
331110001	6	6
331110002	14	12
331110003	10	9
331110004	10	9
331110005	18	16
331110006	3	0
331110008	13	0
331110009	3	1
331110010	3	1
331120001	18	16
331120002	62	59
331130001	6	6
333010001	320	320
333010002	320	320
333010003	263	263
333010004	356	342
333020001	640	640
333020002	214	214
333020003	100	111
333020004	72	68
333020006	160	160
333062001	125	125

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APN	TotalAcres	Irrigated Acres
263030002	12	12
263030056	0	37
263080006	27	27
264060008	10	10
264060009	20	20
264060010	10	10
264060018	25	25
264060027	5	5
264060045	11	0
264060046	13	0
264060055	74	74
264070002	20	20
268010001	120	120
268022013	1	1
268022014	1	1
268022015	1	1
268110007	39	39
268110014	20	20
268110016	40	40
268110029	18	18
268110029	18	20
268110030	20	20
268110030	20	20
268110031	20	20
268110031	20	20
268120002	40	38
268120019	37	37
268120020	80	80
268120026	16	16
268130002	40	40
268130007	2	3
268130008	2	3
268130010	34	35
268130015	19	19
268130019	5	3
268130021	3	1
268130022	35	37
268130023	18	18
268130030	5	4
268130031	5	4
268130032	5	4
268130033	25	25
268130034	4	0

APN	TotalAcres	Irrigated Acres
333072001	200	200
333080001	139	76
333080002	187	0
333080005	530	208
333090024	258	255
333104004	65	65
333110005	367	367
333110006	212	212
333110007	53	53
333120002	24	0
333150001	160	0
333150003	5	0
333150005	18	0
333150008	10	0
333150009	5	0
333150010	5	0
333150012	10	0
333150013	15	0
333150014	30	0
333150016	5	0
333150018	5	0
333150019	10	0
333170001	40	38
333170003	73	70
333170012	10	0
333170017	80	77
333170019	320	308
333180001	326	158
333180002	320	158
333230001	160	154
333230002	323	307
333230003	162	150
333230005	40	40
333230006	20	20
333230010	80	70
333230011	40	40
333230012	242	220
333240011	10	0
333270001	640	615
333270002	120	120
333270003	20	20
333270004	20	20
333270012	20	20

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APN	TotalAcres	Irrigated Acres
268130036	10	10
268130037	10	10
268130038	10	10
268130039	10	10
269060059	39	40
269060059	39	40
269060060	19	0
269080001	80	80
269080002	37	30
269080007	19	19
269090002	49	40
269090003	40	40
269090004	32	32
269090005	26	20
269090017	5	4
269090029	20	60
269090034	80	40
270030002	40	40
270030004	2	2
270030006	6	6
270040001	34	34
270070012	5	5
270090005	30	0
270090006	10	10
270090010	5	4
270100015	10	5
270100016	15	15
270100017	15	15
270100025	3	3
270100029	5	5
270100038	5	5
270100039	7	7
270100040	8	8
270100041	5	0
270100042	4	0
270100050	5	5
270100051	10	10
270100055	16	16
270100057	10	10
270100058	10	7
270100059	10	10
270100060	10	10
270110005	10	10

APN	TotalAcres	Irrigated Acres
333270013	40	40
333270014	160	160
333270015	160	160
333280002	1	1
333280006	8	8
333280008	20	20
333280009	10	10
333280010	10	10
333280011	15	15
333280012	16	16
333290015	40	40
333290016	34	38
333300001	80	80
333300002	80	80
333300003	80	80
333300004	80	80
333300005	160	160
333300006	160	160
333300007	80	80
333300008	40	40
333300009	200	200
333310001	80	80
333320003	320	320
333320004	80	80
333320006	80	80
333350036	30	28
333360001	120	0
333360002	28	0
333360004	5	0
333360015	8	0
333360016	8	0
333360029	0	0
333360032	2	0
333360034	5	0
333360036	33	0
333370002	155	0
333370004	60	0
333370005	10	0
333370006	10	0
333370007	10	0
333370010	8	8
333370011	19	0
333370012	10	0

CURRENT MEMBERSHIP PARCELS
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APN	TotalAcres	Irrigated Acres
270110006	10	10
270110015	15	15
270110017	13	13
270110028	12	12
270110036	14	14
270110037	14	14
270110038	20	20
270110041	40	40
270110047	19	19
270110048	0	0
270110054	10	10
270110056	10	10
270110057	9	9
270110058	5	5
270110059	5	4
270110060	20	20
270110063	14	14
270110064	5	5
270110065	20	20
270110067	12	12
271010004	10	9
271010008	28	27
271010012	5	5
271020001	18	18
271060001	3	3
271060025	59	59
271070006	2	2
271090007	37	37
271110002	38	38
271110003	37	37
271120001	15	15
271120002	5	5
271120006	10	10
271120007	40	40
271130003	19	19
271130004	20	20
271130005	20	20
271130006	15	15
271140004	16	16
271140010	10	10
271140012	9	9
271150001	19	19
271150004	17	17

APN	TotalAcres	Irrigated Acres
333370013	20	0
333380001	149	149
333380003	98	98
333380004	60	60
333390003	10	10
333390003	10	10
333400001	30	30
333400002	10	10
333400013	4	0
333410007	5	0
333430001	72	72
336010001	42	42
336010002	82	82
336010005	40	40
336010006	40	40
336010007	18	18
336010011	34	34
336010012	2	2
336010014	1	1
336010015	80	80
336010016	35	35
336010017	5	5
336010018	160	152
336010019	80	72
336010020	80	74
336010021	40	37
336010022	40	37
336010023	80	80
336010024	20	20
336010026	20	20
336010027	142	142
336010028	102	102
336010042	40	40
336020002	40	39
336020003	160	149
336020004	78	78
336020005	39	35
336030001	160	143
336030003	20	18
336030004	140	128
336040001	40	38
336040002	22	19
336040003	10	10

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APN	TotalAcres	Irrigated Acres
271150006	15	15
271160005	20	0
271160007	18	18
271160008	0	2
271160010	19	18
271160013	15	14
271171004	0	0
271171005	0	0
271171006	0	0
271171007	0	0
271171008	0	0
271171009	0	0
271171010	0	0
271171011	0	0
271171013	0	0
271171015	0	0
271171016	0	0
271171040	3	3
271171044	5	5
271171046	20	20
271171048	9	9
271172002	18	17
271172004	8	8
271172005	5	5
282010003	140	140
282010004	25	25
282010011	24	24
282010012	6	6
282010013	10	10
282010014	10	10
282010015	24	24
282020006	2	0
282020017	5	2
282020027	10	8
282020028	9	7
282020029	11	10
282030014	7	7
282030042	21	16
282030044	8	9
282040003	40	40
282040005	130	80
282040016	12	0
282040017	0	0

APN	TotalAcres	Irrigated Acres
336040009	72	68
336040021	63	63
336040024	0	38
336050001	103	101
336050002	27	26
336050005	40	28
336050023	38	33
336060002	80	80
336060003	80	80
336060007	80	70
336060009	80	80
336060010	80	80
336060011	80	80
336060013	240	231
336060016	78	70
336060018	256	250
336060022	157	156
336060023	20	19
336060025	38	38
336070001	107	107
336070002	160	160
336070005	40	40
336070007	40	40
336070008	20	18
336070010	40	37
336070013	120	120
336070014	40	40
336070015	40	40
336070017	140	140
336070018	100	95
336070019	60	55
336070020	107	104
336070021	107	104
336070023	118	116
336070024	0	1
336070025	0	38
336080001	130	130
336080002	10	10
336080003	160	150
336080006	10	10
336090020	100	95
336090041	20	20
336090042	20	20

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APN	TotalAcres	Irrigated Acres
282040021	10	0
282040022	82	67
282040023	29	26
282060007	9	9
282060022	12	12
282070006	7	7
282070008	10	10
282070038	15	15
282080002	39	39
282090001	40	40
282090010	8	8
282090012	28	28
282090018	40	40
282090034	22	22
282090035	10	10
282090050	19	19
282090059	5	5
282090060	41	41
282100013	97	0
282100014	158	78
282110003	80	80
282110004	80	80
282110013	9	9
282110015	9	9
282110018	13	13
282110019	121	121
282120008	45	45
282120009	12	12
282120010	298	218
284040001	20	20
284040006	13	13
284040008	20	20
284050004	28	28
284050014	56	56
284050015	6	6
284070008	6	4
284112055	28	20
284112057	2	1
284112058	60	20
284112058	60	8
284160041	5	5
284171013	18	15
284182012	0	4

APN	TotalAcres	Irrigated Acres
336090043	20	20
336100004	29	29
336100005	60	60
336100013	78	78
336100023	20	20
336100028	17	17
336110004	78	78
336110006	38	39
336110030	5	5
336110037	17	56
336110037	17	17
336110038	96	56
336110038	96	85
336120001	79	76
336120002	39	36
336120027	160	160
336120028	20	20
336120036	187	177
336120037	157	143
336120039	99	99
336120040	18	18
336130001	80	0
336130002	80	72
336130007	84	84
336130010	45	42
336130012	5	2
336130013	75	71
336130014	34	34
336130015	40	40
336130016	40	40
336130017	40	40
336130019	80	73
336130020	40	36
336130021	80	75
336130022	100	88
336130023	20	18
336130025	80	73
336130026	119	104
336130030	37	37
336130032	38	36
336141001	0	0
336141002	1	1
336141015	0	0

CURRENT MEMBERSHIP PARCELS
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APN	TotalAcres	Irrigated Acres
284182028	20	20
284230099	160	18
284341024	10	6
284342009	7	7
284342010	18	14
284342012	32	32
284342013	21	21
284342014	24	24
284400016	4	4
284400017	11	11
284420002	149	0
284430001	160	15
284430001	160	1
284430002	63	0
284430003	42	42
284430005	20	20
284470020	5	3
284470021	5	2
284470022	5	5
284470028	28	28
284480016	15	3
284480018	1	1
284480022	21	10
284490001	54	0
284490014	32	23
284490033	24	17
284500018	0	1
284500019	100	30
284500022	32	30
284500035	5	5
284540023	6	5
284540024	5	5
284540025	3	3
284540026	5	4
284540027	1	1
284560002	2	2
284560003	2	2
284600002	39	39
284610012	47	47
284610015	5	2
284610018	25	25
284620012	40	20
284620025	39	20

APN	TotalAcres	Irrigated Acres
336141017	0	0
336141036	92	92
336141037	39	39
336141038	16	16
336142010	0	0
336142014	0	0
336142030	164	147
336150001	160	149
336150002	160	147
336150003	320	302
336180001	54	54
336180002	108	108
336180003	40	40
336180004	40	40
336180005	80	80
336190002	41	41
336190006	10	10
336190007	160	160
336190008	5	5
336190009	4	4
336190010	5	5
336190011	1	1
336190017	0	3
336190018	3	3
336190020	3	3
336190021	1	1
336190022	5	5
336190029	12	12
336190030	11	11
336190031	13	13
336190032	4	4
336190033	14	14
336200001	19	18
336200003	7	0
336210002	65	58
337030004	140	140
337030005	20	20
337030006	40	40
337030007	40	40
337030008	120	120
337030009	40	40
337030010	40	40
337030011	40	40

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APN	TotalAcres	Irrigated Acres
284690003	9	6
284690016	11	11
284700001	27	27
284700002	8	8
284720003	19	19
284720004	5	3
284760011	22	14
284760017	36	17
284760018	3	2
284760023	20	20
284760024	10	10
284810005	10	10
284890010	1	1
284890011	1	1
284890012	1	1
284890013	2	2
284890014	2	2
291010002	6	0
291010009	383	332
291020001	8	7
291020006	120	109
291020016	182	182
291020021	55	250
291020023	66	65
291020024	164	153
291030007	45	45
291030013	237	215
291030024	2	2
291030030	173	157
291030031	79	72
291030036	16	15
291030039	199	181
291040011	383	383
291050019	1	1
291050021	99	93
291050023	5	4
291050030	213	201
291050031	303	285
291050033	0	21
291060002	7	7
291060023	123	115
291070006	78	70
291070008	408	375

APN	TotalAcres	Irrigated Acres
337030012	40	40
337030013	80	80
337030014	40	40
337040010	162	150
337040021	240	240
337040022	80	80
337050001	79	79
337050002	40	40
337050003	20	20
337050004	39	39
337050005	15	15
337050006	27	27
337050006	27	25
337050010	54	49
337050011	3	3
337060002	82	78
337060003	18	16
337060013	1	1
337060014	28	28
337060019	81	80
337060026	11	11
337060027	12	12
337090004	21	21
337090005	21	18
337090006	0	57
337090009	29	27
337090012	72	72
337090013	61	61
337100001	80	80
337100006	160	144
337100007	320	202
337100007	320	0
337100007	320	101
337100008	81	78
337100009	80	54
337100009	80	0
337100009	80	38
337100010	80	54
337100011	58	58
337100012	98	94
337110002	20	20
337110007	40	0
337110007	40	38

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APN	TotalAcres	Irrigated Acres
291070011	50	49
291080006	20	18
291100005	19	19
291100006	19	19
291100007	38	37
291100008	66	61
291100011	108	82
291110007	18	15
293040005	160	150
293040015	80	75
293050004	320	300
293060013	158	150
293070007	20	15
293070020	159	145
293070024	57	50
293080007	157	150
293080017	157	151
293080018	76	72
293090005	125	112
293090023	105	101
293100003	80	80
293100006	80	75
293100007	320	270
293100010	151	145
293100011	78	70
293100013	78	78
293110004	160	150
293110009	157	148
293110010	160	151
293120002	160	150
293120007	40	38
293120008	39	37
293120009	78	75
293120013	97	90
293140030	138	123
293140036	119	115
293150019	157	157
293170003	158	158
293170004	158	158
293240001	40	38
293270019	13	13
295010001	117	100
295010004	151	150

APN	TotalAcres	Irrigated Acres
337110009	41	33
337110010	21	21
337110011	40	34
337110012	60	57
337120001	159	141
337120002	30	30
337120003	107	107
337120004	0	1
337120005	0	1
337120006	20	18
337130002	160	153
337130007	80	80
337130010	160	160
337130011	40	40
337130012	20	20
337130013	77	77
337130014	160	160
337130015	160	139
337130016	80	80
337130017	80	80
337130018	80	80
337130019	77	74
337130020	79	5
337140002	156	165
337140003	77	80
337140006	58	58
337140008	172	172
337140009	79	79
337140013	39	39
337140016	40	40
337140018	38	38
337140021	219	219
337140023	216	216
337140026	76	76
337150002	160	160
337150003	258	258
337150004	80	80
337150005	80	80
337150005	80	20
337150006	160	144
337150009	20	20
337150010	160	152
337150013	80	80

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APN	TotalAcres	Irrigated Acres
295020010	40	40
295020011	40	40
295020012	38	38
295020014	35	35
295030008	13	13
295040011	5	5
295040020	5	5
295050006	27	25
295060002	20	20
295060004	28	30
295070005	20	18
295080001	10	10
295080002	30	30
295080003	20	18
295110002	60	60
295150001	160	160
295160001	29	28
295160002	5	5
295160003	3	2
295160004	3	2
295160006	9	9
295170013	5	4
295170015	10	9
295170019	5	4
295180019	8	7
295180020	10	10
295190019	37	34
295210003	5	5
295210004	5	5
295210005	10	10
295210011	28	22
295230004	153	153
295240014	16	14
295250012	10	7
295250020	19	18
295270028	7	6
295270029	10	7
298020011	5	5
298020014	4	3
298020020	10	10
298030013	138	135
298100014	4	4
298100016	5	5

APN	TotalAcres	Irrigated Acres
337150014	80	80
337150015	37	36
337160003	105	100
337160004	80	80
337160005	10	10
337160006	23	20
337160007	50	50
337170001	46	42
337170002	261	239
337180001	161	161
337180002	159	159
337190001	161	145
337190002	80	38
337190007	4	0
337190008	59	53
337200016	397	397
337200017	80	80
337200018	80	80
337200019	80	80
338010005	65	62
338010006	80	80
338010011	159	150
338010016	5	5
338010017	5	5
338010018	205	187
338010025	97	97
338010027	74	74
338010029	39	39
338010030	99	99
338010031	42	42
338010032	36	36
338010034	156	156
338010035	157	157
338020007	79	79
338020009	160	160
338020016	40	40
338020019	40	40
338020021	79	74
338020022	35	35
338020023	40	40
338020028	33	32
338020029	78	78
338020030	152	147

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APN	TotalAcres	Irrigated Acres
298110009	3	3
298120004	81	81
298120010	79	79
298120012	104	104
299030004	7	6
299030005	3	3
299040006	174	165
299050002	40	40
299050003	40	40
299050006	78	78
299050006	78	72
300010002	123	123
300010003	14	14
300010008	49	49
300010013	17	13
300010022	8	7
300010024	120	120
300010026	110	110
300010028	24	24
300010032	162	162
300020007	16	16
300020019	9	10
300020034	143	142
300030028	20	20
300030029	199	199
300040014	2	0
300050007	158	145
300070002	78	152
300080005	28	26
300080015	120	112
300080021	40	40
300080022	120	120
300080026	35	33
300080027	154	45
300080027	160	22
300080028	153	77
300080029	3	78
300080031	37	32
300080033	151	139
300090002	26	12
300090007	20	18
300090008	56	52
300090009	77	35

APN	TotalAcres	Irrigated Acres
338020033	159	148
338020034	39	39
338020034	39	34
338020036	77	77
338030006	70	78
338030007	33	34
338030009	9	9
338030010	27	27
338030011	14	14
338030020	83	84
338030022	1	1
338030026	19	20
338040006	40	37
338040007	39	37
338040008	39	33
338040009	39	36
338040010	51	51
338050001	133	133
338050006	113	113
338050007	41	42
338060001	140	140
338060002	161	161
338070008	20	20
338070010	20	20
338070017	160	159
338070044	158	158
338070047	161	160
338070066	120	120
338070071	240	240
338070072	20	20
338070073	20	20
338080003	161	145
338080004	161	160
338080014	40	40
338080015	159	159
338080018	157	157
338080024	80	80
338080025	19	19
338080026	20	20
338080027	19	19
338080028	20	20
338080029	38	38
338080030	40	40

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APN	TotalAcres	Irrigated Acres
300090009	80	38
300090010	79	35
300090010	80	38
300090011	80	76
300090025	20	20
300090026	5	0
300100006	77	73
300100007	79	79
300100009	3	2
300100010	74	70
300100012	80	76
300100013	160	151
300110002	87	87
300110003	65	65
300110016	30	30
300110018	50	50
300110019	80	74
300110020	40	40
300110021	40	40
300110041	40	40
300110042	195	195
300120001	78	82
300120002	80	57
300120003	80	80
300120013	79	79
300120014	79	79
300120014	79	73
300120015	80	80
300120016	78	78
300120033	76	76
300120041	19	18
300120042	20	19
300120043	22	21
300120044	65	62
300120045	56	56
300120049	0	48
300130001	5	0
300130002	69	69
300130005	183	168
300130009	40	38
300130010	25	21
300130012	39	36
300130013	80	76

APN	TotalAcres	Irrigated Acres
338080031	40	40
338080032	40	40
338080033	38	38
338080034	38	38
338080035	80	80
338080037	43	44
338080038	39	39
338080039	39	39
338090002	80	66
338090007	20	18
338090009	80	78
338090010	318	318
338090011	3	3
338090013	40	33
338090014	80	76
338090016	313	273
338090017	78	74
338090018	78	0
338090018	78	71
338090019	39	0
338090019	0	0
338090020	40	40
338090021	1	0
338090022	19	19
338090023	9	9
338090024	10	10
338090025	20	19
338090026	20	17
338090027	19	19
338100001	40	37
338100001	40	40
338100002	119	119
338100004	60	75
338100005	100	75
338110002	40	40
338110003	80	80
338110004	40	40
338110006	40	40
338110008	19	19
338110009	20	20
338120001	44	44
338120003	22	19
338120005	22	22

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APN	TotalAcres	Irrigated Acres
300130014	80	76
300130015	75	75
300130016	74	74
300130019	20	19
300130025	74	74
300130031	40	37
300130035	39	35
300130039	19	17
300130040	37	35
300140001	71	71
300140002	80	80
300140009	80	71
300140013	14	13
300140016	160	154
300140018	80	75
300140019	80	56
300140020	82	82
300140026	120	112
300140027	80	73
300140029	39	38
300140030	39	37
300140031	40	39
300140032	39	38
300140034	137	131
300140036	0	38
300150004	80	80
300150005	80	76
300150006	80	76
300150007	80	76
300150009	160	152
300150010	160	152
300150011	160	160
300150012	160	150
300150013	40	40
300150015	40	40
300150016	40	37
300160002	269	264
300160003	40	38
300160004	51	48
300160005	131	124
300160006	138	128
300160008	160	152
300160010	80	76

APN	TotalAcres	Irrigated Acres
338120006	78	78
338120007	73	72
338120008	94	90
338120009	31	30
338120010	19	15
338120011	149	154
338120012	80	77
338120015	81	81
338120018	78	78
338120019	234	237
338120021	79	78
338120022	78	77
338120023	45	40
338120024	42	40
338130001	311	311
338130005	156	147
338130006	320	298
338130007	98	91
338130008	61	53
338130009	157	144
338140001	160	146
338140002	160	160
338140003	160	160
338140007	2	0
338140024	71	67
338140025	67	72
338150005	259	259
338150006	52	52
338160006	266	266
338160007	44	44
338170002	72	52
338170004	15	68
338170006	160	160
338170007	147	143
338170008	76	76
338170009	80	78
338170015	56	11
338170018	156	156
338170019	4	4
338170020	157	155
338170021	157	155
338170022	7	0
338170023	148	148

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APN	TotalAcres	Irrigated Acres
300160011	240	228
300160012	160	152
300160013	6	6
300170001	153	145
300170003	160	152
300170004	160	152
300170005	40	38
300170006	120	120
300170007	160	152
300170008	160	152
300170009	155	148
300170010	150	143
300180001	159	151
300180002	40	38
300180003	80	76
300180004	40	36
300180005	160	152
300180006	40	38
300180007	40	40
300180012	39	39
300180014	80	80
300180016	160	149
300180019	20	19
300180020	20	19
300180029	78	74
300180035	79	79
300180038	38	38
300190001	160	152
300190002	40	38
300190003	40	38
300190004	80	75
300190007	80	76
300190008	80	76
300190009	20	20
300190010	58	58
300190011	80	76
300190012	80	76
300190014	80	76
300190015	160	152
300190016	240	228
300190017	80	76
300200003	40	40
300200004	79	79

APN	TotalAcres	Irrigated Acres
338180002	310	310
338180003	156	156
338180004	52	52
338180005	52	48
338180006	50	47
338180007	20	20
338180012	128	120
338180013	79	76
338180014	88	82
338180015	76	75
338180016	74	74
338180017	113	106
338190010	270	247
338190011	77	77
338190012	235	220
338190013	156	145
338190014	154	150
338190015	39	37
338190016	292	283
338200004	320	283
338200006	73	68
338200007	116	116
338200010	160	160
338200011	80	80
338200015	79	72
338200023	73	73
338200024	116	116
338200026	106	106
338200027	136	136
338210003	80	80
338210004	160	160
338210006	160	149
338210009	160	160
338210015	121	121
338210017	40	40
338210018	40	40
338210019	40	40
338210020	40	40
338210021	0	0
338210023	159	159
338210024	80	80
338210025	158	158
338220010	79	115

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APN	TotalAcres	Irrigated Acres
300200006	143	143
300200008	88	88
300200011	38	38
300200012	38	38
300200015	226	226
300200018	1	0
300200020	71	71
300200021	1	1
300200022	6	6
300200025	118	117
300200030	171	171
300200031	39	39
300200032	40	40
300200034	77	77
300200039	67	67
300210002	122	116
300210012	80	80
300210018	118	118
300210027	39	39
300210029	80	76
300210030	118	118
300220003	241	229
300230007	79	75
300230019	78	74
300230022	78	74
300240003	352	333
300240009	120	120
300240014	125	119
300240021	0	76
300240022	0	234
300250002	160	160
300250004	40	40
300250005	40	40
300250006	39	40
300250015	80	80
300250017	40	40
300250022	105	105
300250023	107	106
300250027	79	79
300250028	9	10
300250030	104	104
300250034	19	20
300250035	14	15

APN	TotalAcres	Irrigated Acres
338220017	80	80
338220018	80	80
338220019	80	80
338220020	40	40
338220021	40	40
338220022	160	149
338220024	159	148
338220025	158	143
338220026	110	110
338220027	124	124
338220028	0	129
338220029	19	0
338230014	158	158
338230016	80	80
338230021	70	70
338230027	285	285
338230028	354	354
338230029	161	161
338230030	142	142
338230030	142	142
338240005	151	150
338240009	77	72
338240010	75	68
338250006	75	75
338250012	55	50
338250013	91	84
338250015	79	79
338270001	67	67
338270003	27	27
338270005	5	5
338270006	31	31
338270019	16	16
339010003	152	152
339020001	280	269
339020002	143	138
339020005	93	93
339020017	41	41
339030003	10	10
339030009	10	10
339030013	120	120
339030014	10	10
339030029	17	17
339030031	39	39

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APN	TotalAcres	Irrigated Acres
300250037	0	95
300250038	0	92
300260001	160	160
300280002	154	155
300280003	155	155
300290003	160	152
300300004	60	57
300300005	98	94
300310001	17	17
300310011	0	9
300310013	38	37
300320005	39	33
300320006	34	39
300320007	71	70
302010002	45	45
302010047	80	76
302010048	144	137
302010049	1	1
302020003	120	107
302020004	79	75
302020006	40	40
302020008	41	41
302020013	159	149
302020014	40	40
302020015	79	79
302020016	40	40
302020033	80	74
302020039	38	38
302020044	116	108
302020046	37	37
302020048	0	35
302030001	240	240
302030002	80	80
302040019	19	19
302040026	10	8
302040037	18	18
302040039	18	19
302040040	46	47
302060001	80	78
302060003	18	15
302060012	71	71
302060013	72	70
302060014	37	37

APN	TotalAcres	Irrigated Acres
339030032	386	386
339030034	10	10
339030035	266	266
339030036	25	25
339030037	29	29
339060005	160	160
339060007	80	0
339060013	479	453
339060014	176	176
339070001	64	57
339070002	124	116
339070003	60	58
339070004	80	77
339070005	183	174
339070020	205	188
339070021	119	116
339080010	20	20
339080012	76	0
339080020	7	6
339080025	39	0
339080026	274	0
339090002	160	0
339090004	160	0
339100001	61	61
339100002	65	65
339100003	34	34
339100004	160	160
339100005	160	155
339110007	132	132
339120006	53	41
339120010	343	343
339120013	16	13
339120014	331	320
339120015	192	178
339120018	304	292
339130001	142	131
339130003	2	140
339130003	2	2
339130012	320	320
339130013	108	108
339130014	40	40
339130017	10	10
339130018	10	10

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APN	TotalAcres	Irrigated Acres
302060015	172	172
302060018	160	151
302060025	39	35
302060026	20	20
302060027	20	20
302060028	20	20
302060029	19	15
302060030	35	56
302060030	35	34
302060032	31	31
302060035	34	34
302060037	38	37
302060039	148	142
302080005	20	20
302080036	5	5
302080067	40	37
302080068	37	37
302080069	79	75
302080072	61	61
302080080	77	77
302080081	20	17
302080082	301	282
302080083	38	25
302080085	17	20
302090005	142	135
302090006	40	40
302090007	45	52
302100002	102	102
302100011	65	49
302100012	11	11
302110001	81	79
302110005	80	80
302110008	41	39
302110009	20	20
302110010	20	20
302110020	80	76
302110032	38	38
302110073	38	25
302121009	160	113
302121014	19	19
302121015	58	58
302121016	20	20
302121018	80	73

APN	TotalAcres	Irrigated Acres
339130020	51	51
339130023	240	240
339130026	10	10
339130027	113	105
339130028	70	64
339140002	104	104
339140007	80	80
339160001	19	19
339160002	72	72
339160003	10	10
339160009	19	19
339160016	10	11
339160018	19	15
339160019	20	20
339170001	20	20
339170002	60	60
339170012	158	158
339170014	160	160
339170017	80	80
339170026	10	10
339170028	10	10
339170029	10	10
339170030	10	10
339170031	10	10
339170032	10	10
339170033	10	10
339170035	10	10
339170036	10	10
339170037	10	10
339170038	10	10
339170039	10	10
339170040	10	10
339170041	10	10
339170042	10	10
339170043	9	9
339170044	10	10
339170045	10	10
339170046	10	10
339170047	10	10
339170048	10	10
339170049	10	10
339170050	10	10
339170051	10	10

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APN	TotalAcres	Irrigated Acres
302121019	80	72
302121021	19	19
302121022	39	39
302121024	39	37
302121025	18	17
302121029	5	4
302122002	20	19
302122007	20	20
302122008	10	10
302122009	10	10
302122010	19	17
302122011	20	20
302122012	39	39
302122013	20	20
302122015	19	19
302122015	19	20
302122017	20	20
302122018	20	20
302123002	10	10
302123004	15	11
302123009	23	23
302123012	9	9
302124002	39	39
302125001	19	19
302125002	20	16
302125003	20	19
302125004	20	9
302125005	10	10
302125006	10	10
302125008	20	18
302125009	20	20
302125009	20	18
302125010	20	19
302125012	29	29
302125013	9	9
302130022	54	50
302130027	103	103
302130029	158	150
302130030	167	167
302130031	22	21
302130032	36	35
302130033	77	74
302130036	106	106

APN	TotalAcres	Irrigated Acres
339180001	80	80
339180010	9	9
339180011	80	38
339180012	80	80
339180015	5	5
339180016	80	80
339180019	40	40
339180020	40	40
339180023	119	119
339180027	60	57
339180028	60	54
339180036	19	19
339180037	9	10
339180038	9	9
339180040	9	10
339180040	9	8
339180044	18	18
339180045	19	19
339180046	25	25
339180047	31	31
339180048	61	61
339180049	20	22
340010028	32	0
340010036	0	34
340010037	0	0
340010038	0	148
340070002	12	12
340070012	82	82
340070013	3	3
340070015	96	82
340070017	3	3
342020004	40	0
342020018	122	122
342060010	160	15
342080017	40	40
342080018	0	40
342080021	40	40
342080022	34	34
342080029	40	10
342080030	40	22
342080031	20	20
342080032	20	20
342090007	160	65

CURRENT MEMBERSHIP PARCELS
TBWQC - 2014/2015

APN	TotalAcres	Irrigated Acres
302140006	87	80
302140007	73	73
302140011	135	130
302140012	64	63
302140013	97	92
302140014	102	101
302140015	96	93
302140016	55	53
302140017	56	53
302140021	322	282
302140022	159	156
302161002	2	15
302161012	80	80
302161016	65	10
302161016	65	0
302161028	177	177
302161029	93	84
302161030	40	40
302161031	29	28
302170001	304	279
302170015	6	6

APN	TotalAcres	Irrigated Acres
342110003	80	80
342110012	1	0
342110013	175	0
342120007	159	116
342120015	40	37
342120016	40	29
342120017	60	46
342120019	60	48
342120020	159	145
342120022	40	38
342120024	40	38
342120025	39	37
342120026	39	33
342120028	40	40
342120029	40	38
342120030	157	67
342120031	2	0
342120032	1	0
342120033	163	0
342120034	50	46

APPENDIX B

NRCS IRRIGATION RATINGS

Irrigation, General

Aggregation Method: Dominant Component
Tie-break Rule: Higher

Tulare County, Western Part, California
Survey Area Version and Date: 8 - 09/30/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
101	Akers-Akers, saline-Sodic, complex, 0 to 2 percent slopes	Somewhat limited	Akers 60% Rapid water movement Seepage Excess Sodium
102	Armona sandy loam, partially drained, 0 to 1 percent slopes	Very limited	Armona 85% Excess Sodium Low water holding capacity Rapid water movement Excess Salt Seepage
103	Atesh-Jerryslu association, 0 to 2 percent slopes	Somewhat limited	Atesh 65% Rapid water movement Low water holding capacity Seepage Cemented pan
104	Biggriz-Biggriz, saline-Sodic, complex, 0 to 2 percent slopes	Somewhat limited	Biggriz 55% Rapid water movement Excess Sodium
105	Calgro-Calgro, saline-Sodic, complex, 0 to 2 percent slopes	Somewhat limited	Calgro 60% Cemented pan Low water holding capacity Rapid water movement Seepage Excess Sodium
106	Centerville clay, 0 to 2 percent slopes	Very limited	Centerville, 0-2% slopes 90% Excess Sodium Excess Salt
107	Centerville clay, 2 to 5 percent slopes	Very limited	Centerville 90% Excess Sodium Excess Salt Slope
108	Colpien loam, 0 to 2 percent slopes	Somewhat limited	Colpien 85% Rapid water movement Excess Sodium
109	Crosscreek-Kai association, 0 to 2 percent slopes	Somewhat limited	Crosscreek 70% Excess Salt Rapid water movement Cemented pan Excess Sodium
111	Delvar clay loam, 2 to 9 percent slopes	Somewhat limited	Delvar 85% Excess Sodium Excess Salt Slope
112	Dumps	Not rated	Dumps 100%
113	Excelsior fine sandy loam, 0 to 1 percent slopes	Very limited	Excelsior 85% Excess Sodium Rapid water movement Excess Salt Too alkaline Low water holding capacity
114	Exeter loam, 0 to 2 percent slopes	Somewhat limited	Exeter, 0-2% slopes 85% Cemented pan Low water holding capacity Rapid water movement
115	Exeter loam, 2 to 5 percent slopes	Somewhat limited	Exeter, 2-5% slopes 85% Cemented pan Low water holding capacity Rapid water movement Slope

Irrigation, General

Aggregation Method: Dominant Component
Tie-break Rule: Higher

Tulare County, Western Part, California
Survey Area Version and Date: 8 - 09/30/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
116	Flamen loam, 0 to 2 percent slopes	Somewhat limited	Flamen 85% Rapid water movement Cemented pan Low water holding capacity Excess Sodium
117	Gambogy loam, drained, 0 to 1 percent slopes	Somewhat limited	Gambogy 85% Seepage Rapid water movement Excess Sodium
118	Gambogy-Biggriz, saline-Sodic, association, drained, 0 to 2 percent slopes	Somewhat limited	Gambogy 50% Seepage Rapid water movement Excess Sodium
119	Gareck-Garces association, 0 to 2 percent slopes	Somewhat limited	Gareck 70% Rapid water movement Seepage
120	Gepford silty clay, partially drained, 0 to 1 percent slopes	Very limited	Gepford 85% Excess Sodium Excess Salt Low water holding capacity
121	Gepford silty clay, partially drained, sandy substratum , 0 to 1 percent slopes	Very limited	Gepford, partially drained, sandy substratum 85% Excess Sodium Seepage Excess Salt Low water holding capacity
123	Grangeville fine sandy loam, saline-sodic, 0 to 1 percent slopes	Very limited	Grangeville, saline-sodic 90% Rapid water movement Excess Sodium Excess Salt Too alkaline Seepage
124	Hanford sandy loam, 0 to 2 percent slopes	Very limited	Hanford 85% Rapid water movement Seepage Low water holding capacity
125	Houser fine sandy loam, drained, 0 to 1 percent slopes	Very limited	Houser, fine sandy loam 85% Excess Sodium Excess Salt Seepage Low water holding capacity
126	Houser silty clay, drained, 0 to 1 percent slopes	Very limited	Houser, silty clay 85% Excess Sodium Low water holding capacity Excess Salt
127	Kimberlina fine sandy loam, 0 to 2 percent slopes MLRA 17	Very limited	Kimberlina 85% Rapid water movement Seepage
128	Lethent silt loam, 0 to 1 percent slopes	Very limited	Lethent 85% Excess Sodium Excess Salt Too alkaline Low water holding capacity
129	Nahrub silt loam, overwashed, 0 to 1 percent slopes	Very limited	Nahrub 85% Excess Sodium Excess Salt Too alkaline Low water holding capacity

Irrigation, General

Aggregation Method: Dominant Component
Tie-break Rule: Higher

Tulare County, Western Part, California
Survey Area Version and Date: 8 - 09/30/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
130	Nord fine sandy loam, 0 to 2 percent slopes	Very limited	Nord 85% Seepage Rapid water movement
131	Pits	Not rated	Pits 100%
132	Quonal-Lewis association, 0 to 2 percent slopes	Very limited	Quonal 70% Excess Sodium Excess Salt Cemented pan Low water holding capacity Lewis 15% Low water holding capacity Excess Sodium Excess Salt Too alkaline
134	Riverwash	Not rated	Riverwash 100%
135	San Joaquin loam, 0 to 2 percent slopes	Somewhat limited	San Joaquin 85% Low water holding capacity Cemented pan
137	Tagus loam, 0 to 2 percent slopes	Somewhat limited	Tagus 85% Rapid water movement Seepage
138	Tujunga loamy sand, 0 to 2 percent slopes	Very limited	Tujunga 85% Rapid water movement Seepage Low water holding capacity
139	Wasco sandy loam, 0 to 2 percent slopes	Very limited	Wasco 85% Rapid water movement Low water holding capacity Seepage
140	Westcamp silt loam, partially drained, 0 to 2 percent slopes	Very limited	Westcamp 85% Excess Sodium Excess Salt Low water holding capacity Rapid water movement
141	Posochanet silt loam, 0 to 2 percent slopes	Very limited	Posochanet 85% Excess Sodium Excess Salt
143	Yettem sandy loam, 0 to 2 percent slopes	Very limited	Yettem 85% Rapid water movement Seepage Low water holding capacity
144	Youd loam, 0 to 1 percent slopes	Very limited	Youd 85% Cemented pan Low water holding capacity Excess Sodium Excess Salt
145	Water-perennial	Not rated	Water 100%
166ki	Twisselman silty clay, saline-alkali	Not limited	Twisselman 85%

Irrigation, General

Rating Options

Attribute Name: Irrigation, General

This interpretation evaluates a soil's limitation(s) for installation and use of irrigation systems. This interpretation is for non-specific irrigation methods and is intended to provide initial planning information. If the type of irrigation system has been determined, additional interpretations provide more specific information. This interpretation does not apply if the crop planned for irrigation is rice or other crops (such as cranberries) with unique plant physiological characteristics. The ratings are for soils in their natural condition and do not consider present land use.

Irrigation systems are used to provide supplemental water to crops, orchards, vineyards, and vegetables in areas where natural precipitation will not support desired production of crops being grown.

The soil properties and qualities important in design and management of irrigation systems are sodium adsorption ratio, depth to high water table, available water holding capacity, saturated hydraulic conductivity (Ksat), slope, calcium carbonate content, ponding, and flooding. Soil properties and qualities that influence installation are stones, depth to bedrock or cemented pan, and depth to a high water table. The properties and qualities that affect performance of the irrigation system are depth to bedrock or to a cemented pan, the sodium adsorption ratio, salinity, and soil reaction.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the interpretation. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating class terms indicate the extent to which the soils are limited by the soil features that affect the soil interpretation. Verbal soil rating classes are based on the highest numerical rating for the most limiting soil feature(s) considered in the rating process. "Not limited" (numerical value for the most restrictive feature = 0.00) indicates that the soil has no limiting features for the specified use. "Somewhat limited" (numerical value for the most restrictive feature =.01 to .99) indicates that the soil has limiting features for the specified use that can be overcome with proper planning, design, installation, and management. The effort required to overcome a soil limitation increases as the numerical rating increases. "Very limited" (numerical value for the most restrictive feature = 1.00) indicates that the soil has one or more very limiting features that can only be overcome with special planning, major soil modification, special design, or significant management practices.

Lesser soil restrictive features have a lower numerical value than the maximum used to rate the soil, and they are identified to provide the user with additional information about soil limitations for the specific use. Lesser soil restrictive features also need to be considered in planning, design, installation, and management.

The results of this interpretation are not designed or intended to be used in a regulatory manner.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Aggregation Method: Dominant Component

Aggregation is the process by which a set of component attribute values is reduced to a single value to represent the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. The components in the map unit name represent the major soils within a map unit delineation. Minor components make up the balance of the map unit. Great differences in soil properties can occur between map unit components and within short distances. Minor components may be very different from the major components. Such differences could significantly affect use and management of the map unit. Minor components may or may not be documented in the database. The results of aggregation do not reflect the presence or absence of limitations of the components which are not listed in the database. An on-site investigation is required to identify the location of individual map unit components.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in

some, but not all, aggregation methods.

For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be generated. Aggregation must be done because, on any soil map, map units are delineated but components are not.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie. The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Irrigation, General

Aggregation Method: Dominant Condition
Tie-break Rule: Higher

Tulare County, California, Central Part
Survey Area Version and Date: 8 - 09/25/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
100	Auberry sandy loam, 5 to 9 percent slopes	Somewhat limited	Auberry, Local phase 80% Rapid water movement Seepage Slope Depth to soft bedrock
101	Auberry sandy loam, 9 to 15 percent slopes	Somewhat limited	Auberry 80% Slope Rapid water movement Seepage Depth to soft bedrock
102	Auberry sandy loam, 15 to 30 percent slopes	Very limited	Auberry 80% Slope Rapid water movement Seepage Depth to soft bedrock
103	Auberry sandy loam, 30 to 50 percent slopes	Very limited	Auberry 80% Slope Rapid water movement Seepage Depth to soft bedrock
104	Auberry-Rock outcrop complex, 9 to 50 percent slopes	Very limited	Auberry 50% Slope Rapid water movement Seepage Depth to soft bedrock
105	Blasingame sandy loam, 9 to 15 percent slopes	Somewhat limited	Blasingame 80% Slope Depth to soft bedrock Seepage Low water holding capacity Rapid water movement
106	Blasingame sandy loam, 15 to 30 percent slopes	Very limited	Blasingame 80% Slope Depth to soft bedrock Seepage Low water holding capacity Rapid water movement
107	Blasingame sandy loam, 30 to 50 percent slopes	Very limited	Blasingame 80% Slope Depth to soft bedrock Seepage Low water holding capacity Rapid water movement
108	Blasingame-Rock outcrop complex, 9 to 50 percent slopes	Very limited	Blasingame 50% Slope Depth to soft bedrock Seepage Low water holding capacity Rapid water movement
109	Centerville clay, 0 to 2 percent slopes	Somewhat limited	Centerville 85% Depth to soft bedrock Low water holding capacity
110	Centerville clay, 2 to 9 percent slopes	Somewhat limited	Centerville 80% Depth to soft bedrock Low water holding capacity Slope

Irrigation, General

Aggregation Method: Dominant Condition
Tie-break Rule: Higher

Tulare County, California, Central Part
Survey Area Version and Date: 8 - 09/25/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
111	Centerville clay, 9 to 15 percent slopes	Somewhat limited	Centerville 85% Slope Depth to soft bedrock Low water holding capacity
112	Centerville clay, 15 to 30 percent slopes	Very limited	Centerville 85% Slope Depth to soft bedrock Low water holding capacity
113	Cibo clay, 15 to 30 percent slopes	Very limited	Cibo 80% Slope Depth to hard bedrock Low water holding capacity
114	Cibo clay, 30 to 50 percent slopes	Very limited	Cibo 80% Slope Depth to hard bedrock Low water holding capacity
115	Cibo-Rock outcrop complex, 15 to 50 percent slopes	Very limited	Cibo 50% Slope Depth to hard bedrock Low water holding capacity
115tw	Exeter loam, 2 to 5 percent slopes	Somewhat limited	Exeter, 2-5% slopes 85% Cemented pan Low water holding capacity Rapid water movement Slope
116	Cieneba-Rock outcrop complex, 15 to 75 percent slopes	Very limited	Cieneba 55% Rapid water movement Low water holding capacity Slope Depth to soft bedrock Seepage
117	Clear Lake clay, drained	Somewhat limited	Clear Lake 85% Excess Salt
118	Coarsegold loam, 15 to 30 percent slope	Very limited	Coarsegold 80% Slope Depth to soft bedrock Low water holding capacity Rapid water movement
119	Coarsegold loam, 30 to 50 percent slopes	Very limited	Coarsegold 80% Slope Depth to soft bedrock Low water holding capacity Rapid water movement
120	Coarsegold-Rock outcrop complex, 15 to 50 percent slope s	Very limited	Coarsegold 50% Slope Depth to soft bedrock Low water holding capacity Rapid water movement
124	Exeter loam, 0 to 2 percent slopes	Somewhat limited	Exeter 75% Cemented pan Low water holding capacity Rapid water movement
124tw	Hanford sandy loam, 0 to 2 percent slopes	Very limited	Hanford 85% Rapid water movement Seepage Low water holding capacity

Irrigation, General

Aggregation Method: Dominant Condition
Tie-break Rule: Higher

Tulare County, California, Central Part
Survey Area Version and Date: 8 - 09/25/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
125	Exeter loam, 2 to 9 percent slopes	Somewhat limited	Exeter 85% Cemented pan Low water holding capacity Slope Rapid water movement
130	Friant-Rock outcrop complex, 15 to 75 percent slopes	Very limited	Friant 50% Rapid water movement Low water holding capacity Slope Depth to hard bedrock Seepage
131	Grangeville silt loam, drained	Somewhat limited	Grangeville 90% Rapid water movement Seepage
132	Greenfield sandy loam, 0 to 2 percent slopes	Very limited	Greenfield 85% Rapid water movement Seepage
133	Greenfield sandy loam, 2 to 5 percent slopes	Very limited	Greenfield 85% Rapid water movement Seepage Slope
134	Havala loam, 0 to 2 percent slopes	Somewhat limited	Havala 85% Seepage Rapid water movement
135	Havala loam, 2 to 5 percent slopes	Somewhat limited	Havala 85% Seepage Slope Rapid water movement
138tw	Tujunga loamy sand, 0 to 2 percent slopes	Very limited	Tujunga 85% Rapid water movement Seepage Low water holding capacity
139	Honcut sandy loam, 0 to 2 percent slopes	Very limited	Honcut 80% Rapid water movement Seepage
140	Honcut sandy loam, 2 to 5 percent slopes	Very limited	Honcut 80% Rapid water movement Seepage Slope
141	Las Posas loam, 9 to 15 percent slopes	Somewhat limited	Las Posas 80% Slope Depth to soft bedrock Low water holding capacity
142	Las Posas loam, 15 to 30 percent slopes	Very limited	Las Posas 80% Slope Depth to soft bedrock Low water holding capacity
143	Las Posas loam, 30 to 50 percent slopes	Very limited	Las Posas 80% Slope Depth to soft bedrock Low water holding capacity
144	Las Posas-Rock outcrop complex, 9 to 50 percent slopes	Not rated	Rock outcrop 30% Blasingame 7% Unnamed, steeper slopes 6% Trabuco 6% Coarsegold 6%

Irrigation, General

Aggregation Method: Dominant Condition
Tie-break Rule: Higher

Tulare County, California, Central Part
Survey Area Version and Date: 8 - 09/25/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
145	Lewis clay loam	Somewhat limited	Lewis 90% Low water holding capacity Cemented pan Excess Salt
146	Pits	Not rated	Pits 90% Water 10%
147	Porterville clay, 0 to 2 percent slopes	Not limited	Porterville 85%
148	Porterville clay, 2 to 9 percent slopes	Somewhat limited	Porterville 85% Slope
149	Porterville clay, 9 to 15 percent slopes	Somewhat limited	Porterville 90% Slope
150	Porterville cobbly clay, 2 to 15 percent slopes	Very limited	Porterville 90% Content of large stones Slope
151	Riverwash	Not rated	Riverwash 95% Honcut 3% Tujunga 2%
152	Rock outcrop	Not rated	Rock outcrop 90% Unnamed 10%
153	San Emigdio loam	Very limited	San Emigdio 90% Rapid water movement Seepage
154	San Joaquin loam, 0 to 2 percent slopes	Somewhat limited	San Joaquin 75% Low water holding capacity Cemented pan Rapid water movement
155	San Joaquin loam, 2 to 9 percent slopes	Somewhat limited	San Joaquin 80% Cemented pan Low water holding capacity Slope Rapid water movement
157	Sesame sandy loam, 15 to 30 percent slopes	Very limited	Sesame 80% Slope Depth to soft bedrock Rapid water movement Low water holding capacity Seepage
158	Sesame sandy loam, 30 to 50 percent slopes	Very limited	Sesame 80% Slope Depth to soft bedrock Rapid water movement Low water holding capacity Seepage
159	Seville clay	Somewhat limited	Seville 90% Cemented pan Low water holding capacity
161	Trabuco loam, 15 to 30 percent slopes	Very limited	Trabuco 80% Slope Depth to soft bedrock Low water holding capacity
164	Tujunga sand	Very limited	Tujunga 90% Rapid water movement Seepage Low water holding capacity Slope

Irrigation, General

Aggregation Method: Dominant Condition
Tie-break Rule: Higher

Tulare County, California, Central Part
Survey Area Version and Date: 8 - 09/25/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
165	Vista coarse sandy loam, 9 to 15 percent slopes	Very limited	Vista 85% Rapid water movement Low water holding capacity Depth to soft bedrock Slope Seepage
166	Vista coarse sandy loam, 15 to 30 percent slopes	Very limited	Vista 85% Rapid water movement Slope Low water holding capacity Depth to soft bedrock Seepage
167	Vista coarse sandy loam, 30 to 50 percent slopes	Very limited	Vista 80% Rapid water movement Slope Low water holding capacity Depth to soft bedrock Seepage
168	Vista-Rock outcrop complex, 9 to 50 percent slopes	Very limited	Vista 55% Rapid water movement Low water holding capacity Slope Depth to soft bedrock Seepage
169	Walong sandy loam, 15 to 30 percent slopes	Very limited	Walong 85% Rapid water movement Slope Low water holding capacity Depth to soft bedrock Seepage
171	Walong-Rock outcrop complex, 15 to 50 percent slopes	Very limited	Walong 55% Rapid water movement Slope Low water holding capacity Depth to soft bedrock Seepage
172	Wyman loam, 0 to 2 percent slopes	Somewhat limited	Wyman 85% Rapid water movement
173	Wyman loam, 2 to 5 percent slopes	Somewhat limited	Wyman 85% Rapid water movement Slope
174	Wyman gravelly loam, 0 to 2 percent slopes	Very limited	Wyman 95% Seepage Low water holding capacity Rapid water movement
175	Xerofluvents, flooded	Not rated	Xerofluvents 75% Unnamed, stony 10% Unnamed, sandy 10% Unnamed 5%
176	Yettem sandy loam, 0 to 2 percent slopes	Very limited	Yettem 85% Rapid water movement Seepage Low water holding capacity
177	Yettem sandy loam, 2 to 5 percent slopes	Very limited	Yettem 85% Rapid water movement Seepage Slope Low water holding capacity
178	Water	Not rated	Water 100%

Irrigation, General

Aggregation Method: Dominant Condition
Tie-break Rule: Higher

Tulare County, California, Central Part
Survey Area Version and Date: 8 - 09/25/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
179	Dam	Not rated	Dam 100%
193nk	Chanac-Pleito complex, 2 to 5 percent slopes	Somewhat limited	Chanac 50% Slope Rapid water movement Pleito 30% Rapid water movement Slope
195nk	Centerville-Delvar complex, 9 to 30 percent slopes	Very limited	Centerville 60% Slope Delvar 20% Slope Excess Sodium
407nk	Centerville clay, 2 to 5 percent slopes	Very limited	Centerville 90% Excess Sodium Excess Salt Slope

Irrigation, General

Rating Options

Attribute Name: Irrigation, General

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Irrigation systems are used to provide supplemental water to crops, orchards, vineyards, and vegetables in areas where natural precipitation will not support desired production of crops being grown.

The soil properties and qualities important in design and management of irrigation systems are sodium adsorption ratio, depth to high water table, available water holding capacity, saturated hydraulic conductivity (Ksat), slope, calcium carbonate content, ponding, and flooding. Soil properties and qualities that influence installation are stones, depth to bedrock or cemented pan, and depth to a high water table. The properties and qualities that affect performance of the irrigation system are depth to bedrock or to a cemented pan, the sodium adsorption ratio, salinity, and soil reaction.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the interpretation. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating class terms indicate the extent to which the soils are limited by the soil features that affect the soil interpretation. Verbal soil rating classes are based on the highest numerical rating for the most limiting soil feature(s) considered in the rating process. "Not limited" (numerical value for the most restrictive feature = 0.00) indicates that the soil has no limiting features for the specified use. "Somewhat limited" (numerical value for the most restrictive feature =.01 to .99) indicates that the soil has limiting features for the specified use that can be overcome with proper planning, design, installation, and management. The effort required to overcome a soil limitation increases as the numerical rating increases. "Very limited" (numerical value for the most restrictive feature = 1.00) indicates that the soil has one or more very limiting features that can only be overcome with special planning, major soil modification, special design, or significant management practices.

Lesser soil restrictive features have a lower numerical value than the maximum used to rate the soil, and they are identified to provide the user with additional information about soil limitations for the specific use. Lesser soil restrictive features also need to be considered in planning, design, installation, and management.

The results of this interpretation are not designed or intended to be used in a regulatory manner.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value to represent the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. The components in the map unit name represent the major soils within a map unit delineation. Minor components make up the balance of the map unit. Great differences in soil properties can occur between map unit components and within short distances. Minor components may be very different from the major components. Such differences could significantly affect use and management of the map unit. Minor components may or may not be documented in the database. The results of aggregation do not reflect the presence or absence of limitations of the components which are not listed in the database. An on-site investigation is required to identify the location of individual map unit components.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in

some, but not all, aggregation methods.

For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be generated. Aggregation must be done because, on any soil map, map units are delineated but components are not.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Irrigation, General

Aggregation Method: Dominant Condition
Tie-break Rule: Higher

Kern County, California, Northwestern Part
Survey Area Version and Date: 7 - 09/18/2014

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
103tw	Atesh-Jerryslu association, 0 to 2 percent slopes	Somewhat limited	Atesh 65% Rapid water movement Low water holding capacity Seepage Cemented pan
111tw	Delvar clay loam, 2 to 9 percent slopes	Somewhat limited	Delvar 85% Excess Sodium Excess Salt Slope
114tw	Exeter loam, 0 to 2 percent slopes	Somewhat limited	Exeter, 0-2% slopes 85% Cemented pan Low water holding capacity Rapid water movement
119tw	Gareck-Garces association, 0 to 2 percent slopes	Somewhat limited	Gareck 70% Rapid water movement Seepage
125	Granoso loamy sand, 0 to 2 percent slopes	Very limited	Granoso 85% Rapid water movement Seepage Low water holding capacity
129tw	Nahrub silt loam, overwashed, 0 to 1 percent slopes	Very limited	Nahrub 85% Excess Sodium Excess Salt Too alkaline Low water holding capacity
130tw	Nord fine sandy loam, 0 to 2 percent slopes	Very limited	Nord 85% Seepage Rapid water movement
154	Exeter sandy loam, 0 to 2 percent slopes	Somewhat limited	Exeter 85% Low water holding capacity Cemented pan Rapid water movement
155	Exeter sandy loam, 2 to 9 percent slopes	Somewhat limited	Exeter 85% Low water holding capacity Cemented pan Rapid water movement Slope
166ki	Twisselman silty clay, saline-alkali	Not limited	Twisselman 85%
174	Kimberlina fine sandy loam, 0 to 2 percent slopes MLRA 17	Very limited	Kimberlina 85% Rapid water movement Seepage
183	Lethent silt loam	Very limited	Lethent 85% Excess Sodium Low water holding capacity Excess Salt
192	McFarland loam	Somewhat limited	McFarland 85% Rapid water movement
243	Wasco sandy loam	Very limited	Wasco 85% Rapid water movement Seepage Low water holding capacity
257	Water	Not rated	Water 100%

Irrigation, General

Rating Options

Attribute Name: Irrigation, General

This interpretation evaluates a soil's limitation(s) for installation and use of irrigation systems. This interpretation is for non-specific irrigation methods and is intended to provide initial planning information. If the type of irrigation system has been determined, additional interpretations provide more specific information. This interpretation does not apply if the crop planned for irrigation is rice or other crops (such as cranberries) with unique plant physiological characteristics. The ratings are for soils in their natural condition and do not consider present land use.

Irrigation systems are used to provide supplemental water to crops, orchards, vineyards, and vegetables in areas where natural precipitation will not support desired production of crops being grown.

The soil properties and qualities important in design and management of irrigation systems are sodium adsorption ratio, depth to high water table, available water holding capacity, saturated hydraulic conductivity (Ksat), slope, calcium carbonate content, ponding, and flooding. Soil properties and qualities that influence installation are stones, depth to bedrock or cemented pan, and depth to a high water table. The properties and qualities that affect performance of the irrigation system are depth to bedrock or to a cemented pan, the sodium adsorption ratio, salinity, and soil reaction.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the interpretation. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating class terms indicate the extent to which the soils are limited by the soil features that affect the soil interpretation. Verbal soil rating classes are based on the highest numerical rating for the most limiting soil feature(s) considered in the rating process. "Not limited" (numerical value for the most restrictive feature = 0.00) indicates that the soil has no limiting features for the specified use. "Somewhat limited" (numerical value for the most restrictive feature =.01 to .99) indicates that the soil has limiting features for the specified use that can be overcome with proper planning, design, installation, and management. The effort required to overcome a soil limitation increases as the numerical rating increases. "Very limited" (numerical value for the most restrictive feature = 1.00) indicates that the soil has one or more very limiting features that can only be overcome with special planning, major soil modification, special design, or significant management practices.

Lesser soil restrictive features have a lower numerical value than the maximum used to rate the soil, and they are identified to provide the user with additional information about soil limitations for the specific use. Lesser soil restrictive features also need to be considered in planning, design, installation, and management.

The results of this interpretation are not designed or intended to be used in a regulatory manner.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value to represent the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. The components in the map unit name represent the major soils within a map unit delineation. Minor components make up the balance of the map unit. Great differences in soil properties can occur between map unit components and within short distances. Minor components may be very different from the major components. Such differences could significantly affect use and management of the map unit. Minor components may or may not be documented in the database. The results of aggregation do not reflect the presence or absence of limitations of the components which are not listed in the database. An on-site investigation is required to identify the location of individual map unit components.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in

some, but not all, aggregation methods.

For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be generated. Aggregation must be done because, on any soil map, map units are delineated but components are not.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

APPENDIX C

2014 SPRING GROUNDWATER ELEVATION DATA

2014 Spring Groundwater Elevation Data - DCTRA and DWR Wells

DCTRA Member	*Well ID*	DCTRA Spring 2014 Groundwater Elevation (Feet AMSL)	*Well ID*	DWR Spring 2014 Groundwater Elevation (Feet AMSL)
Lower Tule River Irrigation District	20S26E31L001M	167.10	27S27E32M001M	525.20
	21S24E35A001M	120.90	24S27E32K001M	476.00
	21S24E13K001M	197.60	24S24E25J001M	66.70
	21S24E32M001M	-32.20	24S27E22P001M	596.80
	21S23E25A001M	98.70	24S26E24Q001M	471.90
	22S23E16C001M	112.60	24S25E22B001M	121.00
	21S26E19J001M	189.60	24S25E13F001M	215.00
	21S25E12D001M	226.80	24S26E13D001M	262.00
	21S26E08R001M	201.90	24S25E13D002M	246.90
	22S24E01A001M	129.90	24S27E08L001M	516.70
	22S25E08N001M	132.20	24S26E12H001M	378.00
	22S25E12A002M	105.00	24S27E07H002M	424.00
	22S24E09R001M	1.00	24S25E08F002M	109.30
	22S23E15K001M	65.60	24S26E10A001M	300.00
	21S25E15N001M	157.10	24S24E04R001M	178.00
	22S26E04J001M	206.40	24S26E02R001M	309.00
Porterville Irrigation District	21S26E35C001M	259.40	24S26E03P002M	274.00
	21S26E23D001M	278.40	24S26E05R001M	242.00
	21S26E24R001M	321.60	24S26E01R001M	486.60
	21S26E26R002M	282.10	24S26E04R001M	215.00
	21S26E11P001M	275.10	24S26E04P001M	245.00
	21S26E13M001M	285.60	24S26E02H001M	322.00
	21S26E13R001M	302.30	24S24E04E002M	131.60
	21S27E31H001M	330.70	24S26E01F001M	343.00
	21S27E32N001M	297.90	24S26E03A001M	273.00
	21S27E32J001M	343.90	24S24E03A001M	94.60
	21S27E18R002M	342.50	23S26E36J002M	376.00
	21S27E17R001M	353.80	23S26E32J001M	218.00
	21S27E08R001M	338.10	23S26E25L001M	343.00
	21S27E07P001M	308.80	23S24E32F001M	151.80
	21S27E09J001M	350.30	23S26E35H001M	322.00
	21S27E09Q001M	346.80	23S23E36E001M	323.00
	21S27E21P001M	353.10	23S27E31B001M	402.00
	21S27E20Q001M	353.20	23S26E36A001M	324.00
	21S27E30H001M	347.30	23S27E32C002M	431.00
	21S27E20M001M	326.20	23S23E25N001M	210.60
	22S26E02R001M	251.90	23S26E25Q001M	376.00
Pixley Irrigation District	22S24E20A002M	3.70	23S24E28J002M	115.70
	22S23E25J001M	12.70	23S23E25E001M	315.00
	22S24E26C002M	3.90	23S25E28F001M	105.00
	23S24E28J002M	95.30	23S23E24R001M	139.00
	22S25E28Q002M	105.40	23S23E24N001M	327.00
	23S23E12A001M	27.80	KRCDTL016	338.00
	23S24E14H002M	-15.40	23S23E24K001M	137.90
	23S24E16R001M	88.70	23S23E24M001M	313.00
	23S25E20B002M	121.30	23S26E23H001M	313.00
	22S25E25N001M	37.00	23S25E19D001M	156.30
	23S25E19D001M	82.00	23S25E20B002M	132.00

2014 Spring Groundwater Elevation Data - DCTRA and DWR Wells

DCTRA Member	*Well ID*	DCTRA Spring 2014 Groundwater Elevation (Feet AMSL)
Saucelito Irrigation District	22S26E25J001M	263.70
	22S26E35A001M	226.30
	22S26E34H001M	183.10
	22S26E33H001M	112.30
	22S26E32B001M	96.50
	22S26E20R001M	134.40
	22S26E27G001M	177.00
	22S26E22Q001M	184.30
	22S26E23M001M	205.50
	22S26E26A001M	201.60
	22S26E07J001M	123.80
	22S26E07Q001M	100.10
	22S26E17A001M	142.40
	22S26E16C001M	159.80
	22S26E15L001M	182.50
	22S26E09B001M	187.50
	22S26E14D001M	223.60
	22S26E11P001M	228.00
	22S26E13R001M	260.60
	22S26E24A001M	260.50
	22S26E13C001M	249.90
	22S26E13J001M	264.40
	23S26E03A001M	172.80
	23S26E08A001M	94.70
	23S26E04R001M	109.00
	23S26E02R001M	193.00
Vandalia Irrigation District	22S27E12R001M	337.00
	22S27E13A001M	379.50
	22S27E01A001M	449.00
	22S27E01G001M	438.50
	22S27E01B001M	423.40
	22S28E07K001M	403.60
	22S28E07F001M	395.90
	22S28E07M001M	384.70
	22S28E18D001M	381.60
	22S28E18B001M	371.80
	22S28E18A001M	398.00
	22S28E18H001M	430.90
	22S27E17M001M	445.60
	22S28E06C002M	458.00
	22S28E06C001M	457.30
	22S28E06B001M	437.70

Well ID	DWR Spring 2014 Groundwater Elevation (Feet AMSL)
23S24E16R001M	123.00
23S24E14H002M	243.90
23S27E10H001M	208.00
23S23E12A001M	174.90
23S26E04R001M	251.00
23S23E02A001M	186.00
22S25E28Q002M	166.80
22S25E25N001M	269.60
22S28E30J001M	22.00
22S23E30J001M	58.80
22S26E26A001M	184.00
22S24E20A002M	221.10
22S27E17M001M	127.00
22S27E07Q001M	136.00
22S25E08N001M	140.00
22S26E07Q001M	226.00
22S24E09R001M	235.70
22S25E12A002M	216.40
22S26E04J001M	151.90
22S24E01A001M	132.00
21S24E32M001M	265.70
22S28E06B001M	46.00
21S24E35A001M	129.90
21S27E30H001M	60.00
21S23E25A001M	123.90
21S26E19J001M	150.00
21S25E15N001M	132.30
21S24E13K001M	57.40
21S26E08R001M	141.60
21S27E09Q001M	58.50
21S25E12D001M	83.80
20S26E31L001M	153.90

APPENDIX D

NITRATE STATISTICAL ANALYSIS

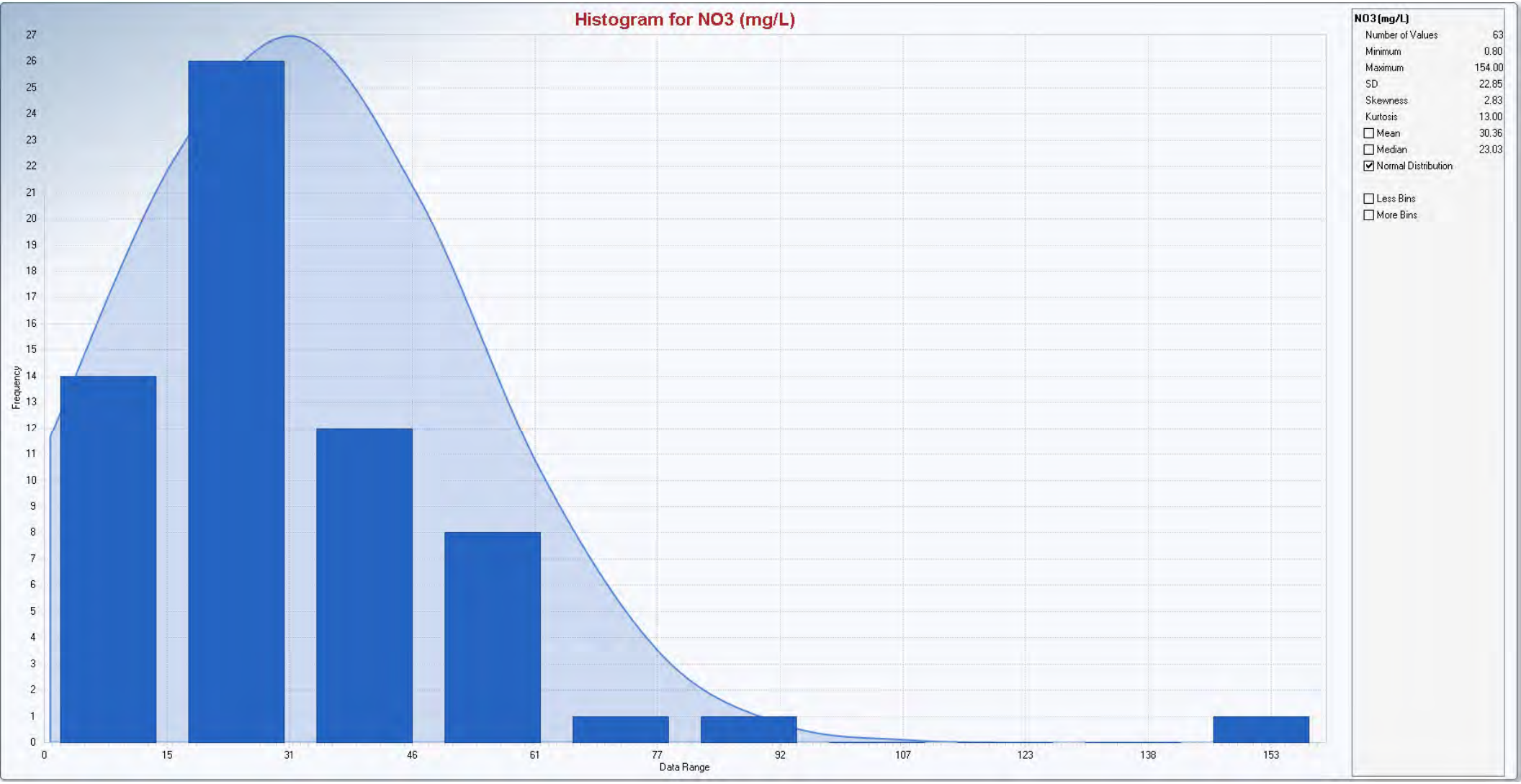
Nitrate Concentration
Statistical Data Set
TBWQC - 1945 to 2014

Year	Average NO3 (mg/L)
1945	1.00
1946	14.65
1947	21.65
1948	25.00
1949	#N/A
1950	26.22
1951	5.69
1952	12.39
1953	9.50
1954	#N/A
1955	#N/A
1956	15.26
1957	14.60
1958	11.83
1959	19.48
1960	23.28
1961	50.22
1962	15.44
1963	16.82
1964	18.15
1965	#N/A
1966	37.94
1967	82.63
1968	32.29
1969	35.66
1970	26.84
1971	58.88
1972	67.81
1973	35.17
1974	55.27
1975	#N/A
1976	50.51
1977	#N/A
1978	66.67
1979	51.44

Year	Average NO3 (mg/L)
1980	95.82
1981	38.56
1982	48.08
1983	#N/A
1984	42.75
1985	38.60
1986	53.51
1987	71.65
1988	34.90
1989	36.38
1990	31.88
1991	36.61
1992	38.64
1993	27.22
1994	46.01
1995	28.08
1996	42.06
1997	21.53
1998	39.29
1999	42.49
2000	55.32
2001	57.05
2002	47.85
2003	19.69
2004	35.73
2005	153.34
2006	33.93
2007	32.27
2008	20.84
2009	52.96
2010	39.87
2011	33.47
2012	37.46
2013	36.48
2014	36.34
2015	#N/A

	A	B	C	D	E	F	G	H	I	J	K	L	M
1				General Statistics on Uncensored Full Data									
2			Date/Time of Computation	1/30/2015 10:13:29 AM									
3			User Selected Options										
4			From File	Data Set_1-30.xls									
5			Full Precision	OFF									
6													
7	From File: Data Set_1-30.xls												
8													
9						General Statistics for Uncensored Dataset							
10													
11	Variable		NumObs	# Missing	Minimum	Maximum	Mean	SD	SEM	MAD/0.675	Skewness	Kurtosis	CV
12		NO3 (mg/L)	63	0	0.8	154	30.36	22.85	2.878	16.4	2.83	13	0.752
13													
14						Percentiles for Uncensored Dataset							
15													
16	Variable		NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
17		NO3 (mg/L)	63	0	10.8	14.12	17.13	23.03	37.89	44.07	52.68	59.47	107.7

	A	B	C	D	E	F	G	H	I	J	K	L
1				Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects								
2			User Selected Options									
3			Date/Time of Computation	1/30/2015 10:14:01 AM								
4			From File	Data Set_1-30.xls								
5			Full Precision	OFF								
6			Confidence Coefficient	0.95								
7												
8												
9	NO3 (mg/L)											
10												
11			Raw Statistics									
12			Number of Valid Observations			63						
13			Number of Distinct Observations			62						
14			Minimum			0.8						
15			Maximum			154						
16			Mean of Raw Data			30.36						
17			Standard Deviation of Raw Data			22.85						
18			Khat			2.199						
19			Theta hat			13.81						
20			Kstar			2.105						
21			Theta star			14.43						
22			Mean of Log Transformed Data			3.169						
23			Standard Deviation of Log Transformed Data			0.776						
24												
25			Normal GOF Test Results									
26												
27			Correlation Coefficient R			0.871						
28			Approximate Shapiro Wilk Test Statistic			0.792						
29			Approximate Shapiro Wilk P Value			8.484E-12						
30			Lilliefors Test Statistic			0.142						
31			Lilliefors Critical (0.05) Value			0.112						
32	Data not Normal at (0.05) Significance Level											
33												
34			Gamma GOF Test Results									
35												
36			Correlation Coefficient R			0.952						
37			A-D Test Statistic			0.453						
38			A-D Critical (0.05) Value			0.762						
39			K-S Test Statistic			0.0769						
40			K-S Critical(0.05) Value			0.114						
41	Data appear Gamma Distributed at (0.05) Significance Level											
42												
43			Lognormal GOF Test Results									
44												
45			Correlation Coefficient R			0.951						
46			Approximate Shapiro Wilk Test Statistic			0.934						
47			Approximate Shapiro Wilk P Value			0.00294						
48			Lilliefors Test Statistic			0.123						
49			Lilliefors Critical (0.05) Value			0.112						
50	Data not Lognormal at (0.05) Significance Level											

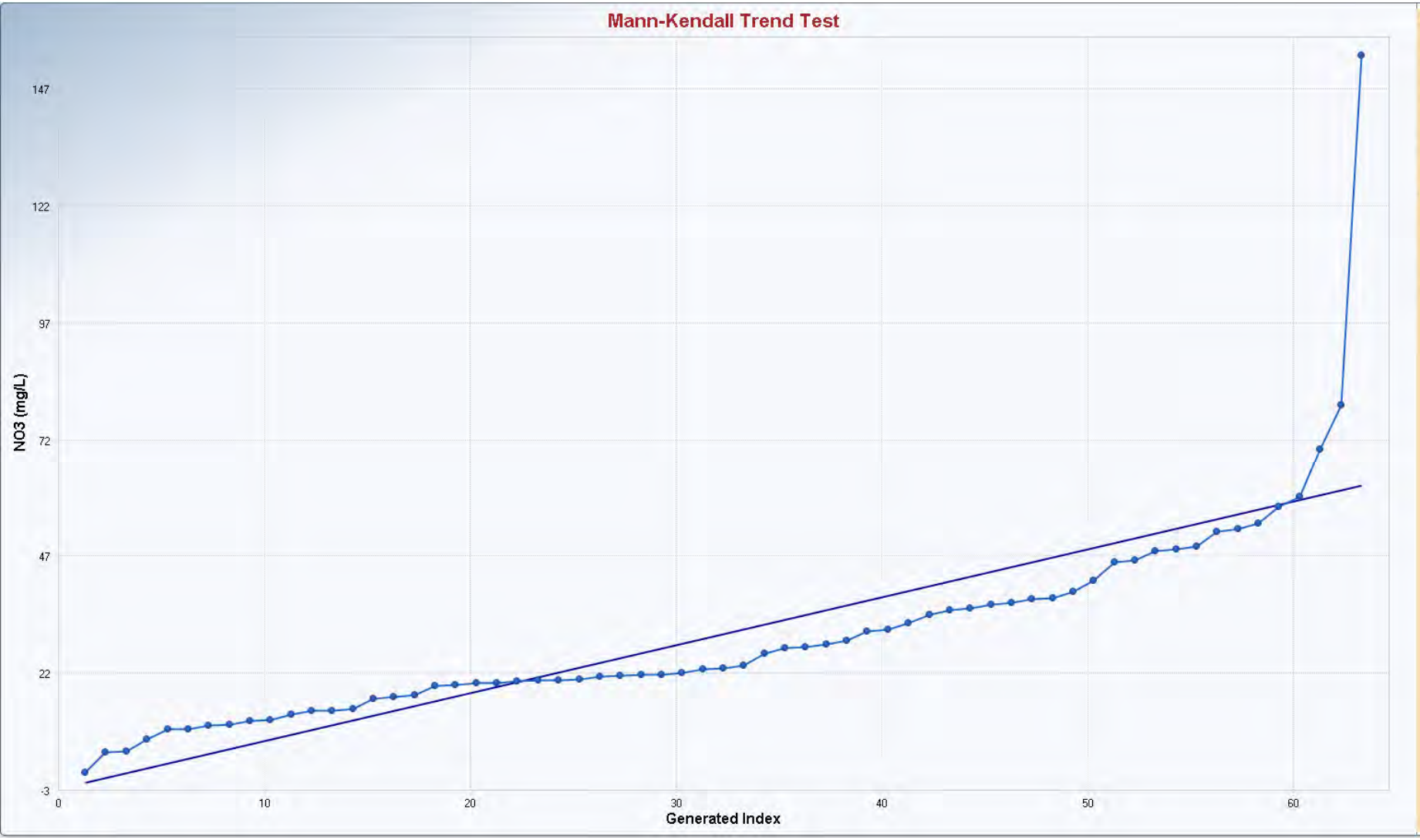

Histogram for NO3 (mg/L)
Frequency
Data Range
0
15
31
46
61
77
92
107
123
138
153
NO3 (mg/L)
Number of Values 63
Minimum 0.80
Maximum 154.00
SD 22.85
Skewness 2.83
Kurtosis 13.00
Mean 30.36
Median 23.03
Normal Distribution
Less Bins
More Bins

Gamma Q-Q Plot for NO3 (mg/L)
NO3 (mg/L)
150
125
100
75
50
25
0
0
20
40
60
80
100
Theoretical Quantiles of Gamma Distribution
NO3 (mg/L)
N = 63
Mean = 30.3628
k hat = 2.1989
theta hat = 13.8082
Slope = 1.0522
Intercept = -1.4950
Correlation, R = 0.9522
Anderson-Darling Test
Test Statistic = 0.453
Critical Value(0.05) = 0.762
Data appear Gamma Distributed
Best Fit Line

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2				**User Selected Options**								
3			Date/Time of Computation		1/30/2015 10:14:38 AM							
4				From File	Data Set_1-30.xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for NO3 (mg/L)**								
9												
10												
11				**Mean**	**30.36**							
12				**Standard Deviation**	**22.85**							
13				**Number of data**	**63**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	30.36	22.66	154	63	5.455	3.218	3.578				
19												
20	For 5% Significance Level, there is 1 Potential Outlier											
21	Potential outliers is: 154											
22												
23	For 1% Significance Level, there is 1 Potential Outlier											
24	Potential outliers is: 154											
25												

Box Plot for NO3 (mg/L)
NO3 (mg/L)
150
125
100
75
50
25
0
NO3 (mg/L)

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2			User Selected Options									
3			Date/Time of Computation	1/30/2015 10:17:56 AM								
4			From File	Data Set_1-30.xls								
5			Full Precision	OFF								
6			Confidence Coefficient	0.95								
7			Level of Significance	0.05								
8												
9			**NO3 (mg/L)**									
10												
11			**General Statistics**									
12			Number or Reported Events Not Used		0							
13			Number of Generated Events		63							
14			Number Values Reported (n)		63							
15			Minimum		0.8							
16			Maximum		154							
17			Mean		30.36							
18			Geometric Mean		23.78							
19			Median		23.03							
20			Standard Deviation		22.85							
21												
22			**Mann-Kendall Test**									
23			Test Value (S)		1952							
24			Critical Value (0.05)		1.645							
25			Standard Deviation of S		168.6							
26			Standardized Value of S		11.57							
27			Approximate p-value		0							
28												
29	**Statistically significant evidence of an increasing**											
30	**trend at the specified level of significance.**											



Mann-Kendall Trend Analysis

n	63
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	168.6001
Standardized Value of S	11.5718
Test Value (S)	1,952
Appx. Critical Value (0.05)	1.6449
Approximate p-value	0.0000

OLS Regression Line (Blue)

OLS Regression Slope	1.0233
OLS Regression Intercept	-2.3815

Statistically significant evidence of an increasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			1/30/2015 10:19:19 AM								
5	From File			Data Set_1-30.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**NO3 (mg/L)**											
12												
13	**General Statistics**											
14	Total Number of Observations					63	Number of Distinct Observations					62
15							Number of Missing Observations					0
16	Minimum					0.8	Mean					30.36
17	Maximum					154	Median					23.03
18	SD					22.85	Std. Error of Mean					2.878
19	Coefficient of Variation					0.752	Skewness					2.83
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.792	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk P Value					8.484E-12	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.142	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.112	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					35.17	95% Adjusted-CLT UCL (Chen-1995)					36.19
31							95% Modified-t UCL (Johnson-1978)					35.34
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.453	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.762	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.0769	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.114	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					2.199	k star (bias corrected MLE)					2.105
42	Theta hat (MLE)					13.81	Theta star (bias corrected MLE)					14.43
43	nu hat (MLE)					277.1	nu star (bias corrected)					265.2
44	MLE Mean (bias corrected)					30.36	MLE Sd (bias corrected)					20.93
45							Approximate Chi Square Value (0.05)					228.5
46	Adjusted Level of Significance					0.0462	Adjusted Chi Square Value					227.7
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50)					35.24	95% Adjusted Gamma UCL (use when n<50)					35.36
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.934	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk P Value	0.00294	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.123	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.112	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	-0.223				Mean of logged Data		3.169
60					Maximum of Logged Data	5.037				SD of logged Data		0.776
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	39.4				90% Chebyshev (MVUE) UCL		42.4
64					95% Chebyshev (MVUE) UCL	47.15				97.5% Chebyshev (MVUE) UCL		53.73
65					99% Chebyshev (MVUE) UCL	66.67						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	35.1				95% Jackknife UCL		35.17
72					95% Standard Bootstrap UCL	35.13				95% Bootstrap-t UCL		36.4
73					95% Hall's Bootstrap UCL	39.11				95% Percentile Bootstrap UCL		35.34
74					95% BCA Bootstrap UCL	36.63						
75					90% Chebyshev(Mean, Sd) UCL	39				95% Chebyshev(Mean, Sd) UCL		42.91
76					97.5% Chebyshev(Mean, Sd) UCL	48.34				99% Chebyshev(Mean, Sd) UCL		59
77												
78	**Suggested UCL to Use**											
79					95% Approximate Gamma UCL	35.24						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

APPENDIX E

ELECTRICAL CONDUCTIVITY STATISTICAL ANALYSIS

Electrical Conductivity
Statistical Data Set
TBWQC - 1950 to 2014

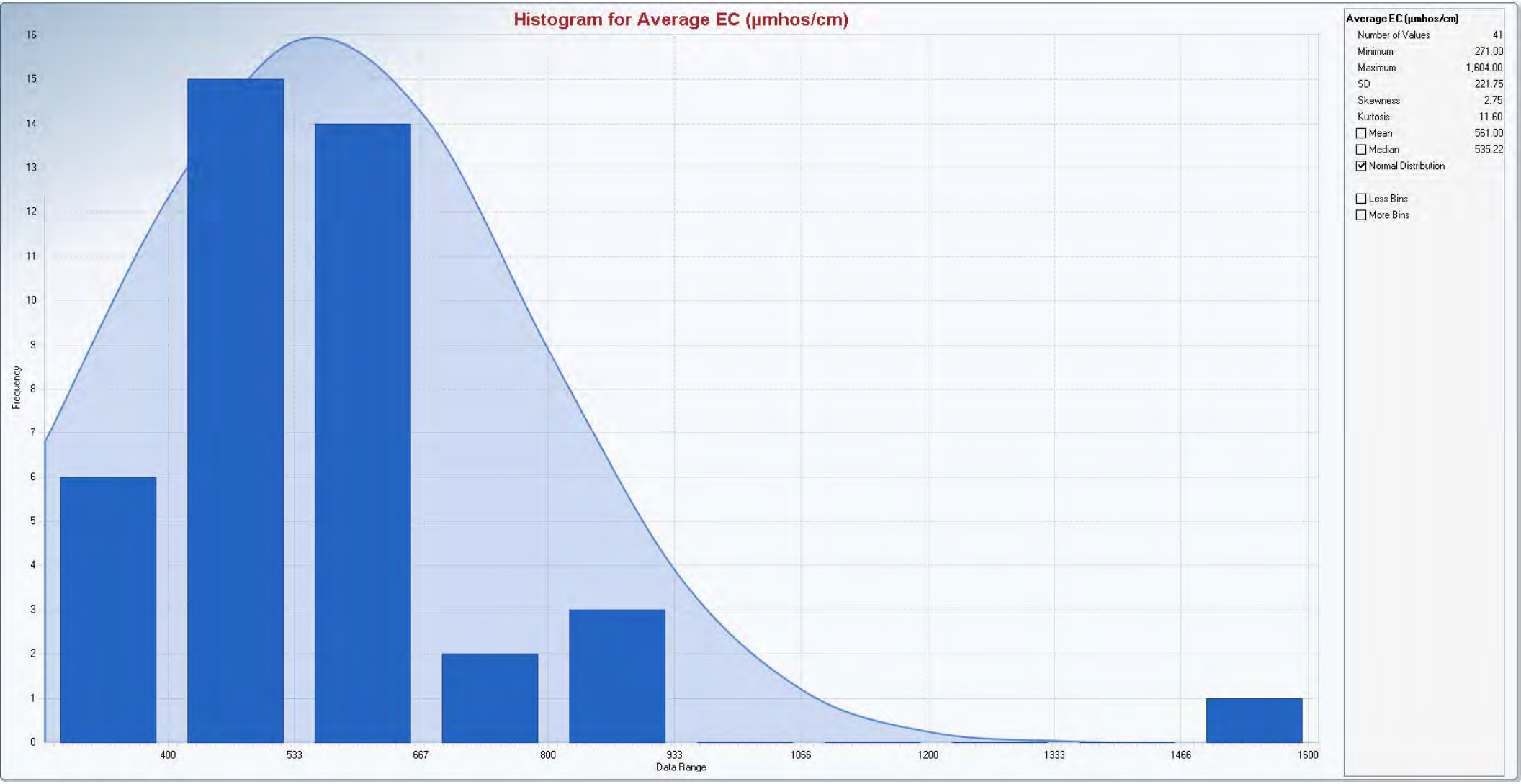
Year	Average EC (µmhos/cm)
1950	599.75
1951	770.25
1952	629.90
1953	1604.00
1954	271.00
1955	862.86
1956	535.22
1957	430.10
1958	454.21
1959	346.90
1960	#N/A
1961	454.00
1962	445.83
1963	#N/A
1964	#N/A
1965	#N/A
1966	#N/A
1967	#N/A
1968	#N/A
1969	#N/A
1970	#N/A
1971	#N/A
1972	#N/A
1973	#N/A
1974	#N/A
1975	#N/A
1976	#N/A
1977	#N/A
1978	#N/A
1979	299.67
1980	563.50
1981	#N/A
1982	400.00

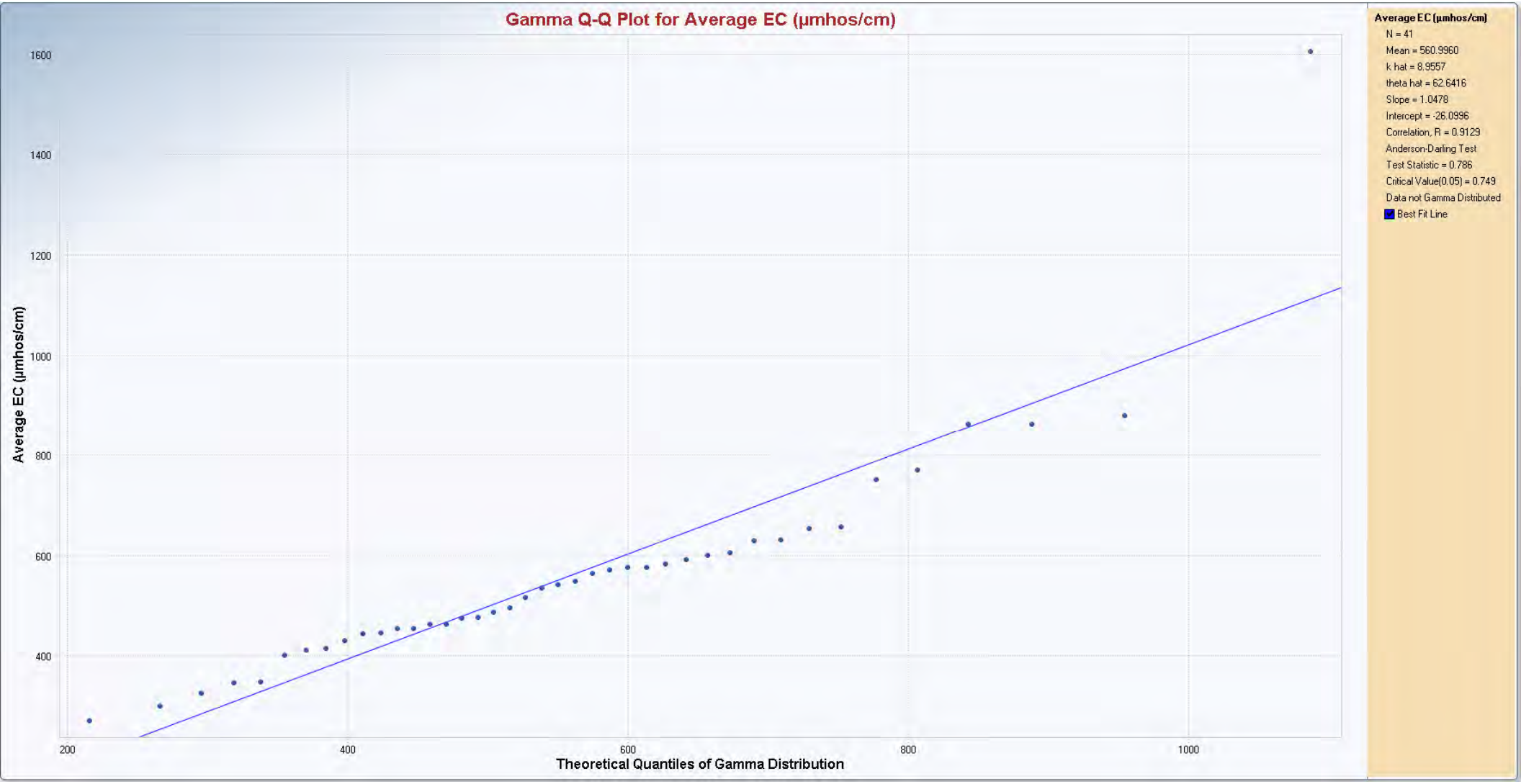
Year	Average EC (µmhos/cm)
1983	#N/A
1984	476.25
1985	444.29
1986	575.52
1987	486.45
1988	515.83
1989*	13114.19
1990*	5453.50
1991*	10359.89
1992*	11165.91
1993	324.50
1994	463.17
1995	652.25
1996	345.00
1997	#N/A
1998	411.67
1999	582.17
2000	590.80
2001	414.40
2002	495.00
2003	474.93
2004	570.50
2005	548.54
2006	656.43
2007	541.85
2008	604.20
2009	629.51
2010	861.88
2011	879.39
2012	750.35
2013	576.04
2014	462.75
2015	#N/A

***Value not used in analysis**

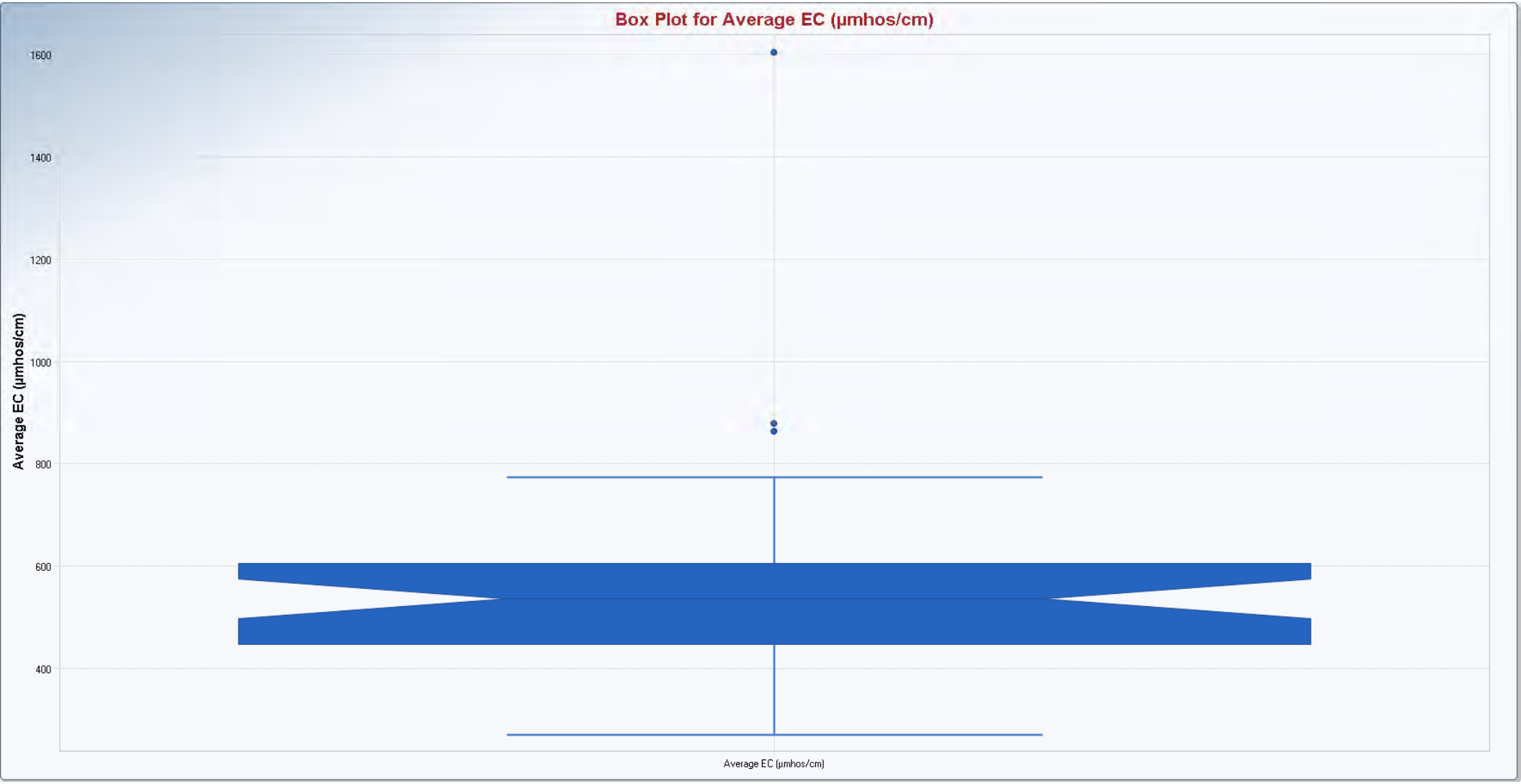
	A	B	C	D	E	F	G	H	I	J	K	L	M
1				**General Statistics on Uncensored Full Data**									
2			Date/Time of Computation	1/30/2015 11:13:56 AM									
3			**User Selected Options**										
4			From File	Data Set_1-30.xls									
5			Full Precision	OFF									
6													
7	**From File: Data Set_1-30.xls**												
8													
9						**General Statistics for Uncensored Dataset**							
10													
11	**Variable**		**NumObs**	**# Missing**	**Minimum**	**Maximum**	**Mean**	**SD**	**SEM**	**MAD/0.675**	**Skewness**	**Kurtosis**	**CV**
12	Average EC (µmhos/cm)		41	0	271	1604	561	221.8	34.63	132.5	2.753	11.6	0.395
13													
14						**Percentiles for Uncensored Dataset**							
15													
16	**Variable**		**NumObs**	**# Missing**	**10%ile**	**20%ile**	**25%ile(Q1)**	**50%ile(Q2)**	**75%ile(Q3)**	**80%ile**	**90%ile**	**95%ile**	**99%ile**
17	Average EC (µmhos/cm)		41	0	346.9	430.1	445.8	535.2	604.2	629.9	770.3	862.9	1314

	A	B	C	D	E	F	G	H	I	J	K	L
1				Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects								
2			User Selected Options									
3			Date/Time of Computation	1/30/2015 11:14:37 AM								
4			From File	Data Set_1-30.xls								
5			Full Precision	OFF								
6			Confidence Coefficient	0.95								
7												
8												
9	Average EC (µmhos/cm)											
10												
11			Raw Statistics									
12			Number of Valid Observations			41						
13			Number of Distinct Observations			41						
14			Minimum			271						
15			Maximum			1604						
16			Mean of Raw Data			561						
17			Standard Deviation of Raw Data			221.8						
18			Khat			8.956						
19			Theta hat			62.64						
20			Kstar			8.317						
21			Theta star			67.45						
22			Mean of Log Transformed Data			6.273						
23			Standard Deviation of Log Transformed Data			0.326						
24												
25			Normal GOF Test Results									
26												
27			Correlation Coefficient R			0.865						
28			Shapiro Wilk Test Statistic			0.78						
29			Shapiro Wilk Critical (0.05) Value			0.941						
30			Approximate Shapiro Wilk P Value			1.1893E-7						
31			Lilliefors Test Statistic			0.187						
32			Lilliefors Critical (0.05) Value			0.138						
33	Data not Normal at (0.05) Significance Level											
34												
35			Gamma GOF Test Results									
36												
37			Correlation Coefficient R			0.913						
38			A-D Test Statistic			0.786						
39			A-D Critical (0.05) Value			0.749						
40			K-S Test Statistic			0.13						
41			K-S Critical(0.05) Value			0.138						
42	Data follow Appr. Gamma Distribution at (0.05) Significance Level											
43												
44			Lognormal GOF Test Results									
45												
46			Correlation Coefficient R			0.971						
47			Shapiro Wilk Test Statistic			0.959						
48			Shapiro Wilk Critical (0.05) Value			0.941						
49			Approximate Shapiro Wilk P Value			0.201						
50			Lilliefors Test Statistic			0.109						
51			Lilliefors Critical (0.05) Value			0.138						
52	Data appear Lognormal at (0.05) Significance Level											

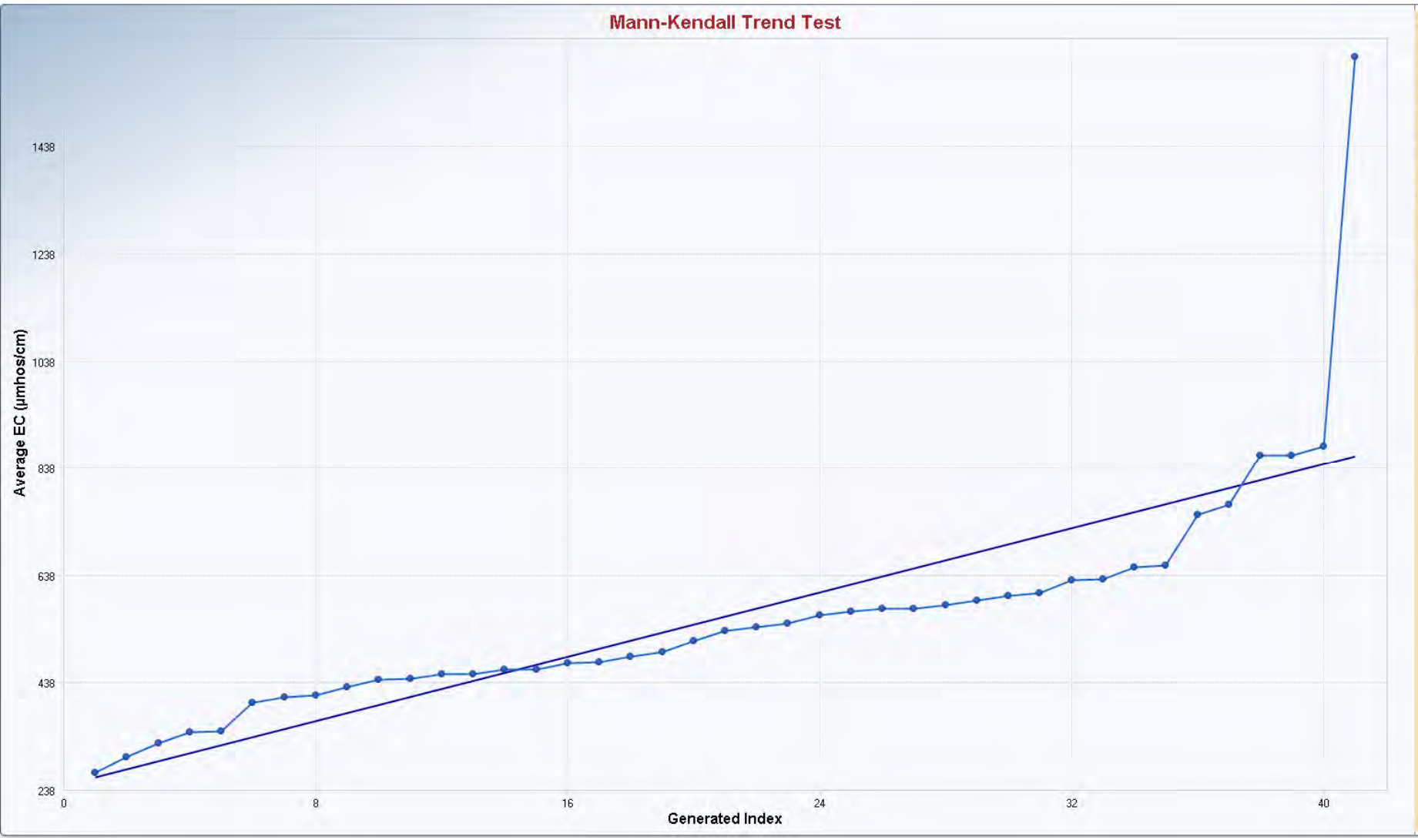

Histogram for Average EC (µmhos/cm)
Frequency
Data Range
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
400
533
667
800
933
1066
1200
1333
1466
1600
Average EC (µmhos/cm)
Number of Values 41
Minimum 271.00
Maximum 1,604.00
SD 221.75
Skewness 2.75
Kurtosis 11.60
Mean 561.00
Median 535.22
Normal Distribution
Less Bins
More Bins


Gamma Q-Q Plot for Average EC (µmhos/cm)
Average EC (µmhos/cm)
N = 41
Mean = 560.9960
k hat = 8.9557
theta hat = 62.6416
Slope = 1.0478
Intercept = -26.0996
Correlation, R = 0.9129
Anderson-Darling Test
Test Statistic = 0.786
Critical Value(0.05) = 0.749
Data not Gamma Distributed
Best Fit Line
Average EC (µmhos/cm)
1600
1400
1200
1000
800
600
400
200
400
600
800
1000
Theoretical Quantiles of Gamma Distribution

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2				**User Selected Options**								
3			Date/Time of Computation	1/30/2015 11:17:22 AM								
4				From File	Data Set_1-30.xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Average EC (µmhos/cm)**								
9												
10												
11				**Mean**	**561**							
12				**Standard Deviation**	**221.8**							
13				**Number of data**	**41**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	561	219	1604	41	4.762	3.05	3.39				
19												
20	For 5% Significance Level, there is 1 Potential Outlier											
21	Potential outliers is: 1604											
22												
23	For 1% Significance Level, there is 1 Potential Outlier											
24	Potential outliers is: 1604											
25												


Box Plot for Average EC (µmhos/cm)
Average EC (µmhos/cm)
1600
1400
1200
1000
800
600
400
Average EC (µmhos/cm)

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2			User Selected Options									
3			Date/Time of Computation	1/30/2015 11:16:25 AM								
4			From File	Data Set_1-30.xls								
5			Full Precision	OFF								
6			Confidence Coefficient	0.95								
7			Level of Significance	0.05								
8												
9	**Average EC (µmhos/cm)**											
10												
11	**General Statistics**											
12			Number or Reported Events Not Used		0							
13			Number of Generated Events		41							
14			Number Values Reported (n)		41							
15			Minimum		271							
16			Maximum		1604							
17			Mean		561							
18			Geometric Mean		530							
19			Median		535.2							
20			Standard Deviation		221.8							
21												
22	**Mann-Kendall Test**											
23			Test Value (S)		820							
24			Critical Value (0.05)		1.645							
25			Standard Deviation of S		89.03							
26			Standardized Value of S		9.199							
27			Approximate p-value		0							
28												
29	**Statistically significant evidence of an increasing**											
30	**trend at the specified level of significance.**											



Mann-Kendall Trend Analysis

n	41
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	89.0318
Standardized Value of S	9.1990
Test Value (S)	820
Appx. Critical Value (0.05)	1.6449
Approximate p-value	0.0000

OLS Regression Line (Blue)

OLS Regression Slope	14.9617
OLS Regression Intercept	246.8002

Statistically significant evidence of an increasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			1/30/2015 11:18:13 AM								
5	From File			Data Set_1-30.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Average EC (µmhos/cm)**											
12												
13	**General Statistics**											
14	Total Number of Observations					41	Number of Distinct Observations					41
15							Number of Missing Observations					0
16	Minimum					271	Mean					561
17	Maximum					1604	Median					535.2
18	SD					221.8	Std. Error of Mean					34.63
19	Coefficient of Variation					0.395	Skewness					2.753
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.78	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.941	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.187	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.138	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					619.3	95% Adjusted-CLT UCL (Chen-1995)					633.9
31							95% Modified-t UCL (Johnson-1978)					621.8
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.786	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.749	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.13	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.138	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					8.956	k star (bias corrected MLE)					8.317
42	Theta hat (MLE)					62.64	Theta star (bias corrected MLE)					67.45
43	nu hat (MLE)					734.4	nu star (bias corrected)					682
44	MLE Mean (bias corrected)					561	MLE Sd (bias corrected)					194.5
45							Approximate Chi Square Value (0.05)					622.4
46	Adjusted Level of Significance					0.0441	Adjusted Chi Square Value					620.3
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50)					614.7	95% Adjusted Gamma UCL (use when n<50)					616.8
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.959	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.941	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.109	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.138	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	5.602				Mean of logged Data		6.273
60					Maximum of Logged Data	7.38				SD of logged Data		0.326
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	612.8				90% Chebyshev (MVUE) UCL		645.2
64					95% Chebyshev (MVUE) UCL	684.6				97.5% Chebyshev (MVUE) UCL		739.4
65					99% Chebyshev (MVUE) UCL	846.9						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	618				95% Jackknife UCL		619.3
72					95% Standard Bootstrap UCL	617.1				95% Bootstrap-t UCL		645
73					95% Hall's Bootstrap UCL	731.1				95% Percentile Bootstrap UCL		619.3
74					95% BCA Bootstrap UCL	639.3						
75					90% Chebyshev(Mean, Sd) UCL	664.9				95% Chebyshev(Mean, Sd) UCL		712
76					97.5% Chebyshev(Mean, Sd) UCL	777.3				99% Chebyshev(Mean, Sd) UCL		905.6
77												
78	**Suggested UCL to Use**											
79					95% Adjusted Gamma UCL	616.8						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

APPENDIX F

NITRATE DATA TABLE

Nitrate Concentration Data Source

Number of Data Points	Number of Wells	Date Range	Sources
128	46	2006-2013	Tulare County Well Data
931	873	2007-2013	RWQCB Dairy Annual Report Data
539	306	1950-2014	Tulare County GAMA http://geotracker.waterboards.ca.gov/gama/data_download.asp
31	21	1950-2013	Kern County GAMA http://geotracker.waterboards.ca.gov/gama/data_download.asp
2,212	2,131	1945-2011	UC Davis Well Data http://geotracker.waterboards.ca.gov/gama/data_download.asp

APPENDIX G

ELECTRICAL CONDUCTIVITY DATA TABLE

Electrical Conductivity Data Source

Number of Data Points	Number of Wells	Date Range	Sources
64	21	2006-2013	Tulare County Well Data
904	881	2007-2013	RWQCB Dairy Annual Report Data
467	327	1950-2014	Tulare County GAMA http://geotracker.waterboards.ca.gov/gama/data_download.asp
36	24	1950-2013	Kern County GAMA http://geotracker.waterboards.ca.gov/gama/data_download.asp