EASTERN TULE GSA

TRI-COUNTY WATER AUTHORITY GSA

PIXLEY IRRIGATION DISTRICT GSA

LOWER TULE RIVER IRRIGATION DISTRICT GSA

DELANO-EARLIMART IRRIGATION DISTRICT GSA

ALPAUGH GSA

TULARE COUNTY GSA

TULE SUBBASIN COORDINATION AGREEMENT

1/6/2020

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LIST OF ACRONYMS AND DEFINITIONS

"GSA"- Groundwater Sustainability Agency

"GSP" - Groundwater Sustainability Plan

"Coordination Agreement"

"DWR" - California Department of Water Resources

"Tule Subbasin" or "Tule Basin" - Bulletin 118 Groundwater Basin Number 5-22.13

"Tule Subbasin TAC" - Tule Subbasin Technical Advisory Committee

ACOE - United States Army Corps of Engineers

Alpaugh GSA – Alpaugh Irrigation District Groundwater Sustainability Agency

AWWA – American Water Works Association

BMP – Best Management Practices

CASGEM – California Statewide Groundwater Elevation Monitoring

DCTRA – Deer Creek Tule River Authority

DEID GSA – Delano-Earlimart Irrigation District Groundwater Sustainability Agency

ET - Evapotranspiration

ETGSA – Eastern Tule Groundwater Sustainability Agency

GIS – Geographic Information System

LTGSA – Lower Tule River Irrigation District Groundwater Sustainability Agency

LTRID – Lower Tule River Irrigation District

PIXID GSA – Pixley Irrigation District Groundwater Sustainability Agency

RWQCB – Regional Water Quality Control Board

QA/QC – Quality Assurance/Quality Control

SGMA – Sustainable Groundwater Management Act

TCWA GSA – Tri-County Water Authority Groundwater Sustainability Agency

TRA – Tule River Association

USBR – United State Bureau of Reclamation

USGS – United States Geological Survey

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I. INTRODUCTION

1.1 General (§357.4(a))

Pursuant to 23 Cal. Code Regs. §357.4(a), the GSAs hereby enter into this Coordination Agreement. The Tule Subbasin identified by DWR as No. 5-22-13 of the Tulare Lake Hydrologic Region, **Figure 1-1**, is currently composed of seven GSAs. Each GSA within the Tule Subbasin has previously submitted notice to the Department of its intent to implement and develop its own GSP pursuant to 23 CCR §353.6. As a result, a Coordination Agreement is necessary as multiple GSAs within the Tule Subbasin are developing and implementing independent GSPs. The purpose of this Coordination Agreement is to fulfill all statutory and regulatory requirements related to Intra-basin coordination agreements pursuant to the Sustainable Groundwater Management Act ("SGMA").

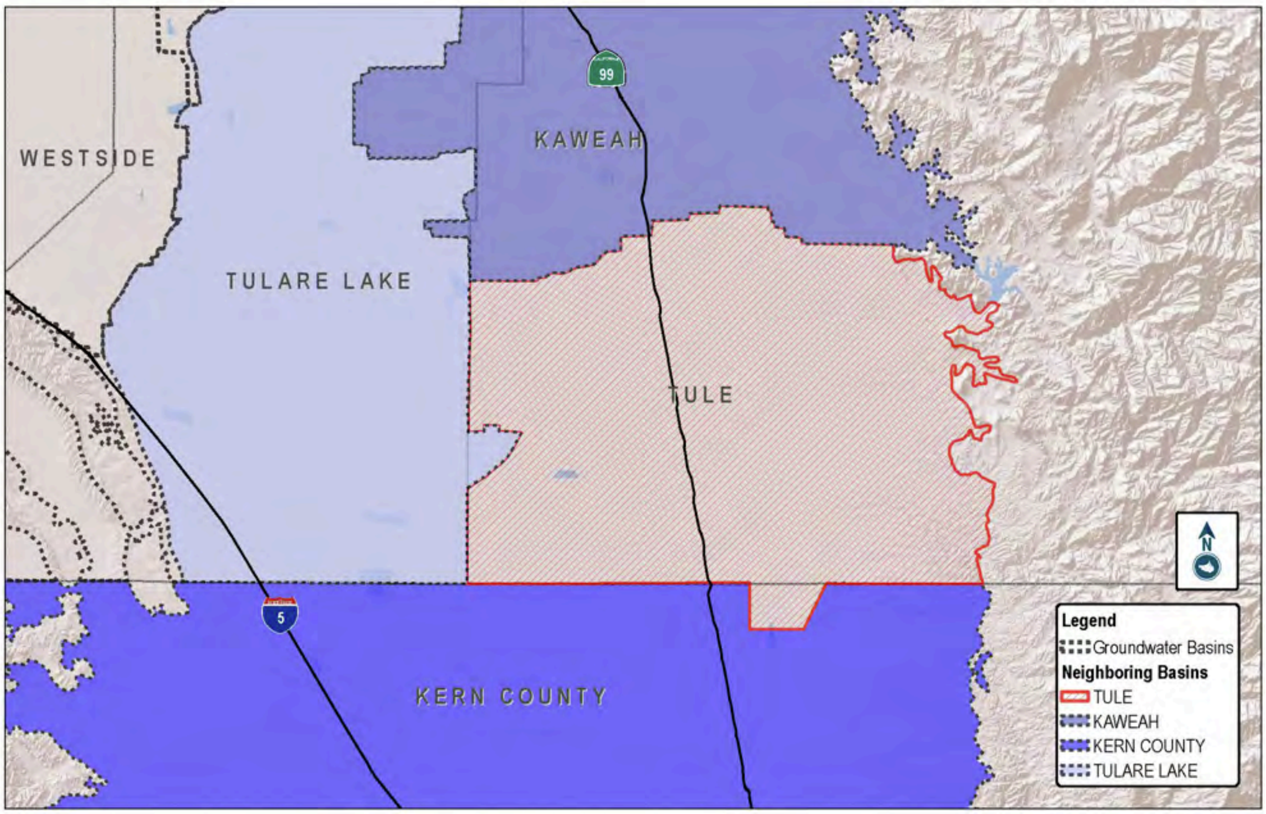

FIGURE 1-1: TULE SUBBASIN

1.2 Parties

The Parties to this Coordination Agreement are the seven (7) exclusive GSAs within the Tule Subbasin identified as follows:

1. Eastern Tule Groundwater Sustainability Agency ("ETGSA"),
2. Tri-County Water Authority Groundwater Sustainability Agency ("TCWA GSA"),
3. Pixley Irrigation District Groundwater Sustainability Agency ("PIXID GSA"),

4. Lower Tule River Irrigation District Groundwater Sustainability Agency ("LTGSA"),
5. Delano-Earlimart Irrigation District Groundwater Sustainability Agency ("DEID GSA"), and
6. Alpaugh Groundwater Sustainability Agency ("Alpaugh GSA")
7. Tulare County Groundwater Sustainability Agency ("Tulare County GSA")

It should be noted the Tulare County GSA has entered into MOUs concerning coverage of territories under adjacent GSPs and although there are seven GSAs there will be six GSPs covering the Tule Subbasin. Hereinafter the foregoing is collectively referred to as "Parties" or "Tule Subbasin GSAs" or individually as "Party", **Figure 1-2**. Collectively, the Parties' jurisdictional areas cover the Tulare Lake Hydrologic Region San Joaquin Valley Groundwater Basin, Tule Subbasin, a groundwater subbasin recognized by DWR as described in Groundwater Bulletin 118 and also identified as Groundwater Basin Number 5-22.13.

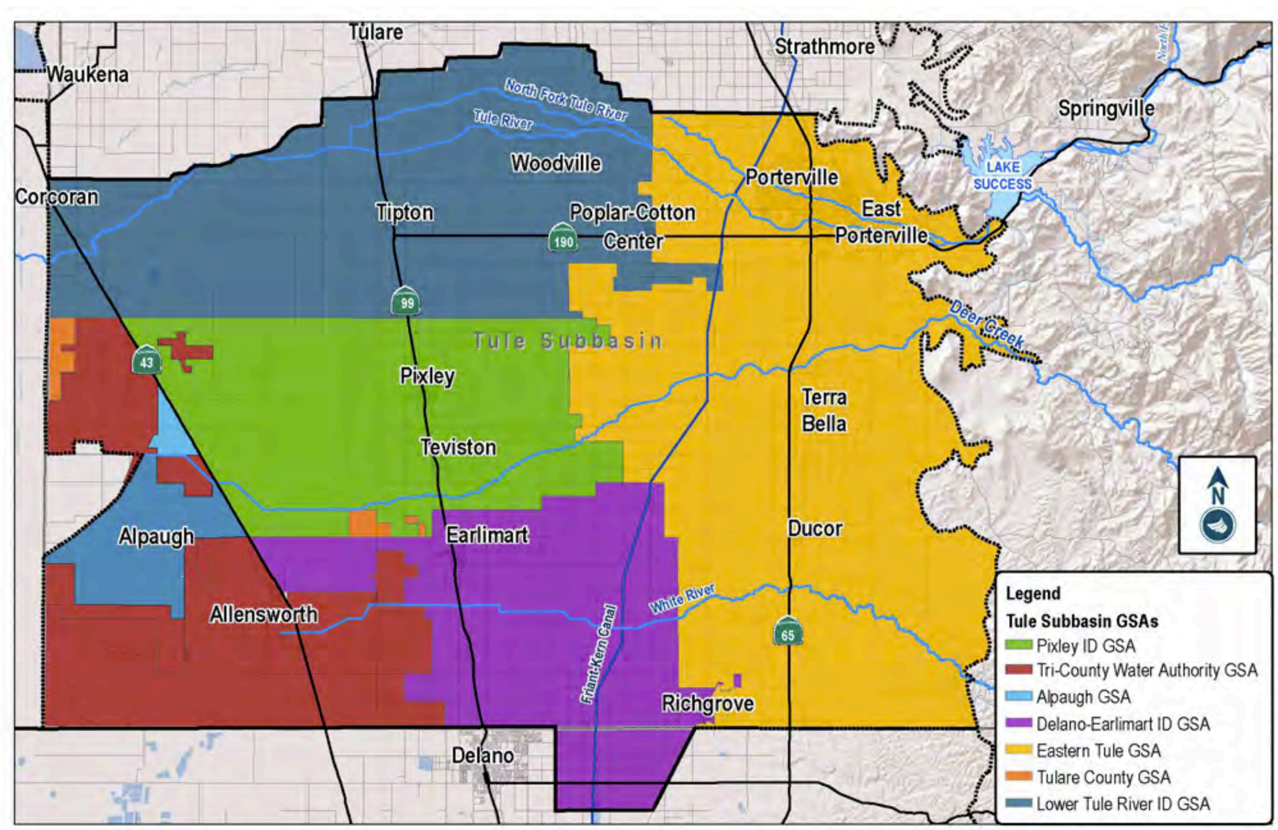

FIGURE 1-2: TULE SUBBASIN GROUNDWATER SUSTAINABILITY AGENCIES

1.3 Plan Manager (§§357.4(b)(1), 351(z))

Pursuant to 23 Cal. Code Regs. §357.4(b) and §351(z), the Plan Manager or point of contact with DWR, who is responsible for reviewing this Agreement and the GSPs prepared by each respective GSA and delegated the authority under this Agreement to submit information on behalf of the GSAs within the Tule Subbasin to DWR, shall be the selected chairperson of the Tule

Subbasin Technical Advisory Committee (TAC), which consists of representatives from each Party. Currently, the Chairperson of the Tule Subbasin TAC is:

David De Groot, Principal Engineer
324 S. Sante Fe, Suite A
Visalia, CA 93292
559-802-3052
davidd@4-creeks.com

The Parties agree that no GSP shall be submitted by the Plan Manager without the prior authority to do so being granted by the respective GSA that prepared that GSP.

1.4 Process for submitting all Plans, Plan amendments, supporting information, monitoring data, annual reports and periodic evaluations. (§357.4(d).)

Pursuant to 23 Cal. Code Regs. §357.4(d), this section describes the process for submitting GSPs, plan amendments, supporting information, monitoring data, and other pertinent information, along with annual reports and periodic evaluations to DWR. Each GSA shall provide to the Chairperson of the Tule Subbasin TAC the approved GSP, any subsequent GSP amendments and supporting information for submittal to the DWR. All GSAs within the Tule Subbasin shall endeavor to complete all GSP requirements in a timely manner.

The Plan Manager shall be responsible for submitting all required information to DWR in compliance with SGMA and 23 Cal. Code Regs. §353.4. No information shall be submitted by the Plan Manager without the prior written authorization of each responsible GSA.

1.4.1 Groundwater Sustainability Plans, Plan Amendments, and Supporting Information (§355.2, §355.10)

The Parties agree that each GSA shall prepare and submit its respective GSP and supporting information to the Tule Subbasin TAC so each GSP can be reviewed by the other GSAs in the Subbasin prior to the GSPs being submitted to the DWR. The Parties shall notify the other GSAs of future amendments and updates to their respective GSPs. The Parties agree that they endeavor to provide each other with as much notice of such amendments and updates as practically possible, but that the baseline, minimum noticing requirements will be what the SGMA Regulations require for public notice. Any plan amendments shall also be circulated to the other GSAs for review and submitted to the Plan Manager for submittal to DWR.

1.4.2 Monitoring Data (§354.40)

Basin-wide monitoring data will be collected in accordance with the Tule Subbasin Monitoring Plan, provided in this Coordination Agreement as **Attachment 1**, and reported to the Tule Subbasin TAC as part of the annual reports described below in compliance with 23 Cal. Code Regs. § 354.40.

If an individual GSA has identified monitoring features for use in collecting data specific to its GSA, and the features are not included in the Subbasin Monitoring Plan of this Coordination

Agreement, then the GSA can incorporate the features and data into its GSP upon confirmation that the monitoring features meet the minimum criteria specified in the Monitoring Plan.

1.4.3 Annual Reports (§356.2)

Pursuant to 23 Cal. Code Regs. § 356.2, annual reports are required to be submitted to DWR by April 1 of each year following the adoption by the GSA of the GSP. Each GSA shall submit annually to the Plan Manager a report to meet these requirements, who will in turn submit the reports to DWR on behalf of the Tule Subbasin. The Tule Subbasin TAC may develop a standardized template for these reports and use by each respective GSA. The annual report shall be separated between a subbasin-wide section and individual GSA specific sections that will be prepared by each respective GSA, but reviewed by the Tule Subbasin TAC prior to submission to DWR for review. The report shall contain the information described below.

- General information summarizing the contents of the report and a map depicting the subbasin.
- Groundwater elevation data from monitoring wells
  - Groundwater elevation contour maps
  - Hydrographs of groundwater elevations and water year type
- Groundwater extraction from preceding water year
- Surface water supply used or available for use for groundwater recharge or in-lieu use
- Total water use
- Changes in groundwater storage
  - Change in groundwater storage maps
  - Graph depicting water year type, groundwater use, annual change in groundwater storage, and cumulative change in groundwater in storage for the basin

In addition, each GSA shall provide a description of the progress towards implementing its respective GSP. The description shall include progress with respect to interim milestones, implementation of projects, and any management actions implemented since the prior annual report.

1.4.4 Periodic Evaluations (§356.4)

Pursuant to 23 Cal. Code Regs. §356.4, periodic evaluations by each GSA are required at least every five years and whenever a GSP is amended. These evaluations shall be provided to DWR.

Each individual GSA shall prepare the required periodic evaluation, in consultation with the Tule Subbasin TAC where subbasin-wide information is required. The evaluations shall be delivered to the Plan Manager for submission to DWR and subject to review by the other subbasin GSAs.

The periodic evaluations shall include all the requirements found in Section 356.4 of SGMA Regulations, including but not limited to the following:

- Groundwater conditions relative to measurable objectives, interim milestones, and minimum thresholds
- Description of project or management action implementations
- GSP elements that are being requested for reconsideration or proposed revision, if any
- Evaluation of the basin setting in light of new information or changes in water use
- Description of the monitoring network as described in **Attachment 1** including:
    - Assessment of monitoring network function
    - Identification of data gaps and program resolving such gaps
    - Plans to install new data collection facilities
    - Adjustments to Monitoring Network
- Description of significant information that has been made available since GSP adoption, amendment, or prior periodic evaluation and if changes to GSP elements are needed
- Description of actions taken by GSA related to GSP
- Enforcement activities, if any, by the GSA
- GSP amendments that have been completed or proposed
- Summary of coordination between GSAs
- Other relevant information

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II. BASIN SETTING (§§354.12-354.20)

Pursuant to 23 Cal. Code Regs. §354.12-354.20, the basin setting components are attached hereto and incorporated by reference as **Attachment 2** and summarized below.

2.1 Physical Setting

The Tule Subbasin is located in the southern portion of the San Joaquin Valley Groundwater Basin in the Central Valley of California. The lateral boundaries of the Tule Subbasin include both natural and political boundaries. The eastern boundary of the Tule Subbasin is defined by the surface contact between crystalline rocks of the Sierra Nevada and surficial alluvial sediments that make up the groundwater basin. The northern boundary is defined by the Lower Tule River Irrigation District (LTRID) and Porterville Irrigation District boundaries. The western boundary is defined by the Tulare County/Kings County boundary, except for a portion of the Tulare Lake Basin Water Storage District that extends east across the county boundary and is excluded from the subbasin. The southern boundary is defined by the Tulare County/Kern County boundary except for the portion of the Delano-Earlimart Irrigation District (DEID) that extends south of the county boundary and is included in the subbasin.

The area of the Tule Subbasin is defined by the latest version of DWR Bulletin 118 and is approximately 744 square miles (475,895 acres). The subbasin has been divided into seven individual GSAs: ETGSA, LTGSA, PIXID GSA, DEID GSA, Alpaugh GSA, TCWA GSA, and the Tulare County GSA. Communities within the subbasin include Allensworth, Alpaugh, Porterville, Tipton, Pixley, Earlimart, Richgrove, Ducor and Terra Bella. Neighboring DWR Bulletin 118 subbasins include the Kern County Subbasin to the south, the Tulare Lake Subbasin to the west, and the Kaweah Subbasin to the north.

2.2 Hydrogeologic Conceptual Model §354.14

The hydrogeologic conceptual model of the Tule Subbasin, as described in **Attachment 2**, has been developed in accordance with the requirements of California Code of Regulations, Title 23, Division 2, Chapter 1.5, Subchapter 2, Article 5, Subarticle 2 (§354.14) and in consideration of DWR Best Management Practices (BMPs) for the preparation of hydrogeologic conceptual models. The hydrogeologic conceptual model forms the basis for the numerical groundwater flow model of the subbasin.

2.3 Groundwater Conditions §354.16.

Two primary aquifers have been identified within the Tule Subbasin: an upper unconfined to semi-confined aquifer and a lower semi-confined to confined aquifer. The upper and lower aquifers are separated by the Corcoran Clay confining unit in the western portion of the subbasin. Groundwater within the southeastern portion of the subbasin is also produced from the Santa Margarita Formation, which is located stratigraphically below the lower aquifer.

In general, groundwater in the Tule Subbasin flows from areas of natural recharge along major streams at the base of the Sierra Nevada Mountains on the eastern boundary towards a groundwater pumping depression in the western-central portion of the subbasin. Groundwater level changes observed in wells completed in the upper aquifer show a persistent downward trend between approximately 1987 and 2017, despite a relatively wet hydrologic period between 1991 and 1999 and other intervening wet years (2005 and 2011). Groundwater level trends in wells perforated exclusively in the lower aquifer vary depending on location in the subbasin. In the northwestern part of the subbasin, lower aquifer groundwater levels have shown a persistent downward trend from 1987 to 2017. In the southern part of the subbasin, groundwater levels were relatively stable between 1987 and 2007, but began declining after 2007.

Changes in groundwater storage within the Tule Subbasin have been estimated through analysis of the water budget. Comparison of the groundwater inflow elements of the water budget with the outflow elements shows a cumulative change in groundwater storage over the 31-year period between 1986/87 and 2016/17 of approximately -4,948,000 acre-ft. The average annual change in storage resulting from the groundwater budget is approximately -160,000 acre-ft/yr.

Seawater intrusion cannot occur in the Tule Subbasin due to its location with respect to the Pacific Ocean.

Groundwater quality in the Tule Subbasin is generally very good and does not prevent the beneficial use of the water in most places. The primary exception is perched and upper aquifer groundwater in the southwest portion of the subbasin, where the beneficial use designation has been removed by the State Water Resources Control Board. The primary groundwater quality issues that could affect the beneficial uses of groundwater in the future are nitrate and pesticides. Point sources of contamination have been identified in some parts of the subbasin, but they are highly localized problems.

Land surface subsidence resulting from lowering the groundwater level from groundwater production has been well documented in the Tule Subbasin. Since 1987, the highest rates of land subsidence have occurred in the northwestern portion of the subbasin and in the vicinity of the Friant-Kern Canal near Terra Bella.

Groundwater dependent ecosystems require shallow groundwater or groundwater that discharges at the land surface. Throughout the Tule Subbasin, the depth to groundwater is well below the level required to support riparian vegetation (vegetation that draws water directly from groundwater) or near surface ecosystems, except some areas along the Tule River, east of Porterville.

2.4 <u>Water Budget §354.18.</u>

A detailed surface water and groundwater budget has been developed for the Tule Subbasin for the 31-year period from 1986/87 to 2016/17. The surface water budget includes the following inflow and outflow terms:

<u>Surface Water Inflow</u>

- Precipitation
- Stream inflow
- Imported water

- Discharge to the land surface from wells

Surface Water Outflow

- Infiltration of precipitation
- Evapotranspiration of precipitation from native vegetation and crops
- Stream infiltration
- Canal losses
- Recharge in basins
- Deep percolation of applied water
- Crop consumptive use

The groundwater budget describes the sources and estimates the volumes of groundwater inflow and outflow within the Tule Subbasin. The groundwater budget includes the following inflow and outflow terms:

Groundwater Inflow

- Areal recharge from precipitation
- Recharge in stream/river channels
- Managed recharge in basins
- Canal losses
- Deep percolation of applied water
- Release of water from compression of aquitards
- Subsurface inflow

Groundwater Outflow

- Groundwater pumping
- Evapotranspiration
- Subsurface outflow

A fundamental premise of the groundwater budget is the following relationship:

Inflow – Outflow = +/- ΔS

The difference between the sum of groundwater inflow terms and the sum of groundwater outflow terms is the change in groundwater storage (ΔS). The cumulative change in groundwater storage over the 31-year period between 1986/87 and 2016/17 in the Tule Subbasin was approximately -4,948,000 acre-ft. The average annual change in storage resulting from the groundwater budget is approximately -160,000 acre-ft/yr.

In the Tule Subbasin, sources of groundwater recharge (i.e. inflow) that are associated with pre-existing surface water rights and imported water deliveries are not used to estimate the Sustainable Yield of the subbasin.

III. COORDINATED DATA AND METHODOLOGIES (§357.4(b)(3).)

3.1 General

This section of the Coordination Agreement describes the types of data to be collected and the data collection and analysis methodologies to be utilized to satisfy requirements for the preparation of GSPs and annual reports.

Pursuant to Water Code Section 10727.6, GSAs intending to develop and implement multiple GSPs are required to coordinate with other agencies preparing a GSP within the basin to ensure that the various GSPs utilize the same data and methodologies for the following assumptions in developing the GSP:

a) Groundwater elevation data;
b) Groundwater extraction data;
c) Surface water supply;
d) Total water use;
e) Change in groundwater storage;
f) Water budget; and
g) Sustainable yield.

3.2 Groundwater Elevation (§357.4(b)(3)(A))

Pursuant to 23 Cal. Code Regs. §357.4(b)(3)(A), the following describes how the GSAs have used the same data and methodologies for groundwater elevation, which is supported by the quality, frequency and spatial data in the monitoring network and monitoring objectives. Groundwater elevation data to be relied on for the purpose of determining minimum thresholds, estimating change in groundwater storage as required for annual reports, and measuring progress towards achieving sustainability will be collected from the minimum monitoring well network identified in the Tule Subbasin Monitoring Plan (see **Attachment 1**).

The Tule Subbasin shall use the following data and methods to measure or estimate groundwater elevations:

3.2.1 Data and Monitoring Protocols

Groundwater elevation data to be relied on for the purpose of determining minimum thresholds, estimating change in groundwater storage as required for annual reports, and measuring progress towards achieving sustainability will be collected from the minimum monitoring well network. Groundwater elevation monitoring protocols and measurement frequencies are described in detail in the Tule Subbasin Monitoring Plan (**Attachment 1**).

The monitoring well network for collection of groundwater elevation data may consist of a combination of existing wells and new dedicated monitoring wells. In order to be included in the well network for collecting groundwater elevation data, each monitoring well must meet the following minimum criteria:

3.2.1.1 *Existing Wells*

Preference will be given where feasible to existing wells that are not actively pumped as they provide the most representative static groundwater level data. Monitoring of groundwater levels in existing wells that are actively pumped must be conducted in accordance with the monitoring procedures specified in the Tule Subbasin Monitoring Plan (**Attachment 1**).

The location (i.e. X-Y Coordinates) of existing wells to be included in the monitoring well network must be surveyed to the nearest 1 foot (NAD83) by a California licensed land surveyor. The elevation of the reference point (i.e. the Z Coordinate) shall be surveyed to an accuracy of 0.1 foot relative to mean sea level (NAVD88) by a California licensed land surveyor.

The construction of each existing well must be documented and confirmed to the satisfaction of the Tule Subbasin TAC's technical consultant. Construction information shall include:

- The total well depth,
- The perforation interval(s),
- The casing diameter,
- Depth intervals of all seals,
- Pump setting (if applicable).

If these data are not known or cannot be confirmed, the well must be investigated in the field to be considered for inclusion in the monitoring well network. Any field investigation must be conducted with the consent of the landowner and/or well owner. All field verification of the wells will be collected utilizing professional staff that are trained and experienced in the use of the equipment used to measure well depth and inspect wells, and who meet the minimum qualifications and training requirements required by the Tule Subbasin TAC technical consultant. Field verification of the wells identified in the Tule Subbasin Monitoring Plan will be conducted by a technical consultant of the Tule Subbasin TAC. A GSA may hire and use its own technical consultant, who meets minimum qualifications and training requirements required by the Tule Subbasin TAC consultant, to collect data from wells within its GSA's boundaries, that a GSA may choose to monitor in addition to the wells identified in the Tule Subbasin Monitoring Plan. Each GSA shall be provided notice of when the Tule Subbasin TAC consultant will be conducting field verification or measurements and a GSA may have its consultant quality control check the Tule Subbasin TAC's consultant's work. Furthermore, nothing in this Agreement prevents multiple GSAs from using the same consultant to conduct field verification.

Field verification will consist of obtaining a downhole video log of the full length of blank and perforated well casing. If the well is equipped with a pump, the pump shall be removed prior to obtaining the downhole video log. The video camera equipment shall be equipped with side-scan capability in order to view the condition and depth of well perforations. Existing wells for which adequate documentation is not available, as determined by the Tule Subbasin TAC's technical consultant, will not be included in the groundwater level monitoring network. Further, wells for which the owner does not provide access, does not voluntarily remove the pump for investigating the well, or does not otherwise provide consent to investigate the well will not be included in the groundwater level monitoring network.

An established and acceptable sounding access tube or port shall be available for the purpose of measuring groundwater levels. Sounding tubes that are separate and outside the main well casing (i.e. enter the well casing from the outside at depth) will be preferred. Sounding tubes located within the main well casing are acceptable if they extend past the pump intake depth. The sounding tube shall be free and clear and allow for collection of representative groundwater level measurements without the risk of damaging the sounder.

Only wells perforated exclusively in either the upper aquifer (as defined in **Attachment 1**) or lower aquifer (as defined in **Attachment 1**) will be included in the monitoring well network. Wells constructed with perforations across multiple aquifers in a single casing string (i.e. "composite wells") will not be included in the monitoring network for measuring groundwater elevations unless authorized by the Tule Subbasin TAC.

Groundwater elevation data has historically been obtained via monitoring programs conducted under other local State and Federal programs such as the Regional Water Quality Control Board (RWQCB) General Order for Dairies, California Statewide Groundwater Elevation Monitoring (CASGEM) program, Bureau of Reclamation, and others. Existing wells that have been monitored as part of these programs will be considered for the Tule Subbasin monitoring network as long as they meet the criteria specified in this section.

3.2.1.2 *New Wells*

New monitoring wells will either be constructed in the upper aquifer, lower aquifer, or Santa Margarita Formation aquifer (as defined in **Attachment 1**). New wells shall not be constructed as composite wells. The exact depth and perforation intervals of these wells will be determined from site-specific data collected during the drilling of the boreholes for the wells.

New monitoring wells will be constructed with minimum 4-inch diameter casing in order to allow for collection of groundwater samples.

Each new monitoring well will be constructed with a steel above-ground riser equipped with a protective locking cap for keeping the wellhead secure. The above-ground riser will be surrounded by cement-filled steel bollards for further protection.

A dedicated reference point shall be established and marked on the top of the monitoring well casing. All groundwater level measurements shall be obtained relative to the reference point. The elevation of the reference point shall be surveyed to an accuracy of 0.1 foot relative to mean sea level (NAVD88) by a California licensed land surveyor.

3.2.2 Quality Assurance/Quality Control

All groundwater elevation data will be collected utilizing professional staff that are trained and experienced in the use of the monitoring equipment and who meet the minimum qualifications and training requirements required by the Tule Subbasin TAC technical consultant. All data collection required for the Tule Subbasin Monitoring Plan ("Baseline Monitoring") will be performed either by the Tule Subbasin TAC technical consultant or a consultant hired direct by the GSA. If the GSA utilizes the Tule Subbasin TAC technical consultant, each GSA shall be notified in advance of when such data collection will occur within that respective GSA's boundaries and each GSA may hire its own consultant for quality control and peer review the work of the Tule Subbasin TAC technical consultant. If the GSA hires and uses its own consultant, who meets the same minimum qualifications and training requirements required by the Tule Subbasin TAC consultant, to collect data for monitoring features within its GSA's boundaries, all data shall be submitted per the data management requirements and schedule. Furthermore, nothing in this Agreement prevents multiple GSAs from using the same consultant to collect such data. General and basin-wide data will be collected by and/or provided to the Tule Subbasin TAC's consultant in accordance with the protocols specified in the Tule Subbasin Monitoring Plan (**Attachment 1**). The goal of the GSAs is to maintain the integrity of the data by following the above described procedures for collection of Baseline Monitoring data and additional data within each GSA that will provide additional information for the benefit of the Subbasin.

By December 1 following a water year, all groundwater elevation data produced by the GSAs shall be submitted to the Tule Subbasin TAC's technical consultant for input into the Tule Subbasin Water Management Database (**Attachment 1**). All groundwater elevation data shall be subject to Quality Assurance/Quality Control (QA/QC) checks by the Tule Subbasin TAC's technical consultant. QA/QC may include (but not necessarily be limited to):

- Verification of reference point survey data
- Verification of groundwater level measurement methodology
- Review of calculations to convert groundwater depth to groundwater elevation
- Comparison of data with previous measurements to identify outliers

Data from wells that have not been included in the Tule Subbasin Monitoring Plan or do not follow the above-described procedures, shall not be relied on for making basin management decisions and shall not be used in the analyses necessary for completion of GSPs or annual reports. No wells will be added or removed from the groundwater elevation network without the prior approval of the Tule Subbasin TAC. All monitoring wells to be added to the monitoring network shall meet the criteria specified in this section. Upon such time as wells are added or removed from the monitoring network, the Tule Subbasin Monitoring Plan (**Attachment 1**) will be revised to reflect the changes.

Individual GSAs may include additional monitoring features, not specifically identified in the Tule Subbasin Monitoring Plan, for collecting data to include in their respective GSPs and annual reports. Tule Subbasin GSAs may collect more GSA-specific data utilizing the same methodologies and may supply applicable information to the Tule Subbasin TAC's technical consultant for the benefit of basin-wide information. The technical consultant will compile the groundwater elevation data into a relational database to be maintained by the consultant in accordance with **Attachment 1**.

3.3 Groundwater Extraction (§357.4(b)(3)(B))

Pursuant to 23 Cal. Code Regs. §357.4(b)(3)(B), this section outlines the approved methodologies for measuring or estimating groundwater extraction in the Tule Subbasin. The

GSAs shall use either satellite remote sensing technology or metered wells to estimate groundwater extraction as described below:

3.3.1 Data and Monitoring Protocols

3.3.1.1 *Groundwater Extraction Estimated from Satellite Data*

In this method, groundwater extraction is estimated as a function of the total agricultural water demand, surface water deliveries, and precipitation. This method is specific to agricultural groundwater extraction (as opposed to municipal groundwater extraction). The total agricultural water demand (i.e. applied water demand) is estimated as follows:

$$W_d = \frac{A_i \ x \ ET}{I_{eff}}$$

Where:

W_d = Total Agricultural Water Demand (acre-ft)
A_i = Irrigated Area (acres)
ET = Evapotranspiration (acre-ft/acre)
I_{eff} = Irrigation Efficiency (unitless)

Crop evapotranspiration (ET) is estimated using remote sensing data from LandSAT satellites. The satellite data is entered into a model, which is used to estimate the ET rate and ET spatial distribution of an area in any given time period. When appropriately calibrated to land-based ET and/or climate stations and validated with crop surveys, the satellite-based model provides an estimate of crop ET (i.e. consumptive use). The satellite-based model is representative, verifiable, and can be accomplished uniformly across the Tule Subbasin by an independent third party. The Tule Subbasin TAC will provide this data for all GSAs.

Irrigation efficiency (I_{eff}) is estimated for any given area based on the irrigation method for that area (e.g. drip irrigation, flood irrigation, micro sprinkler, etc.). Irrigation methods are tied to crop types based on either DWR land use maps or field surveys. The following irrigation efficiencies will be applied to the different irrigation methods based on California Energy Commission (2006):

- Border Strip Irrigation – 77.5 percent
- Micro Sprinkler – 87.5 percent
- Surface Drip Irrigation – 87.5 percent
- Furrow Irrigation – 67.5 percent

Agricultural groundwater extraction is estimated as the total applied water demand (W_d) minus surface water deliveries and effective precipitation. Effective precipitation is the portion of precipitation that becomes evapotranspiration.

3.3.1.2 *Groundwater Extraction Measured Using Flow Meters*

For this method, groundwater extraction is measured using a totalizing flowmeter. The GSAs agree that for metering to be effective, any well in a GSA that chooses this method and pumps over 70 gallons per minute, or an annual total of two (2) acre-ft per year, shall be metered. The GSAs also agree that as a Subbasin-wide standard, meters installed shall be calibrated, certified, and periodically tested following the guidance of American Water Works Association (AWWA) Standard M6 – Water Meters, Selection, Installation, Testing and Maintenance (AWWA, 2012) and the AWWA standards referenced therein for the types of inline meters employed (AWWA C700 series standards). Copies of all meter calibration and testing reports shall be submitted to the Tule Subbasin TAC's technical consultant for review and documentation.

3.3.2 Quality Assurance/Quality Control

By January 1 following a water year, all groundwater extraction data produced by the GSAs shall be submitted to the Tule Subbasin TAC's technical consultant for input into Tule Subbasin Water Management Database (see Section 4.3).

All groundwater extraction data will be subject to QA/QC checks and verification by the Tule Subbasin TAC's technical consultant. QA/QC could include (but not necessarily be limited to):

- Field inspection and verification of inline flow meters.
- Review of flow meter calibration and testing reports.
- Review of groundwater extraction estimates using satellite data.

3.4 Surface Water Supply (§357.4(3)(b)(B))

Pursuant to 23 Cal. Code Regs. §357.4(b)(3)(B), the GSAs agree the total surface water supply to the Tule Subbasin will be the sum of supplies from stream inflow, imported water, and delivered recycled water. Surface water supplies will be compiled annually by the Tule Subbasin TAC consultant from the following sources:

- Tule River inflow to the Subbasin – Tule River Association (TRA) Annual Reports
- Tule River flow from ETGSA to LTGSA – TRA Annual Reports
- Deer Creek inflow to the Subbasin – United States Geological Survey (USGS) Stream Gage at Fountain Springs
- Deer Creek flow from ETGSA to PID GSA – Trenton Weir as provided by Pixley Irrigation District
- Deer Creek flow to downstream license holders in the Tule Subbasin – measured by TCWA GSA
- White River inflow to the Subbasin – Estimated by the Tule Subbasin TAC consultant based on flows measured in Deer Creek
- White River flow from ETGSA to DEID GSA – Estimated by the Tule Subbasin TAC consultant based on an analysis of infiltration or data from White River at Road 208 (from DEID or California Data Exchange Center), as available.

The Tule Subbasin shall use the following data and methods to measure or estimate surface water supply:

3.4.1 Data and Monitoring Protocols

3.4.1.1 *Stream Inflow*

3.4.1.1.1 *Tule River*

Streamflow in the Tule River is recorded as releases from the Lake Success Reservoir and reported in the TRA annual reports. Diversions from the Tule River between Lake Success and Oettle Bridge are documented in TRA annual reports and described in Section 2.6.1.1 of the Monitoring Plan.

Native Tule River water flow in the Tule River channel from the ETGSA to the LTGSA will be recorded as the flow at Rockford Station minus assumed channel losses between the Rockford Station stream gage and Oettle Bridge, as reported in TRA annual reports.

Tule River gaged flow into the LTGSA is assumed to be the sum of gaged surface water measured Below Oettle Bridge, Woods Central Ditch Diversion, Poplar Irrigation Company flow reaching LTGSA, and Porter Slough at 192, as reported in TRA annual reports. Diversions of native Tule River water in the LTGSA will be recorded using the following ratio:

$$\frac{TR_{Gaged}}{TR_{Gaged} + FK_{LTRID}}\ x\ LTRID\ deliveries = TR_{delivered}$$

Where:

TR_{Gaged}	=	Sum of gaged flow at Below Oettle Bridge, Woods Central Diversion, Poplar Irrigation Company flow reaching LTRID, and Porter Slough at 192 (acre-ft).
FK_{LTRID}	=	Imported water delivered to the LTRID from the Friant Kern Canal (acre-ft).
LTRID deliveries	=	Total water deliveries to farmers in the LTRID (acre-ft).
$TR_{delivered}$	=	Assumed portion of LTRID delivered water that is native Tule River water (acre-ft).

Any residual stream flows left in the Tule River after diversions and channel loss are measured at the Turnbull Weir, located at the west end of the LTGSA and the Tule Subbasin. This stream outflow from the Subbasin will be the same as reported in TRA annual reports. Exports of Tule River water to the Friant-Kern Canal will be the same as reported in TRA annual reports.

3.4.1.1.2 *Deer Creek*

Streamflow in Deer Creek is measured by the USGS at their gaging station at Fountain Springs. Stream inflow from Deer Creek into the Tule Subbasin is recorded as the flow at the USGS Fountain Springs stream gage. It is noted that although the Fountain Springs gage is located approximately five miles upstream of the Tule Subbasin boundary, the creek flows over granitic bedrock between the gage and the alluvial basin boundary and losses along this reach are assumed to be limited to evapotranspiration. Evapotranspiration losses between the Fountain Springs gage and the Trenton Weir are assumed to be 30 acre-ft/month when the gaged flow at Fountain Springs is greater than 30 acre-ft/month. When the gaged flow at Fountain Springs is less than 30 acre-ft/month the evapotranspiration is assumed to be equal to the gaged flow.

Deer Creek stream flow from the ETGSA to the PID GSA will be recorded as the flow at Trenton Weir as reported in the Pixley Irrigation District annual water use summaries. J.G. Boswell Company and Angiola Water District hold licenses on Deer Creek and those flows will be reported by TCWA GSA.

3.4.1.1.3 *White River*

Stream inflow into the Tule Subbasin (and ETGSA) from the White River has historically been measured at the USGS stream gage near Ducor. The measured data from this station is only available from 1971 to 2005. For years with no stream flow data, it is assumed that the magnitude of flow in the White River is proportional to the magnitude of flow in Deer Creek. A linear regression analysis of monthly White River streamflow plotted against monthly Deer Creek streamflow for the period 1971 to 2005 results in a correlation coefficient of 0.91. Accordingly, monthly stream flow in the White River will be reported using the following equation from the linear regression:

$$SF_{WR} = 0.3523(SF_{DC}) - 1.1215$$

Where:

SF_{WR} = Stream flow in the White River (Acre-ft).
SF_{DC} = Stream flow in Deer Creek (Acre-ft).

This method will be used to record stream inflow from the White River until a stream gage is established in the river near the eastern subbasin boundary.

White River stream flow from the ETGSA to the DEID GSA will be estimated as the White River inflow into the Subbasin minus evapotranspiration loss and minus an assumed infiltration rate between the eastern subbasin boundary and the DEID GSA boundary. Evapotranspiration losses between the Subbasin boundary and the DEID GSA are estimated to be 14 acre-ft/month when the flow at the boundary is greater than 14 acre-ft/month and equal to the flow in the river when the flow is less than 14 acre-ft/month. Channel loss within the ETGSA is estimated as the total flow minus ET up to 1,190 acre-ft/month. If flows exceed 1,190 acre-ft/month, the balance, up to 9,000 acre-ft/month, is assumed to infiltrate within the DEID GSA. If measured flow at the USGS stream gage near Ducor or interpolated flows, based on the linear regression described above, exceed 9,000 acre-ft in any given month, the volume over 9,000 acre-ft is assumed to infiltrate within the TCWA GSA.

3.4.1.2 *Imported Water*

Imported water delivered to the various agencies within the seven GSAs of the Tule Subbasin will be reported on an annual basis by the agencies receiving deliveries.

3.4.1.3 *Recycled Water*

Recycled water consists of treated wastewater generated at the City of Porterville's Wastewater Treatment Facility and other treatment facilities within the Subbasin. Most of the water from subbasin facilities is delivered to crops in the area. In the case of the City of Porterville, the balance is allowed to infiltrate into the subsurface in recharge ponds located in the old Deer Creek channel. The volume of recycled water delivered to crops shall be measured using an in-line calibrated flow meter. Monthly water deliveries will be provided on an annual basis by the City of Porterville, community services districts, and public utility districts within the Subbasin.

3.4.2 Quality Assurance/Quality Control

The Tule Subbasin GSAs assume that the QA/QC procedures in place by the various entities acting as sources of data, including the TRA, USGS, United States Bureau of Reclamation (USBR), United States Army Corps of Engineers (ACOE), Angiola Water District, City of Porterville, and any other entity upon which the GSAs rely for monitoring surface water flowing in and out of the Subbasin, are satisfactory and will not cause any undue compromise of the data relied upon to calculate total surface water supply.

Surface water supply data will be obtained from the various sources of data by the Tule Subbasin TAC's technical consultant and entered into the Tule Subbasin Water Management Database (see Section 4.3). Surface water supply data will be made available to each GSA by February 1 following the end of a water year.

3.5 Total Water Use (§357.4(b)(3)(B))

Pursuant to 23 Cal. Code Regs. §357.4(b)(3)(B), the GSAs agree the total water use, as defined herein, is based on 23 Cal. Code Regs. §356.2(b)(4), which provides: "Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements." Total water use is the total water demand, including consumptive use.

The Tule Subbasin shall use the following data and methods outlined in **Attachment 1** to measure or estimate total water use, briefly described below:

3.5.1 Data and Monitoring Protocols

3.5.1.1 *Agricultural Water Use*

3.5.1.1.1 *Agricultural Water Demand*

Agricultural water demand will be the sum of groundwater extractions (see Section 3.3) and surface water deliveries from stream sources, imported water, and recycled water (Sections 3.4.1.1, 3.4.1.2 and 3.4.1.3).

3.5.1.1.2 *Agricultural Consumptive Use*

Crop consumptive use will be estimated using the method described in Section 3.3.1.1.

3.5.1.2 *Municipal and Industrial Water Use*

3.5.1.2.1 *M&I Water Demand*

Municipal water demand will be the sum of metered groundwater production from the following communities:

ETGSA

1. City of Porterville
2. Community of East Porterville
3. Terra Bella Irrigation District
4. Ducor Community Services District

LTGSA

1. Tipton Public Utility District
2. Woodville Community Services District
3. Poplar Community Services District

PIXID GSA

1. Pixley Public Utility District
2. Teviston Community Services District

DEID GSA

1. Earlimart Public Utility District
2. Richgrove Community Services District

Alpaugh GSA

1. Alpaugh Community Services District

TCWA GSA

1. Allensworth Community Services District

Tulare County GSA
(None)

3.5.1.2.2 *M&I Consumptive Use*

Consumptive use of landscaping associated with applied municipal groundwater pumping will be estimated based on an assumed percentage of delivered water that is applied to landscaping and an assumed deep percolation factor. It is assumed 47 percent of municipal water use is applied to landscaping. It is assumed that 75 percent of applied water to landscaping is consumptively used by the plants.

The total municipal consumptive use for any one of the communities in the Subbasin is the sum of landscape consumptive use and evaporation of surface water in that community's wastewater treatment facility discharge basins.

3.5.2 Quality Assurance/ Quality Control

By January 1 following a water year, the total water use from each GSA shall be submitted to the Tule Subbasin TAC's technical consultant for review and input into the Tule Subbasin Water Management Database (see Section 4.3).

Total water use will be calculated by individuals from each GSA who meet the minimum qualifications and training requirements. Total water use will be checked by the Tule Subbasin TAC's technical consultant to ensure consistency with the methods described in this Coordination Agreement and to verify that the consumptive use estimates are consistent with satellite data.

3.6 Change in Groundwater Storage (§357.4(b)(3)(B))

The Tule Subbasin shall use the following data and methods to measure or estimate change in annual groundwater storage:

3.6.1 Data and Monitoring Protocols

3.6.1.1 *GIS-Based Method for Estimating Storage Change*

For any given GSA, the change in groundwater storage can be estimated using the following equation:

$$V_w = S_y A \, \Delta h$$

Where:

V_w	=	the volume of groundwater storage change (acre-ft).
S_y	=	specific yield of aquifer sediments (unitless).
A	=	the surface area of the aquifer within the Tule Subbasin/GSA (acres).
Δh	=	the change in hydraulic head (i.e. groundwater level) (feet).

The change in storage estimate is specific to the shallow aquifer as the groundwater level in the deep aquifer will not likely drop below the top of the aquifer. The calculations will be made using a Geographic Information System (GIS) map of the Tule Subbasin/GSA that will be discretized into 300-foot by 300-foot grids to allow for spatial representation of aquifer specific yield and groundwater level change.

The areal and vertical distribution of specific yield for the shallow aquifer will be based on the values obtained from the calibrated groundwater flow model of the Tule Subbasin.

For the areal distribution of change in hydraulic head within the Tule Subbasin/GSA, groundwater contours for the spring of the previous year will be digitized and overlain on the grid map of the Tule Subbasin/GSA in GIS. Groundwater levels will then be assigned to each grid. A contour map with groundwater elevation contours from spring of the next year will also be digitized and overlain on the grid map. Change in hydraulic head (groundwater level) at each grid will be calculated as the difference in groundwater level between the two years.

The complete GIS files of specific yield and groundwater levels will be exported into a spreadsheet program for the final analysis of groundwater storage change. The change in groundwater storage will be calculated for each grid cell by multiplying the change in groundwater level by the specific yield and then by the area of the cell.

The data from the analysis can be used to develop change in storage maps for incorporation into the annual reports.

3.6.1.2 *Groundwater Flow Model Method for Estimating Storage Change*

The calibrated groundwater flow model of the Tule Subbasin, which was originally prepared for the Tule Subbasin TAC in 2018, can be used to estimate the change in groundwater storage across the subbasin and within each GSA boundary. The calibrated groundwater surface from one year can be exported and subtracted from the exported calibrated groundwater surface from a subsequent year. The difference in groundwater levels is multiplied by the specific yield distribution of the shallow aquifer in the model to obtain an estimate of the change in groundwater storage across the subbasin.

In order to develop updated change in storage values for the annual reports, the model will be updated on a regular basis. The update will include incorporation of the previous year's groundwater extractions, recharge values, and groundwater levels. The model calibration will be validated with the measured data and adjusted as needed. Once the updated model is validated, it can be used to estimate changes in groundwater storage both across the Subbasin and within each GSA. The GSAs acknowledge that the more measured data that is available for incorporation into the model, the better the model results will be. The GSAs further acknowledge that they have used the best available information up to this point, but that they will continue to evaluate and gather additional information through the Monitoring Plan.

The model output will be used to develop maps showing the changes in groundwater storage, for incorporation into annual reports.

3.6.2 Quality Control and Assurance

All change in groundwater storage estimates will be conducted by professionals trained and experienced in the use of the groundwater flow model and hydrological calculations. All work shall be conducted under the direct supervision of a California registered Professional Civil Engineer, Professional Geologist, or Certified Hydrogeologist.

3.7 Water Budget (§357.4(b)(3)(B))

Pursuant to 23 Cal. Code Regs. §357.4(b)(3)(B), the GSAs agree to use the following data and methods to measure or estimate a water budget, for both the Subbasin and individual GSAs:

3.7.1 Data and Monitoring Protocols

The water budget methodologies described herein have been developed based on the best available data and procedures at the time of publication. The methodologies shall be reviewed and updated periodically as new monitoring features, data, and technical advances are available.

3.7.2 Surface Water Budget

Surface water budgets describe all of the sources and volumes of surface water inflow and outflow to/from the subbasin. Inflow terms for the surface water budget of the Tule Subbasin will include:

1. Precipitation.
2. Stream inflow.
3. Imported water.
4. Discharge to the land surface from wells.

Surface water outflow terms will include:

1. Infiltration of precipitation.
2. Evapotranspiration of precipitation from native vegetation and crops.
3. Stream infiltration.
4. Infiltration in canals.
5. Recharge in basins.
6. Deep percolation.
7. Consumptive use.
8. Stream outflow.

3.7.2.1 *Surface Water Inflow*

3.7.2.1.1 *Precipitation*

The annual volume of water entering the Tule Subbasin as precipitation will be estimated based on the long-term average annual isohyetal map as included in **Attachment 2** and annual precipitation data reported for the Porterville precipitation station. As annual precipitation values are not available throughout the entire Tule Subbasin, it will be assumed that the relative precipitation distribution for each year is the same as that shown on the isohyetal map. The magnitude of annual precipitation within each isohyetal zone will be varied from year to year based on the ratio of annual precipitation at the Porterville Station to annual average precipitation at the Porterville isohyetal zone multiplied by the isohyetal zone average annual precipitation.

$$\frac{Precip_{Porterville}}{Precip_{Ave\ Porterville}}\ x\ Isohyet_{Ave\ Precip} = Precip_{Isohyet}$$

Where:

$Precip_{Porterville}$	=	Precipitation at the Porterville Station in any given year (ft/yr).
$Precip_{Ave\ Porterville}$	=	Long-Term Average Precipitation at the Porterville Station (ft/yr).
$Isohyet_{Ave\ Precip}$	=	Average precipitation within the Isohyet zone overlying the Subbasin/GSA (ft/yr).
$Precip_{Isohyet}$	=	Adjusted annual precipitation within the isohyet zone overlying the Subbasin/GSA (ft/yr).

The adjusted annual precipitation for the year of interest will be multiplied by the area of the isohyet zone to estimate the precipitation falling on the area (in acre-ft).

3.7.2.1.2 *Stream Inflow*

Surface water inflow to the Tule Subbasin occurs primarily via three native streams: the Tule River, Deer Creek, and the White River. As the ETGSA borders the eastern Tule Subbasin boundary, stream inflow into the Tule Subbasin is equal to the stream inflow into the ETGSA.

Tule River

Streamflow in the Tule River is documented in TRA annual reports. Stream inflow to the Tule Subbasin (and ETGSA) is recorded as releases from the Richard L. Schafer Dam (formerly Lake Success Dam) and will be the same as reported in the TRA annual reports. Accounting of diversions from the Tule River is described in Section 3.4.1.1.1 of this Coordination Agreement.

Deer Creek

Accounting of streamflow in Deer Creek is described in Section 3.4.1.1.2 of this Coordination Agreement.

White River

Accounting of streamflow in the White River is described in Section 3.4.1.1.3 of this Coordination Agreement.

3.7.2.1.3 *Imported Water*

Imported water delivered to the various agencies within the six GSAs of the Tule Subbasin will be provided on an annual basis by the agencies receiving deliveries.

3.7.2.1.4 *Discharge to Crops from Wells*

Water applied to crops from wells is assumed to be the total applied water minus surface water deliveries from imported water and diverted stream flow. Total crop demand will be estimated based on the methodologies identified in Section 3.3.1. Diverted streamflow and imported water deliveries are described in Sections 3.4.1.1 and 3.4.1.2, respectively.

3.7.2.1.5 *Municipal Deliveries from Wells*

Accounting of groundwater pumping for municipal supply will be provided on a monthly basis by the various cities/communities in the Tule Subbasin. These cities/communities include:

1. City of Porterville
2. Tipton Public Utility District
3. Pixley Public Utility District
4. Teviston Community Services District
5. Earlimart Community Services District
6. Terra Bella Irrigation District
7. Richgrove Community Services District
8. Poplar Community Services District
9. Woodville Community Services District
10. Allensworth Community Services District
11. Alpaugh Community Services District
12. Ducor Community Services District

It is assumed that municipal pumping will be metered. In the event that metered pumping data is not available, municipal supply will be estimated based on the population of the community served and an assumption of per capita water demand from the most recent Urban Water Master Plan applicable to the area.

It is noted that there are some households in the rural portions of the Tule Subbasin that rely on private wells to meet their domestic water supply needs. However, given the low population density of these areas, the volume of pumping from private domestic wells is considered negligible compared to the other pumping sources.

***3.7.2.2** Surface Water Outflow*

3.7.2.2.1 *Areal Recharge from Precipitation*

Historical estimates of areal recharge from precipitation falling on the valley floor in the Tule Subbasin, as used in TH&Co (2017a)[1] were based on Williamson et al., (1989).[2] The equation for estimating areal recharge, using the Williamson Method, is:

$$PPT_{rech} = (0.64)PPT - 6.2$$

Where:

PPT_{rech}	=	Groundwater Recharge from Precipitation (ft/yr)
PPT	=	Annual Precipitation (ft/yr)

Total precipitation in any given GSA (i.e. PPT) will be estimated on an annual basis using the portion of the isohyetal map overlapping the GSA (see **Attachment 2**; Figure 2-27) and adjusted based on the recorded annual precipitation at the Porterville station, as described in Section 3.7.1.1.1.1. Precipitation recharge for each GSA will then be recorded on an annual basis using the above equation.

3.7.2.2.2 *Streambed Infiltration (Channel Loss)*

Tule River

Total channel loss (i.e. streambed infiltration plus evapotranspiration) in the Tule River between Lake Success and Oettle Bridge will be the same as reported in TRA annual reports and shall be allocated pursuant to the allocation method in the TRA Water Rights Schedule. Tule River infiltration for the water budget will be estimated as follows:

$TR_{CL} – ET = TR_{NatInf}$

Where:

TR_{CL}	=	Tule River channel losses between Lake Success and Oettle Bridge as reported in TRA annual reports (acre-ft).
ET	=	Evapotranspiration (acre-ft).
TR_{NatInf}	=	Infiltration losses between Lake Success and Oettle Bridge attributed to native Tule River water (acre-ft).

[1] TH&Co, 2017a; Hydrogeological Conceptual Model and Water Budget of the Tule Subbasin. Dated August 1, 2017.

[2] Williamson, A.K., Prudic, D.E., and Swain, L.A., 1989. Ground-Water Flow in the Central Valley, California. USGS Professional Paper 1401-D.

Evapotranspiration between Lake Success and Oettle Bridge will be equal to 35 acre-ft/month when the flow in the channel is greater than 35 acre-ft/month and equal to the flow when less than 35 acre-ft/month.

Reporting of total streambed infiltration of surface water flow in the Tule River channel between Oettle Bridge and Turnbull Weir will be obtained from LTRID annual water use summaries and adjusted to account for ET in the stream channel. Evapotranspiration in the Tule River channel between Oettle Bridge and Turnbull Weir is assumed to be equal to 55 acre-ft/month if the flow in the channel is greater than 55 acre-ft/month and equal to the flow when less than 55 acre-ft/month.

Given the fact that LTRID periodically releases imported water from the Friant-Kern Canal to the Tule River upstream of Oettle Bridge, it will be necessary to account for the portion of channel infiltration attributed to native Tule River flow versus the channel infiltration attributed to imported water as the native river flow infiltration is part of the Sustainable Yield of the subbasin but the imported water recharge is not. Imported water deliveries to the Tule River channel are reported in the TRA annual reports. The estimated native Tule River water infiltration in the channel between Oettle Bridge and Turnbull Weir will be computed as follows:

$$\frac{FK}{TR_{BOB} + FK}\ x\ TR_{Tot\ Inf} - ET = TR_{Native\ Inf\ Loss}$$

Where:

FK	=	Imported water delivered to the LTRID from the Friant Kern Canal (acre-ft).
$\underline{TR_{BOB}}$	=	Gaged flow Below Oettle Bridge from TRA annual reports (acre-ft).
$TR_{Tot\ Inf}$	=	Infiltration losses from both native Tule River water and imported water (acre-ft).
ET	=	Evapotranspiration (acre-ft).
$TR_{Native\ Inf\ Loss}$	=	Infiltration losses between Oettle Bridge and Turnbull Weir attributed to native Tule River water (acre-ft).

<u>Deer Creek</u>

Deer Creek is a losing stream such that infiltration of surface water within the stream channel recharges the groundwater system beneath it. Streambed infiltration (channel loss) is estimated for the stream reaches between the Fountain Springs gaging station and Trenton Weir and between Trenton Weir and Homeland Canal. The difference in streamflow between Fountain Springs station and Trenton Weir is assumed to be total channel loss along this section. Combined streambed infiltration in the Deer Creek channel between Trenton Weir and Homeland Canal and canal losses within the rest of the Pixley Irrigation District were estimated based on Pixley Irrigation District monthly water use summaries. Measured channel loss includes infiltration as well as evapotranspiration. Therefore, infiltration is equal to channel loss minus evapotranspiration.

It is noted that there are two sources of water in the Deer Creek channel: 1) native flow and 2) imported water from the Friant-Kern Canal. It is further noted that imported water is introduced into the Deer Creek channel upstream of Trenton Weir. Thus, until a stream gage is established upstream of the Friant-Kern Canal/Deer Creek intersection, the separate accounting of losses associated with imported water and native Deer Creek surface flow will be approximated. Imported water discharged to the Deer Creek channel from the Friant-Kern Canal is monitored by the USBR and reported in the Pixley Irrigation District monthly water use summaries.

Deer Creek channel loss (i.e. streambed infiltration and evapotranspiration) from Fountain Springs to Trenton Weir was estimated based on the difference in measured flows between the two stations. The surface flow between these two stations is assumed to be, for this water budget, native Deer Creek water. Deer Creek channel infiltration will be estimated as follows:

$$DC_{FS} - DC_{TW} - ET = DC_{Inf\ Loss}$$

Where:

$\underline{DK_{FS}}$	=	Gaged flow at Fountain Springs (acre-ft).
$\underline{DK_{TW}}$	=	Gaged flow at Trenton Weir (acre-ft).
ET	=	Evapotranspiration (acre-ft).
$DC_{Inf\ Loss}$	=	Infiltration losses attributed to native Deer Creek water (acre-ft).

Flow in the Deer Creek channel from Trenton Weir to Homeland Canal is a combination of native Tule River water and imported water purchased by the Pixley Irrigation District for distribution in their service area. For this water balance, it is assumed that all of the water that flows through Trenton Weir is either delivered to farmers or becomes channel or canal loss (i.e. there are no data available to document surface flow from the Deer Creek channel to Homeland Canal although it is known that this occurs during periods of above normal precipitation). The infiltration of native Deer Creek water in the Deer Creek channel downstream of Trenton Weir is estimated for each month based on Pixley Irrigation District annual water use summaries in the following way:

1. Subtract the imported water deliveries to Deer Creek from the total flow measured at Trenton Weir to estimate the volume entering Pixley Irrigation District that is attributed to native Deer Creek flow.
2. Pixley Irrigation District sales and deliveries to basins are subtracted from the total flow through Trenton Weir to determine the volume of water presumably lost as infiltration in the Deer Creek channel and canals.
3. The total loss in No. 2 is multiplied by the ratio of Deer Creek channel length to the total channel/canal length within the Pixley irrigation District (0.21) to estimate losses in the channel and multiplied by the ratio of canal length to the total channel/canal length to estimate losses in the canals (0.79).
4. The total loss attributed to the Deer Creek channel, as estimated from No. 3, is multiplied by the ratio of native Deer Creek flow at Trenton Weir to the total water available to estimate the volume of native Deer Creek water infiltration estimated to occur in the Deer Creek channel.

5. The total loss attributed to canals, as estimated from No. 3, is multiplied by the ratio of native Deer Creek flow at Trenton Weir to the total water available to estimate the volume of native Deer Creek water loss estimated to occur in the canals.

Infiltration losses in the Deer Creek channel are included in the Sustainable Yield of the overall Tule Subbasin.

White River

All of the surface water flow measured or interpolated at the White River stream gage, after accounting for ET losses, is assumed to become streambed infiltration, as described in Section 3.4.1.1.3.

3.7.2.2.3 *Canal Losses*

Canal Losses from Tule River Diversions

Canal losses from Tule River diversions occur within the numerous unlined canals connected to the Tule River within the City of Porterville, Vandalia Water District, Porterville Irrigation District and LTRID. With the exception of LTRID, canal losses are accounted for in the portion of the water budget that addresses deep percolation of applied water (see Section 3.7.1.1.2.5).

Canal losses associated with deliveries of native Tule River water in the LTRID GSA are estimated based on LTRID annual water use summaries. Canal losses will be reported as total LTRID GSA losses minus channel losses attributed to native Tule River water ($TR_{Native\ Inf\ Loss}$). The equation is as follows:

$$\frac{TR_{Gaged}}{TR_{Gaged} + FK}\ x\ LTRID_{Total\ Losses} - TR_{Native\ Inf\ Loss} = TR_{Native\ Can\ Loss}$$

Where:

TR_{Gaged}	=	Sum of gaged flow at Below Oettle Bridge, Woods Central Diversion, Poplar Irrigation Company flow reaching LTRID, and Porter Slough at 192 (acre-ft).
FK	=	Imported water delivered to the LTRID from the Friant Kern Canal.
$LTRID_{Total\ Losses}$	=	Total losses reported in LTRID annual water use summaries.
$TR_{Native\ Inf\ Loss}$	=	Native Tule River channel infiltration losses.
$TR_{Native\ Can\ Loss}$	=	Canal losses attributed to native Tule River water.

Canal losses from diverted native Tule River water are not included in the Sustainable Yield of the overall Tule Subbasin.

Canal Losses from Deer Creek Diversions

It is assumed that canal losses from delivery of native Deer Creek water to riparian landowners and farmers occur only within the PID GSA. The methodology to estimate canal losses within the PID GSA is described above.

Canal losses from diverted Deer Creek water are not included in the Sustainable Yield of the overall Tule Subbasin.

Canal Losses from Imported Water Deliveries

With the exception of canal losses within the Angiola Water District and Porterville Irrigation District, it is assumed that imported water that infiltrates into the subsurface in the Tule River channel, Deer Creek channel and unlined canals is grouped together. Within the Angiola Water District and Porterville Irrigation District, canal losses are accounted for in the portion of the water budget that addresses deep percolation of applied water (see Section 3.7.1.1.2.5). For the Tule River, canal losses are estimated as follows:

$$LTRID_{Total\ Losses} - TR_{Native\ Inf\ Loss} = LTRID_{Imp\ Can\ Loss}$$

Where:

$LTRID_{Total\ Losses}$	=	Total losses reported in LTRID annual water use summaries (acre-ft).
$TR_{Native\ Inf\ Loss}$	=	Native Tule River channel infiltration losses (acre-ft).
$LTRID_{Imp\ Can\ Loss}$	=	Canal losses attributed to imported water in the LTRID (acre-ft).

For Deer Creek, canal losses are estimated as follows:

$$Pixley_{Total\ Losses} - DC_{Native\ Inf\ Loss} = Pixley_{Imp\ Can\ Loss}$$

Where:

$Pixley_{Total\ Losses}$	=	Total losses reported in Pixley Irrigation District annual water use summaries (acre-ft).
$DC_{Native\ Inf\ Loss}$	=	Native Deer Creek channel infiltration losses (acre-ft).
$Pixley_{Imp\ Can\ Loss}$	=	Canal losses attributed to imported water in the Pixley Irrigation District (acre-ft).

Canal losses resulting from delivery of imported water are not included in the Sustainable Yield of the overall Tule Subbasin.

3.7.2.2.4 *Managed Recharge in Basins*

Managed Recharge of Tule River Diversions

Native Tule River water is diverted to basins for recharge by Pioneer Water Company, Campbell and Moreland Ditch Company, Vandalia Water District, Porterville Irrigation District, and LTRID.

All of the water diverted by Campbell and Moreland Ditch Company and Vandalia Water District (ETGSA) is native Tule River flow and is assumed to be delivered to basins. The native Tule River water diverted by these agencies is reported in TRA annual reports. Native Tule River water diverted to basins by Pioneer Water Company and Porterville Irrigation District will be provided by those agencies.

Monthly total water deliveries to basins in the LTGSA are reported in LTRID annual water use summary reports. The total deliveries include both native Tule River water and imported water from the Friant-Kern Canal. The basin recharge attributable to native Tule River water downstream of Oettle Bridge will be reported as follows:

$$\frac{TR_{Gaged}}{TR_{Gaged} + FK}\ x\ LTRID_{Total\ Basin\ Rech} = TR_{Basin\ Rech}$$

Where:

TR_{Gaged}	=	Sum of gaged flow at Below Oettle Bridge, Woods Central Diversion, Poplar Irrigation Company flow reaching LTRID, and Porter Slough at 192 (acre-ft).
FK	=	Imported water delivered to the LTRID from the Friant Kern Canal (acre-ft).
$LTRID_{Total\ Basin\ Rech}$	=	Total LTRID basin recharge from annual water use summaries (acre-ft).
$TR_{Basin\ Rech}$	=	Basin recharge in LTRID attributed to native Tule River water (acre-ft).

Managed recharge of diverted native Tule River water is not included in the Sustainable Yield of the overall Tule Subbasin.

Managed Recharge of Deer Creek Diversions

Artificial recharge (i.e. recharge in basins) of diverted Deer Creek streamflow is accomplished via multiple recharge facilities. Native Deer Creek water is diverted to basins for recharge by Pixley Irrigation District and DCTRA. It is acknowledged that the Pixley Irrigation District diversions are limited to the rights of the riparians within the District. The amount of the water right is subject to discussion. Basin recharge attributed to native Deer Creek water is estimated using the following equation:

$$\frac{DC_{Gaged}}{DC_{Gaged} + FK}\ x\ Pixley_{Total\ Basin\ Rech} = DC_{Basin\ Rech}$$

Where:

DC_{Gaged}	=	Gaged flow through Trenton Weir (acre-ft).
FK	=	Imported water delivered to the Pixley Irrigation District from the Friant-Kern Canal (acre-ft).
$Pixley_{Total\ Basin\ Rech}$	=	Total Pixley Irrigation District basin recharge from annual water use summaries (acre-ft).
$DC_{Basin\ Rech}$	=	Basin recharge in Pixley Irrigation District attributed to native Deer Creek water (acre-ft).

Managed recharge of diverted Deer Creek water is not included in the Sustainable Yield of the overall Tule Subbasin.

Managed Recharge of Imported Water

Managed recharge of imported water is accomplished via multiple recharge facilities within the Porterville Irrigation District, LTRID, Pixley Irrigation District, Tea Pot Dome Water District and DEID. Managed recharge attributed to imported water in the LTRID is estimated as follows:

$$\frac{FK}{TR_{Gaged} + FK}\ x\ LTRID_{Total\ Basin\ Rech} = LTRID_{Imp\ Basin\ Rech}$$

Where:

TR_{Gaged}	=	Sum of gaged flow at Below Oettle Bridge, Woods Central Diversion, Poplar Irrigation Company flow reaching LTRID, and Porter Slough at 192 (acre-ft).
FK	=	Imported water delivered to the LTRID from the Friant Kern Canal (acre-ft).
$LTRID_{Total\ Basin\ Rech}$	=	Total LTRID basin recharge from annual water use summaries (acre-ft).
$LTRID_{Imp\ Basin\ Rech}$	=	Basin recharge in LTRID attributed to imported water (acre-ft).

Managed recharge of imported water in the Pixley Irrigation District is estimated as follows:

$$\frac{FK}{DC_{Gaged} + FK}\ x\ Pixley_{Total\ Basin\ Rech} = Pixley_{Imp\ Basin\ Rech}$$

Where:

DC_{Gaged}	=	Gaged flow through Trenton Weir (acre-ft).
FK	=	Imported water delivered to the Pixley Irrigation District from the Friant Kern Canal (acre-ft).
$Pixley_{Total\ Basin\ Rech}$	=	Total Pixley Irrigation District basin recharge from annual water use summaries (acre-ft).
$Pixley_{Imp\ Basin\ Rech}$	=	Basin recharge in Pixley Irrigation District attributed to imported water (acre-ft).

Imported water delivered to recharge in basins for DEID, Porterville Irrigation District and Tea Pot Dome Water District will be provided by each district.

Managed recharge of imported water is not included in the Sustainable Yield of the overall Tule Subbasin.

Recharge of Recycled Water in Basins

Most of the recycled water generated by the City of Porterville is used for agricultural irrigation. From time to time, some of the recycled water is delivered to basins in the Old Deer Creek Channel where it infiltrates into the subsurface to become groundwater recharge. Basin recharge of recycled water will be based on data provided by the City of Porterville. Managed recharge of recycled water in basins is not included in the Sustainable Yield of the overall Tule Subbasin.

3.7.2.2.5 *Deep Percolation of Applied Water*

Deep Percolation of Applied Tule River Diversions

Deep percolation of applied Tule River water for irrigating agriculture will be applied to the various land uses in the Tule Subbasin according to the irrigation method (e.g. drip irrigation, flood irrigation, micro sprinkler, etc.) for each land use type reported in DWR on-line land use maps. Irrigation efficiencies will be applied to the different irrigation methods based on tables reported in California Energy Commission (2006)[3].

Tule River water is diverted for agricultural irrigation by the Pioneer Water Company, Porter Slough Headgate, Porter Slough Ditch Company, Campbell and Moreland Ditch Company, Vandalia Water District, Hubbs and Miner Ditch Company, Poplar Irrigation Co., Woods Central Ditch Company, Porter Slough Below 192, and Below Oettle Bridge. Application of the appropriate deep percolation rate will depend on the crop types receiving native Tule River water and the associated irrigation methods. In the LTGSA, estimation of the volume of applied water attributed to native Tule River water is based on the following:

[3] California Energy Commission, 2006. PIER Project Report: Estimating Irrigation Water Use for California Agriculture: 1950s to Present. May 2006.

$$\frac{TR_{Gaged}}{TR_{Gaged} + FK} \; x \; LTRID_{Total\ Deliveries} = TR_{App\ Water}$$

Where:

TR_{Gaged}	=	Sum of gaged flow at Below Oettle Bridge, Woods Central Diversion, Poplar Irrigation Company flow reaching LTRID, and Porter Slough at 192 (acre-ft).
FK	=	Imported water delivered to the LTRID from the Friant Kern Canal (acre-ft).
$LTRID_{Total\ Deliveries}$	=	Total LTRID deliveries (i.e. "Sales") from annual water use summaries (acre-ft).
$TR_{App\ Water}$	=	Volume of applied native Tule River water in the LTRID (acre-ft).

Deep percolation is calculated as the applied water ($TR_{App\ Water}$) multiplied by the appropriate percent deep percolation depending on the crop type receiving the water and the associated irrigation method.

Deep percolation of applied native Tule River water is not included in the Sustainable Yield of the overall Tule Subbasin.

Deep Percolation of Applied Deer Creek Diversions

The portion of native Deer Creek water delivered for agricultural use within the PIXID GSA is estimated using the following equation:

$$\frac{DC_{Gaged}}{DC_{Gaged} + FK} \; x \; Pixley_{Total\ Deliveries} = DC_{App\ Water}$$

Where:

DC_{Gaged}	=	Gaged flow through Trenton Weir (acre-ft).
FK	=	Imported water delivered to the Pixley Irrigation District from the Friant Kern Canal (acre-ft).
$Pixley_{Total\ Deliveries}$	=	Total Pixley Irrigation District deliveries (i.e. "Sales") from annual water use summaries (acre-ft).
$DC_{App\ Water}$	=	Applied water in Pixley Irrigation District from native Deer Creek River water (acre-ft).

Deep percolation is estimated as the applied water ($DC_{App\ Water}$) multiplied by the appropriate percent deep percolation depending on the crop type receiving the water.

Deep percolation of applied native Deer Creek water is not included in the Sustainable Yield of the overall Tule Subbasin.

Deep Percolation of Applied Imported Water

Deep percolation of imported water delivered and applied to crops within the LTGSA is based on the following equation:

$$\frac{FK}{TR_{Gaged} + FK}\ x\ LTRID_{Total\ Deliveries} x\ DP_{Factor} = DP_{LTRID\ FK}$$

Where:

TR_{Gaged}	=	Sum of gaged flow at Below Oettle Bridge, Woods Central Diversion, Poplar Irrigation Company flow reaching LTRID, and Porter Slough at 192 (acre-ft).
FK	=	Imported water delivered to the LTRID from the Friant Kern Canal (acre-ft).
$LTRID_{Total\ Deliveries}$	=	Total LTRID deliveries (i.e. "Sales") from annual water use summaries (acre-ft).
DP_{Factor}	=	Deep percolation factor that varies from 0.06 to 0.33 depending on the type of crop receiving the imported water (see Section 3.7.1.1.2.3.4) (unitless).
$DP_{LTRID\ FK}$	=	Deep percolation of imported water applied to crops in the LTRID (acre-ft).

Deep percolation of imported water delivered and applied to crops within the PIXID GSA is based on the following equation:

$$\frac{FK}{DC_{Gaged} + FK}\ x\ Pixley\ ID_{Total\ Deliveries} x\ DP_{Factor} = DP_{Pixley\ ID\ FK}$$

Where:

DC_{Gaged}	=	Deer Creek at Trenton Weir (acre-ft).
FK	=	Imported water delivered to the Pixley ID from the Friant Kern Canal (acre-ft).
Pixley $ID_{Total\ Deliveries}$	=	Total Pixley ID deliveries (i.e. "Sales") from annual water use summaries (acre-ft).
DP_{Factor}	=	Deep percolation factor that varies from 0.06 to 0.33 depending on the type of crop receiving the imported water (see Section 3.7.1.1.2.3.4) (unitless).
$DP_{Pixley\ ID\ FK}$	=	Deep percolation of imported water applied to crops in Pixley Irrigation District (acre-ft).

Deep percolation of imported water delivered and applied to crops in DEID, Porterville Irrigation District, Saucelito Irrigation District, Tea Pot Dome Water District, Alpaugh Irrigation District, Angiola Water District, and Atwell Island Water District shall be estimated as the delivered water, minus water delivered to basins, multiplied by the appropriate percent deep percolation factor.

Deep percolation of applied imported water is not included in the Sustainable Yield of the overall Tule Subbasin.

Deep Percolation of Applied Recycled Water

Deep percolation of recycled water applied to crops will be estimated using the deep percolation factors described earlier in this section. Deep percolation of applied recycled water is not included in the Sustainable Yield of the overall Tule Subbasin.

Deep Percolation of Applied Native Groundwater for Agricultural Irrigation

The balance of agricultural irrigation demand not met by imported water or stream diversions is assumed to be met by groundwater pumping. Groundwater extraction will be calculated based on the methods described in Section 3.3. Deep percolation of applied water from groundwater pumping will be based on the types of crops on which the water is applied and will be calculated using the deep percolation factors discussed earlier in this section. Deep percolation of applied water from agricultural groundwater pumping is included in the Sustainable Yield of the overall Tule Subbasin.

Deep Percolation of Applied Native Groundwater for Municipal Irrigation

Deep percolation of applied water for landscape irrigation was estimated for the urbanized portions of the Tule Subbasin. All municipal water demand is met from groundwater pumping. For the City of Porterville, landscape irrigation was estimated to be 47 percent of the total water delivered to each home based on an analysis of the total groundwater production and influent flows to the wastewater treatment plant (City of Porterville draft Urban Water Management Plan 2010 Update, 2014). Of the water used for irrigation, 25 percent is assumed to become deep percolation and groundwater recharge. Deep percolation of applied water from municipal groundwater pumping is included in the Sustainable Yield of the overall Tule Subbasin.

For the other smaller communities in the Tule Subbasin, wastewater discharge is assumed to be through individual septic systems. For water discharged to septic systems, it is assumed that 100 percent of the discharge becomes deep percolation and groundwater recharge. As with the City of Porterville, 47 percent of total water use was assumed to be for landscape irrigation and 25 percent of the landscape irrigation is assumed to become deep percolation.

3.7.2.2.6 *Evapotranspiration*

Evapotranspiration of Precipitation from Crops and Native Vegetation

Evapotranspiration (ET) is the loss of water to the atmosphere from free-water evaporation, soil-moisture evaporation, and transpiration by plants. Evapotranspiration of precipitation is assumed to be the difference between total precipitation (Section 3.7.1.1.1.1) and areal recharge from precipitation (Section 3.7.1.1.2.1). This value includes evapotranspiration of precipitation from crops as well as native vegetation.

Evapotranspiration of Surface Water Within the Tule River Channel

Evapotranspiration of surface water within the Tule River channel is a function of the ET rate and wetted channel surface area. The ET rate was based on published data for riparian vegetation in an intermittent stream and applied to channel segments with similar average width based on aerial photographs (Google Earth). The ET rate was applied to the surface area of each reach to obtain an estimate of ET. The sum of reach by reach ET estimates between Lake Success and the western Tule Subbasin boundary represents the total Tule River ET.

Evapotranspiration of Surface Water Within the Deer Creek Channel

Evapotranspiration within the Deer Creek channel was estimated using the same methodology as described for the Tule River Channel.

Evapotranspiration of Surface Water Within the White River Channel

Evapotranspiration in the White River channel was estimated using the same methodology as described for the Tule River Channel.

Evapotranspiration of Recycled Water in Basins

Evapotranspiration of recycled water delivered to basins will be provided by the City of Porterville.

Agricultural Consumptive Use

Crop consumptive use may be estimated using one of the methods described in Section 3.3.1.

Municipal Consumptive Use

Consumptive use of landscaping associated with applied municipal groundwater pumping will be estimated based on the methods described in Section 3.5.1.2.2.

3.7.2.2.7 *Surface Water Flow Out of the Subbasin*

Tule River

Any residual stream flow in the Tule River that reaches the Turnbull Weir, located at the west (downstream) end of the Tule Subbasin, is assumed to flow out of the subbasin. Outflow through the Turnbull Weir is documented in the TRA annual reports. Exports of Tule River water to the Friant-Kern Canal will be the same as reported in TRA annual reports.

Deer Creek

During periods of above-normal precipitation, residual stream flow left in the Deer Creek after diversions has historically flowed into Homeland Canal, located at the west end of the Tule Subbasin. The data for this outflow is currently unavailable. As this data becomes available, it will be incorporated into the surface water budget.

3.7.3 Groundwater Budget

The groundwater budget describes the sources and estimates the volumes of groundwater inflow and outflow within the Tule Subbasin. The difference between the sum of inflow terms and the sum of outflow terms is the change in groundwater storage (ΔS). A fundamental premise of the groundwater budget is the following relationship:

Inflow – Outflow = +/- ΔS

Sources of recharge (inflow terms) in the groundwater budget include:

1. Areal recharge from precipitation.
2. Recharge within stream and river channels.
3. Managed recharge in basins.
4. Canal infiltration.
5. Deep percolation of applied municipal and agricultural irrigation.
6. Release of water from compression of aquitards.
7. Subsurface inflow.
8. Mountain-Front Recharge.

It is noted that many of the groundwater inflow terms are surface water outflow terms. The groundwater budget includes the following sources of discharge (outflow terms):

1. Municipal groundwater pumping.
2. Agricultural groundwater pumping.
3. Groundwater pumping for export out of the subbasin.
4. Evapotranspiration.
5. Subsurface outflow.

3.7.3.1 *Sources of Recharge*

3.7.3.1.1 *Areal Recharge*

Groundwater recharge from precipitation falling on the valley floor in the Tule Subbasin will be estimated for each GSA as described in Section 3.7.1.1.2.1. Areal recharge of the groundwater system from precipitation is included in the Sustainable Yield of the overall Tule Subbasin.

3.7.3.1.2 *Tule River*

Groundwater recharge of native Tule River water occurs as streambed infiltration, infiltration of water in unlined canals, recharge in basins, and deep percolation of applied water.

The methods for estimating the volumes of Tule River water that become groundwater recharge are described in Section 3.7.1.1.2.

3.7.3.1.3 *Deer Creek*

Groundwater recharge of native Deer Creek water occurs as streambed infiltration, canal loss, recharge in basins, and deep percolation of applied water. The methods for estimating the volumes of Deer Creek water that become groundwater recharge are described in Section 3.7.1.1.2.

3.7.3.1.4 *White River*

Groundwater recharge of White River water occurs as streambed infiltration as described in Section 3.7.1.1.2.

3.7.3.1.5 *Imported Water Deliveries*

Groundwater recharge of imported water occurs as canal loss, recharge in basins, and deep percolation of applied water as described in Section 3.7.1.1.2.

3.7.3.1.6 *Recycled Water*

Groundwater recharge of recycled water occurs as artificial recharge and deep percolation of applied water as described in Section 3.7.1.1.2.

3.7.3.1.7 *Deep Percolation of Applied Water from Groundwater Pumping*

A portion of irrigated agriculture and municipal applied water from groundwater pumping becomes deep percolation and groundwater recharge as described in Sections 3.7.1.1.2.8.1 and 3.7.1.1.2.8.2.

3.7.3.1.8 *Release of Water from Compression of Aquitards*

As land subsidence due to groundwater withdrawal is considered an undesirable result, the ultimate goal of the Tule Subbasin TAC is to reduce it to de minimis levels. In the meantime, in order to produce a representative water balance, the volume of water released to the aquifer as a result of subsidence can be estimated using the methods described in Section 3.8.

3.7.3.1.9 *Subsurface Inflow*

The subsurface inflow and outflow along the southern, western and northern boundaries of the Tule Subbasin as well as the internal boundaries between each GSA will be evaluated as needed using either of the following methodologies:

Flow Net Analysis

A flow net analysis is applied to groundwater elevation contours developed for both the shallow and deep aquifers. The groundwater elevation contours will be based on measured groundwater levels at designated monitoring wells with perforations specific to each aquifer. After developing the groundwater contours, flow lines that are perpendicular to the groundwater elevation contours will be equally spaced along the boundary of the Subbasin or GSA.

For the shallow aquifer, which is conceptualized as being unconfined, subsurface inflow/outflow will be estimated using the Dupuit Equation, which is expressed as:

$$Q = 0.5K\left(\frac{(h_1 - h_2)^2}{L}\right)$$

Where:

Q	=	Subsurface flow, (acre-ft)
K	=	Hydraulic Conductivity, (ft/day)
h_1	=	Initial Hydraulic head, (ft amsl)
h_2	=	Ending Hydraulic head, (ft amsl)
L	=	Flow Length (ft)

For the deep aquifer, which is conceptualized as being semi-confined/confined, subsurface inflow/outflow will be estimated using the Darcy Equation, which is expressed as:

$$Q = KA\left(\frac{dh}{dl}\right)$$

Where:

Q	=	Subsurface flow, (acre-ft)
K	=	Hydraulic Conductivity, (ft/day)
A	=	Aquifer Cross-Sectional Area, (ft^2)
$\frac{dh}{dl}$	=	Hydraulic gradient

As the groundwater flow lines into and out of the subbasin/GSA may not occur at right angles to the subbasin/GSA boundary, it will be necessary to correct the subsurface flow by the angle (degrees) of the flow line relative to the basin boundary. This will be conducted by multiplying the subsurface inflow value by the sine of the angle of flow relative to the boundary.

Groundwater Flow Model

TH&Co has prepared a calibrated groundwater flow model of the Tule Subbasin. The model is capable of calculating the subsurface inflow and outflow to/from the subbasin boundaries and/or each GSA boundary. In order to develop updated subsurface inflow/outflow values for the water budget, the model will be updated annually with groundwater extractions, recharge values, and groundwater levels. The model calibration will be validated with the measured data and adjusted periodically. Once the updated model is validated, it can be used to estimate the subsurface inflow/outflow at each subbasin boundary and each GSA boundary.

3.7.3.1.10 *Mountain-Front Recharge*

Mountain-front recharge represents the infiltration of precipitation into the fractures in the bedrock east of the Tule Subbasin, which eventually flows into the alluvial aquifer system in the subsurface where the fractured rock aquifer system is in hydrologic communication with the alluvial aquifer system. Estimates of mountain-block recharge will be developed using the calibrated groundwater flow model.

3.7.3.2 *Sources of Discharge*

3.7.3.2.1 *Municipal Groundwater Pumping*

Groundwater pumping data for municipal supply is metered and will be provided by the individual cities within the Tule Subbasin, as described in Section 3.7.1.1.1.5

3.7.3.2.2 *Agricultural Groundwater Pumping*

Agricultural groundwater production will be estimated as described in Section 3.3.

3.7.3.2.3 *Groundwater Pumping for Export Out of the Tule Subbasin*

The volume of groundwater that is pumped and exported out of the subbasin on a quarterly basis will be provided by Angiola Water District and the Boswell/Creighton Ranch.

3.7.3.2.4 *Subsurface Outflow*

The subsurface outflow at the Tule Subbasin boundaries and/or GSA boundaries will be estimated using one of the methods described in Section 3.7.1.2.1.9.

3.7.4 Quality Assurance and Control

The water budget will be completed and updated by each GSA using professionals working under the direct supervision of a California Registered Professional Civil Engineer, Professional Geologist, or Certified Hydrogeologist. All GSA water budgets will be subject to review by the Tule Subbasin TAC's technical consultant.

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IV. Sustainable Management Criteria (§357.4(b)(3)(C))

Pursuant to 23 Cal. Code Regs. §357.4(b)(3)(C), the coordination agreement shall describe how the GSAs have used the same data and methodologies for estimating sustainable yield for the basin. The description shall be supported by a description of undesirable results for the basin, and an explanation of how the minimum thresholds and measurable objectives defined by each Plan relate to those undesirable results, based on information described in the basin setting.

4.1 Introduction (Reg. § 354.22)

Pursuant to 23 Cal. Code Regs. §354.22, this Chapter describes criteria that constitute sustainable groundwater criteria for the Tule Subbasin, including its sustainability goal and the characterization and definition of undesirable results for each applicable sustainability indicator.

4.2 Sustainability Goal (§ 354.24)

Pursuant to 23 Cal. Code Regs. §357.24, the Sustainability Goal of the Tule Subbasin is defined as the absence of undesirable results, accomplished by 2040 and achieved through a collaborative, Subbasin-wide program of sustainable groundwater management by the various Tule Subbasin GSAs.

Achievement of this goal will be accomplished through the coordinated effort of the Tule Subbasin GSAs in cooperation with their many stakeholders. It is further the goal of the Tule Subbasin GSAs that coordinated implementation of their respective GSPs will achieve sustainability in a manner that facilitates the highest degree of collective economic, societal, environmental, cultural, and communal welfare and provides all beneficial uses and users the ability to manage the groundwater resource at least cost. Moreover, this coordinated implementation is anticipated to ensure that the sustainability goal, once achieved, is also maintained through the remainder of the 50-year planning and implementation horizon, and well thereafter.

In achieving the Sustainability Goal, these GSPs are intended to balance average annual inflows and outflows of water by 2040 so that negative change in storage does not occur after 2040, with the ultimate goal being avoidance of undesirable results caused by groundwater conditions throughout the Subbasin. The stabilization of change in storage should also drive stable groundwater elevations, which, in turn, works to inhibit water quality degradation and arrest land subsidence.

4.2.1 Sustainable Yield

Chapter 2.3.2.6 of the *Tule Subbasin Setting* estimates the projected Sustainable Yield for the Tule Subbasin to be approximately 130,000 acre-ft/yr (see ***Table 2-4,*** *Tule Subbasin Setting*).

The term "Sustainable Yield" for the purposes of SGMA and GSPs developed under SGMA is defined by Water Code §107219(w) as: "*the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any* *temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.*"

Within the Tule Subbasin, the Sustainable Yield includes the natural channel losses in the natural streams, precipitation, subsurface inflow and subsurface outflow, mountain front subsurface inflow, and return flow of applied water not subject to recapture (by virtue of a Water Right). The components not included in the estimate of the Tule Subbasin's Sustainable Yield is described below from the Tule Subbasin Setting:

"It is noted that sources of groundwater recharge in the subbasin that are associated with pre-existing water rights and/or imported water deliveries are not included in the Sustainable Yield estimate. These recharge sources include:

Diverted Tule River water canal losses, recharge in basins, and deep percolation of applied water, Diverted Deer Creek water canal losses, recharge in basins, and deep percolation of applied water, Imported water canal losses, recharge in basins, and deep percolation of applied water, and Recycled water deep percolation of applied water and recharge in basins." (Tule Subbasin Setting)

The sources of groundwater recharge that are not included in the Subbasin Sustainable Yield calculations are intended to be accounted for by each GSA.

As noted above, for purposes of establishing the water budget pursuant to 23 Cal. Code Regs. §354.18, the GSAs in the Tule Subbasin have agreed that the Sustainable Yield for the Subbasin shall be divided amongst the GSAs for purposes of development of their GSPs as described in the attached water budget (**Attachment 2**). The basin-wide portion of the Sustainable Yield identified in the water budget was divided amongst each GSA by multiplying that GSA's proportionate areal coverage of the Tule Subbasin times the total Subbasin Sustainable Yield.

The water budget, as divided amongst the GSAs, is not an allocation or final determination of any water rights (including without limitation any claimed appropriative or prescriptive rights). This understanding is consistent with § 10720.5(b) of SGMA, which provides that nothing in SGMA or in a plan adopted under SGMA determines or alters surface or groundwater rights under common law or any provision of law that determines or grants water rights. Rather, for practical reasons and in keeping with SGMA limitations with respect to determining water rights and the statutory deadlines for GSP submittal, the use of the proportional acreage basis for dividing up the water budget among the Tule Subbasin GSAs, was used because it represents the most readily-available and implementable manner of accounting for the water budget for GSA-specific GSP preparation purposes at this time.

The GSAs will be collecting additional data during the GSP implementation period and will consider refining or changing the method of dividing Sustainable Yield for water budget purposes in future GSP updates. The division of Sustainable Yield among the GSAs under this Coordination Agreement does not constitute any determination that groundwater extractions within a GSA in excess of a budgeted amount would necessarily cause an undesirable result or that extractions less than a budgeted amount would necessarily not cause an undesirable result. The water budget division also does not require any GSA to implement particular projects or management actions.

4.3 <u>Undesirable Results (Reg. § 354.26)</u>

Pursuant to 23 Cal. Code Regs. §357.26, the GSAs agree on the following processes and criteria to define undesirable results applicable to the Subbasin. Undesirable Results are caused by groundwater conditions occurring throughout the basin that, for any sustainability indicator, are considered significant and unreasonable. These conditions, or sustainability indicators, include:

- Chronic lowering of groundwater levels indicating a depletion of supply if continued over the planning and implementation horizon;
- Reduction of groundwater storage;
- Seawater intrusion;
- Degraded water quality, including the migration of contaminant plumes that impair water supplies;
- Land subsidence that substantially interferes with surface land uses; and
- Depletions of interconnected surface water that have adverse impacts on beneficial uses.

The Tule Subbasin GSAs have evaluated the potential for each of these groundwater conditions and have established common criteria wherein, if any such significant and unreasonable conditions were to become present, they would constitute an undesirable result within the GSA.

There are four groundwater conditions with sustainability indicators that may have potential to cause significant and unreasonable effects within the Tule Subbasin. These conditions are:

- Chronic lowering of groundwater levels indicating a depletion of supply if continued over the planning and implementation horizon;
- Reduction of groundwater storage;
- Degraded water quality, including the migration of contaminant plumes that impair groundwater supplies; and
- Land subsidence that substantially impacts critical infrastructure.

The undesirable results and measurement methodology for each sustainability indicator are defined below.

4.3.1 <u>Chronic Lowering of Groundwater Levels</u>

4.3.1.1 *<u>Causes of Groundwater Conditions That Could Lead to Undesirable Results (§354.26(b)(1))</u>*

Pursuant to 23 Cal. Code Regs. §354.26(b)(1), chronic lowering of groundwater levels occurs when groundwater pumping exceeds the available recharge of the basin over a prolonged period. The GSAs within the Subbasin have defined the Undesirable Result for groundwater levels to be significant and unreasonable if there is basin-wide loss of well pumping capacity, which cannot be remedied.

Projects and management actions will be implemented by each GSA in order to decelerate and arrest chronic lowering of local groundwater levels within the Tule Subbasin by 2040.

4.3.1.2 *Criteria to Define Undesirable Results (§354.26(b)(2))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(2), the criteria for an undesirable result for the chronic lowering of groundwater levels is defined as the unreasonable lowering of the groundwater elevation below the minimum threshold for two consecutive years at greater than 50% of GSA Management Area RMS Sites, which results in significant impacts to groundwater supply.

Measurement Methodology: Utilize Groundwater Elevations, as determined by measuring depth to groundwater at representative monitoring sites according to the monitoring schedule outlined in **Attachment 1**.

4.3.1.3 *Potential Effects on Beneficial Uses and Users (§354.26(b)(3))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(3), generally, the avoidance of an undesirable result for the chronic lowering of groundwater levels is to protect unreasonable lowering of groundwater levels may effect groundwater users by causing well failures, additional operational costs for groundwater extraction from deeper pumping levels, and additional costs to lower pumps, deepen wells, or drill new wells.

Localized lowering of groundwater levels to the extent that an undesirable result is experienced may also affect other nearby monitoring areas, management areas, or GSAs to maintain groundwater levels above their minimum thresholds and/or prevent them from achieving their measurable objectives.

4.3.2 Reduction of Groundwater Storage

4.3.2.1 *Causes of Groundwater Conditions That Could Lead to Undesirable Results (§354.26(b)(1))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(1), chronic reduction of groundwater storage occurs when pumping exceeds the available recharge and subsurface inflows of the basin over a prolonged period. The Groundwater Level Minimum Threshold elevations across the GSA and subbasin were used to calculate the amount of groundwater in storage below the Minimum Thresholds to the base of the aquifer. An undesirable result would occur if the total amount of water in storage was less than the calculated amount of groundwater in storage below the Minimum Threshold.

Projects and management actions will be implemented by each GSA in order to decelerate and arrest chronic negative change in groundwater storage within the Tule Subbasin by 2040.

4.3.2.2 *Criteria to Define Undesirable Results (§354.26(b)(2))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(2), the criteria for an undesirable result for the reduction of groundwater storage is defined as the unreasonable reduction of Groundwater Storage below the minimum threshold for two consecutive years at greater than 50% of GSA Management Area RMS Sites, which results in significant reductions to groundwater storage.

Measurement Methodology: Utilize groundwater elevations, as determined by measuring depth to groundwater at representative monitoring sites, used to calculate the gross groundwater storage volume. The net groundwater storage volume will be calculated subtracting the gross groundwater storage volume from groundwater that has been banked from surface water supplies. The calculations will be completed each year per schedule in **Attachment 1**.

4.3.2.3 *Potential Effects on Beneficial Uses and Users (§354.26(b)(3))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(3), the avoidance of an undesirable result for the reduction of groundwater storage is to protect the similar effects of the chronic lowering of groundwater elevation summarized above.

4.3.3 Degraded Water Quality

4.3.3.1 *Causes of Groundwater Conditions That Could Lead to Undesirable Results (§354.26(b)(1))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(1), degraded water quality can occur for a variety of reasons, some reasons that are not applicable to SGMA implementation. An undesirable result would be the significant and unreasonable reduction in groundwater quality due to groundwater pumping and recharge projects such that the groundwater is no longer generally suitable for agricultural irrigation and domestic use. For the purposes of SGMA, degraded water quality causation will include those changes to groundwater quality caused by recharge or lowering of groundwater elevations.

Projects and management actions will be implemented by each GSA in order to decelerate and arrest the degradation of groundwater quality caused by recharge or lowering of groundwater elevations within the Tule Subbasin by 2040.

4.3.3.2 *Criteria to Define Undesirable Results (§354.26(b)(2))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(2), the criteria for an undesirable result for the degradation of groundwater quality is defined as the unreasonable long-term changes of groundwater quality above the minimum thresholds at greater than 50% of GSA Management Area RMS wells caused by groundwater pumping and/or groundwater recharge.

Measurement Methodology: Utilize Data collected by others (Public Water Systems, Irrigated Lands Regulatory Program, other Regulated Dischargers) at the RMS well sites identified in **Attachment 1**. Constituents of Concern (COC) to be established at each Groundwater Quality RMS well which will be determined based on Land Use Suitability (domestic water versus irrigated agriculture).

4.3.3.3 *Potential Effects on Beneficial Uses and Users (§354.26(b)(3))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(3), generally, the avoidance of an undesirable result for degraded groundwater quality is to protect the those using the groundwater, which varies depending on the use of the groundwater. The effects of degraded water quality caused by recharge or lowering of groundwater levels may impact crop growth or impact drinking water systems, both of which would cause additional expense of treatment to obtain suitable water.

4.3.4 Land Subsidence

4.3.4.1 *Causes of Groundwater Conditions That Could Lead to Undesirable Results (§354.26(b)(1))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(1), Land Subsidence occurs when there is prolonged dewatering of groundwater that causes subsequent compaction of water bearing formations composed of substantial thicknesses of fine-grained deposits. Land subsidence shall be considered significant and unreasonable if there is a loss of a functionality of a structure or a facility to the point that, due to subsidence, the structure or facility, such as the Friant-Kern Canal (FKC), cannot reasonably operate to meet contracted for water supply deliveries without either significant repair or replacement.

Projects and management actions will be implemented by each GSA in order to decelerate and eventually arrest land subsidence within the Tule Subbasin by 2040, including measures necessary to reduce or eliminate land subsidence significantly and unreasonably affecting the functionality or a structure or facility, such as the FKC.

4.3.4.2 *Criteria to Define Undesirable Results (§354.26(b)(2))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(2), the criteria for an undesirable result for land subsidence is defined as the unreasonable subsidence below minimum thresholds at greater than 50% of GSA Management Area RMS resulting in significant impacts to critical infrastructure. Individual GSAs may adopt more stringent criteria than that established in this section. The Parties to this Agreement hereby acknowledge the need to include an additional standard that an undesirable result will also occur if land subsidence in particularized areas within a given GSA causes significant and unreasonable adverse effects on the functionality of a structure or facility, such as the FKC, regardless of whether more than 50% of the GSA Management Area RMS locations indicate exceedance of the subsidence standard.

4.3.4.3 *Potential Effects on Beneficial Uses and Users (§354.26(b)(3))*

Pursuant to 23 Cal. Code Regs. §354.26(b)(3), the avoidance of an undesirable result of land subsidence is to protect critical infrastructure for the beneficial uses within the Tule Subbasin, including out of the ordinary costs to fix, repair, or otherwise retrofit such infrastructure beyond those which are expected or normal and may also result in an interim loss of benefits to the users of such infrastructure.

An exceedance of minimum thresholds to the extent that the undesirable result for the Tule Subbasin is experienced could likely induce financial hardship on land and property interests, such as the redesign of previously planned construction projects and the fixing and retrofitting of existing infrastructure.

4.3.5 Depletion of Interconnected Surface Waters (Regs. §354.26 (d) & §354.28 (e))

No interconnected surface waters have been identified in any Tule Subbasin GSAs as described more thoroughly in relevant portions of the Basin Setting. Thus, no criteria need be established.

4.3.6 Seawater Intrusion (Regs. §354.26 (d) & §354.28 (e))

Seawater intrusion is defined as "the advancement of seawater into a groundwater supply that results in degradation of water quality in the basin and includes seawater from any source." (23 Cal. Code Regs. §351(af).) As described more thoroughly in the basin setting, there is no potential for the advancement of seawater into any portion of the Tule Subbasin. Thus, no criteria need be established.

4.4 Minimum Thresholds (Reg. § 354.28)

Minimum Thresholds will be quantified at each RMS wells for each applicable sustainability indicator, defined as the numeric value, that if exceeded, may cause undesirable results. Each minimum threshold will be defined and described by each GSA in the GSP.

4.5 Measurable Objectives (Reg. § 354.30)

Measurable Objectives, including interim milestones in increments of five years, will be quantified at each RMS wells for each applicable sustainability indicator, defined as the numeric value in 2040, to achieve the sustainability goal in 20-year of plan implementation. Each measurable objective and interim milestones will be defined and described separately by each GSA in the GSP.

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V. MONITORING PROTOCOLS, NETWORKS, AND IDENTIFICATION OF DATA GAPS (§§352.2, 354.32.)

5.1 Monitoring Network and Representative Monitoring (§§354.34-354.36)

The minimum monitoring network to be used to collect data in the Tule Subbasin is described in the Tule Subbasin Monitoring Plan (see **Attachment 1**). The types of data to be collected as part of the plan include:

- Surface water flow
- Surface water quality
- Groundwater levels
- Groundwater quality
- Land surface elevation from Global Positioning System (GPS) stations
- Land surface elevation changes from satellite data
- Land subsidence data from extensometers

The monitoring plan ensures that the data collected within the subbasin is of sufficient quality, frequency and distribution to provide meaningful results for evaluating changing conditions within the subbasin and informing the decision-making process.

The minimum monitoring network identified in the Tule Subbasin Monitoring Plan is both flexible and iterative, allowing for the addition or subtraction of monitoring features, as necessary, and to accommodate changes in monitoring frequency and alternative methodologies, as appropriate. Any changes to the minimum monitoring network or monitoring protocols identified in **Attachment 1** shall be approved by the Tule Subbasin TAC.

Individual GSAs may include additional monitoring features, not specifically identified in the Tule Subbasin Monitoring Plan, for collecting data to include in their respective GSPs and annual reports. Any monitoring features utilized for the collection of data to be included in GSPs and annual reports that are not identified in the Tule Subbasin Monitoring Plan must meet the minimum design and construction requirements specified in Section 3 of this Coordination Agreement and the Tule Subbasin Monitoring Plan. Any monitoring features not in the Tule Subbasin Monitoring Plan that are to be used by a GSA to collect data for incorporation into GSPs or annual reports will be shared with the Tule Subbasin TAC.

5.1.1 Procedures for Collecting the Data

The Tule Subbasin Monitoring Plan (**Attachment 1**) includes detailed procedures for the collection of surface water flow data, groundwater elevation data, and land surface elevation data. Groundwater quality data will be coordinated with and through the Irrigated Lands Regulatory Program and the existing coalitions. The data collection procedures will ensure that the data collected have the level of accuracy and precision necessary for evaluating conditions relative to minimum thresholds, estimating change in groundwater storage as required for annual reports, and measuring progress toward achieving sustainability. The data collection processes and procedures shall apply to monitoring features specifically identified in the Tule Subbasin Monitoring Plan as well as any additional monitoring features utilized for the collection of data by individual GSAs.

5.1.2 Entities Responsible for Data Collection

All data collection work, as specified in the Tule Subbasin Monitoring Plan (**Attachment 1**) will be performed by each GSA through individuals working under the direct supervision of a California Registered Professional Civil Engineer, Professional Geologist, or Certified Hydrogeologist and who meet the minimum qualifications and training requirements required by the Tule Subbasin TAC's technical consultant. The collection of groundwater quality data will be coordinated with and through the Irrigated Lands Regulatory Program and the existing coalitions. All data will be collected in accordance with the protocols specified in **Attachment 1**.

Nothing in this Agreement prevents multiple GSAs from using the same consultant. It is understood by and among the Parties that there will be individual GSA-specific data that can be collected either through the Tule Subbasin TAC's technical consultant or through the consultant/staff hired by that GSA. The goal is that the data collection be done following the same processes and procedures throughout the Tule Subbasin. If a GSA prefers to use the technical consultant hired by the Tule Subbasin TAC for the purposes of collecting information beyond what is required for Tule Subbasin Monitoring Plan, then that GSA shall pay for the consultant's fees and costs separately and above what the Tule Subbasin GSAs agree to cost share. In the event that a GSA hires its own consultant for site or GSA-specific data collection, such data shall be shared through the data sharing provisions of this Agreement.

All data collected by the GSAs shall be submitted to the Tule Subbasin TAC's technical consultant in accordance with the schedule described in Section 4.1.3 for QA/QC and entry into the Tule Subbasin Water Management Database (see Section 4.3).

5.1.3 How and When Data are Distributed to the GSAs

The complete Tule Subbasin Water Management Database will be available to authorized representatives as set forth by the GSAs of the Tule Subbasin GSAs at any time upon request.

The schedule to distribute data to the individual GSAs for preparation of annual reports has been prepared to enable the Tule Subbasin TAC to submit the compiled annual reports by the SGMA reporting deadline of April 1 following a water year. As per Groundwater Sustainability Plan Regulations Section 356.2, annual reports will include data and analyses for the preceding water year (October 1 through September 30). The distribution of data to the GSAs for the preparation of annual reports will be in accordance with the following schedule:

- The Tule Subbasin TAC's technical consultant will update the database between October 1 and January 30 following a subject water year.
- Individual GSAs will be required to submit groundwater extractions (i.e. pumpage) to the technical consultant by January 1 following a subject water year.
- Following Quality Assurance/Quality Control checks by the technical consultant, the previous water year's data will be submitted to each GSA by February 1 so the

GSAs can prepare their respective annual reports. The data will be formatted for easy incorporation into annual reports and distributed electronically.

- Annual reports will be submitted to the Tule Subbasin TAC for compilation by March 1 following the preceding water year.
- All annual reports will be submitted to the California Department of Water Resources by April 1 following the preceding water year.

5.2 Assessment and Improvement of Monitoring Network and Identification of Data Gaps (§354.38.)

The Tule Subbasin TAC will periodically evaluate the monitoring network in **Attachment 1** to determine if there are data gaps that could affect the ability of the subbasin to meet its sustainability goals. Current data gaps are identified in **Attachment 1**. Every five years, the Tule Subbasin TAC will provide an evaluation of data gaps in the five-year assessment, including steps to be taken to address data gaps before the next five-year assessment.

5.3 Data Management System (DMS) (§357.4(e).)

Efficient data management will be a critical to ensure that each GSA can access the data needed to prepare their respective annual reports in a timely manner and to ensure that the Tule Subbasin TAC can meet deadlines for submittal of the coordinated reports. The Monitoring Plan, **Attachment 1**, describes the Tule Subbasin Water Management Database, the procedures for updating and maintaining the database, and protocols for database security, file access and reporting. Data to be managed will include:

A. Historical data used as a basis for preliminary estimates of the Water Budget and Sustainable Yield of the Tule Subbasin.
B. Data to be collected in accordance with the Tule Subbasin Monitoring Plan (**Attachment 1**).

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VI. IMPLEMENTATION OF GSPS (§357.4(c).)

Pursuant to 23 Cal. Code Regs. §357.24(c), the coordination agreement shall explain how the GSPs when implemented together satisfy the requirements of SGMA and are in substantial compliance with its regulations. SGMA requires the development and implementation of GSPs by GSAs to achieve sustainable groundwater management by 2040.

Throughout this Coordination Agreement, the Tule Subbasin GSAs have agreed upon various data and methodologies critical to understanding the hydrogeology of the Subbasin, and addressing and understanding what remedies are available to avoid undesirable results.

The GSAs within the Tule Subbasin will work together to implement their respective GSPs within the Tule Subbasin. The Tule Subbasin TAC, the technical advisory committee composed of representatives from each GSA, has developed Subbasin-wide data and methodologies for each of the following items, and made them available to each GSA to adopt and utilize in the development of its respective GSP:

- Groundwater elevation data.
- Groundwater extraction data.
- Surface water supply.
- Total water use.
- Change in groundwater storage.
- Water budget.
- Sustainable yield.

The GSAs understand there is local, site-specific data particular to each GSA and which each GSA may utilize in the development of its respective GSP in addition to the Subbasin-wide data. If an individual GSA has identified monitoring features for use in collecting data specific to its jurisdictional area and the features are not included in Section 3 or **Attachment 1** of this Coordination Agreement, then the GSA can incorporate the features and data into its GSP upon confirming that those particular monitoring features meet the minimum criteria specified in Section 3 and that the data has been collected in accordance with this Coordination Agreement.

Each GSA shall submit its respective GSP, and any updates thereto, to the Tule Subbasin TAC so that the other Tule Subbasin GSAs may review and comment prior to documents being submitted to DWR. Each GSA shall comply with 23 Cal. Code Regs. §354.10, regarding comments received on the GSP, and such GSP shall be made available on the GSA's website.

Each GSA acknowledges and agrees that it is responsible to ensure that its GSP complies with the statutory requirements of SGMA. The GSAs further acknowledge the obligation for each GSA to coordinate the implementation of their respective GSPs in order to, collectively, achieve the Sustainability Goal for the Subbasin, as required by SGMA.

Additionally, to better implement and refine the projects and management actions adopted in their respective GSPs, the GSAs are committed to work together on developing and maintaining a data management system and are implementing quality control and quality assurance measures to collect reliable GSA-specific and Subbasin-wide data to ensure Subbasin-wide Sustainability Goal is achieved.

The Tule Subbasin GSAs are committed to implementing their respective projects and management actions set forth in their respective GSPs for the purpose of reaching sustainability for the Subbasin by 2040. The GSAs are also committed to further refine and update their projects, management actions and GSPs in accordance with SGMA as more and better data becomes available.

In relation to subsidence, the Parties acknowledge that the technical understanding of projected subsidence effects post 2020 is still being developed at the time of GSP preparation, and that, in addition to monitoring and identifying where subsidence occurs, the GSAs will need to develop and implement projects and management actions to either prevent or mitigate for the undesirable results from post 2020 subsidence that is likely to occur as the subbasin works towards sustainability. The Parties acknowledge and agree that monitoring subsidence is an important first step and that it necessarily must be accompanied with projects and management actions to address the impacts of post 2020 subsidence levels, including consideration of actions such as the collection of mitigation fees to have the responsible party or entity bear their proportionate share of responsibility in relation to impacts reasonably attributable to such party or entity, which would require adherence to procedural and substantive standards under any applicable provisions of Proposition 218, Proposition 26 or other laws or regulations related to fees or penalties imposed by public agencies. Further, the Parties have begun to work with Friant Water Authority on the development of a Friant-Kern Canal mitigation program, potentially to include targeted pumping reductions and mitigation fees, to be imposed by GSAs within specific areas, based on an analysis of each GSA's likely proportional impact on post 2020 subsidence. The Parties to this Agreement agree to work diligently to develop an initial localized mitigation program based on the best available information related to the projected cause of post 2020 subsidence, with the intent to have said mitigation program effective upon or before the occurrence of any localized or basin wide subsidence undesirable result.

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VII. TULE SUBBASIN ORGANIZATIONAL STRUCTURE

7.1 Tule Subbasin Technical Advisory Committee

The Tule Subbasin TAC was previously formed under a Memorandum of Agreement executed by all Tule Subbasin GSAs. The Parties agree to the continued existence of the Tule Subbasin TAC pursuant to the terms below. The Tule Subbasin TAC is an advisory committee only and has no authority or power to bind any individual GSA to any recommendation or action item taken by its members.

Nothing in this Agreement is intended to affect the statutory powers granted under SGMA, or any other applicable law, to the Tule Subbasin GSAs. Each Tule Subbasin GSA shall be solely responsible for the adoption and enforcement of any ordinances, bylaws, or other legally enforceable actions taken within their respective GSA boundaries to implement SGMA, including, but not limited to, the preparation of the GSP applicable within their GSA boundaries. Each GSA agrees that as required by this Coordination Agreement, they shall utilize the same data and methodologies contained in this Coordination Agreement. The Parties understand there will be basin-wide data, in addition to certain local site-specific data collected and/or utilized by each GSA.

7.1.1 Members and Voting

A Tule Subbasin TAC shall be formed with one (1) representative appointed from each GSA, as well as one (1) alternate from each GSA. The Subbasin TAC shall make technical recommendations regarding the Coordination Agreement and other Tule Subbasin related SGMA compliance issues to each GSA. The Tule Subbasin TAC shall meet as necessary. Each GSA shall be entitled to one (1) vote. Recommendations to each GSA shall only be made upon consensus of the Tule Subbasin TAC. Should consensus not be reached, the votes shall be reported to each GSA Board for further direction. A quorum shall exist when five of the seven GSAs have representatives in attendance. The chairperson and secretary will not hold any separate voting rights on the Tule Subbasin TAC.

7.1.2 Consultants

The Parties agree that the Tule Subbasin TAC should obtain the services of consultants to facilitate the collection of data and the submission of information to the Tule Subbasin GSAs. Prior to hiring consultants, or approving scopes of work, the TAC shall obtain approval from the Tule Subbasin GSAs.

7.1.3 Legal Services

The Tule Subbasin TAC shall not retain independent legal services, unless agreed upon by all Parties hereto. Each Party shall be responsible for any legal fees incurred by its own counsel in the course of performing any legal work related to Subbasin matters.

7.1.4 Chairman and Secretary

A Chairman and Secretary shall be appointed to serve the Tule Subbasin TAC. The Chairperson shall be responsible for managing all Tule Subbasin TAC meetings, preparing agenda materials, managing consultants hired by the Tule Subbasin TAC, and coordinating the delivery of information between GSAs and Tule Subbasin TAC consultants. The Secretary shall be responsible for distributing Tule Subbasin TAC agenda materials to all Tule Subbasin GSAs and to all interested parties that request to be notified of Tule Subbasin TAC meetings, as well as ensuring compliance with all applicable legal requirements, including, but not limited to, the Ralph M. Brown Act. The Secretary shall also be responsible for record keeping of the Tule Subbasin TAC group, maintaining minutes of Tule Subbasin TAC meetings, maintaining copies of all executed agreements, maintaining copies of documents produced by consultants, and providing such information to individual Tule Subbasin GSAs upon request. The appointed Chairperson or Secretary may meet with Tule Subbasin GSAs or GSA member agency employees as necessary.

7.1.5 Meetings

All meetings shall be subject to the Ralph M. Brown Act. The Chairman and Secretary shall be responsible for ensuring compliance. Interested parties shall be provided an opportunity to comment on Coordination Agreement issues. Parties acknowledge the Tule Subbasin TAC duties may include public outreach.

7.1.6 Cost Sharing and Governance

Parties shall share on an equitable basis the costs related to the preparation of the data required for the Coordination Agreement to be drafted. Costs shall be allocated between GSAs based on the number of acres within a GSA.

Each Party to this Agreement shall be responsible for their respective share of costs based on their proportionate acreage within the Tule Subbasin. Through a separate agreement, the Tule Subbasin GSAs have appointed a fiscal agent and that fiscal agent shall have authority to enter into any contract necessary to assist with the preparation of the Coordination Agreement, subject to the direction and authorization of the Tule Subbasin TAC. The fiscal agent shall be responsible for invoicing the respective GSAs and for providing an accounting of all funds received and spent on behalf of the GSAs. The fiscal agent shall attend all Tule Subbasin TAC meetings but has no separate voting rights on the Tule Subbasin TAC.

The Tule Subbasin TAC shall annually prepare a schedule, scope of work, and budget of items required for the Coordination Agreement, which shall identify the estimated expenses and the estimated portions each respective Tule Subbasin GSA will be expected to be responsible for. This information shall be submitted to the GSAs for review and approval. The Tule Subbasin TAC may request funds under the approved budget from the GSAs as needed to reimburse the GSA's fiscal agent and may also request budget amendments.

The Parties agree that if grant funds become available for the Coordination Agreement components, then the Parties shall utilize grant funds to pay for those costs. The Parties agree to coordinate specific grant application requests by separate agreement. The Parties agree that grant funds shall be utilized based on the grant application budget and that if any grant funds are available for distribution to the GSAs, then the remaining grant funds shall be distributed based on GSA acreage within the Tule Subbasin.

7.1.7 Procedures for Timely Exchange of Information (§357.4(b)(2))

7.1.7.1 *Exchange of Information*

Pursuant to 23 Cal. Code Regs. §357.4(b)(2), the GSAs acknowledge and recognize that for this Coordination Agreement to be effective in the enhancement of the goals of basin-wide groundwater sustainability and compliance with the SGMA and the basin level coordinating and reporting regulations, the GSAs will have an affirmative obligation to exchange certain minimally necessary information among and between the other GSA Parties. Likewise, the GSA Parties acknowledge and recognize that individual GSA Parties, in providing certain information, and in particular certain raw data, may contend that limitations apply in the sharing and other dissemination of certain types of said information, which may subject the individual GSA Party to certain duties regarding non-disclosure and privacy restrictions and protections.

7.1.7.2 *Procedure Governing the Exchange of Information*

The GSAs may exchange information through collaboration and/or informal requests made at the Tule Subbasin TAC. To the extent it is necessary to make a written request for information to another GSA, each GSA shall designate a representative to respond to information requests and provide the name and contact information of the designee to the Tule Subbasin TAC. Requests may be communicated in writing and transmitted in person or by mail, facsimile machine or other electronic means to the appropriate representative as named in this Agreement.

Nothing in this Agreement shall be construed to prohibit any Party from voluntarily exchanging information with any other Party by any other mechanism separate from the Tule Subbasin TAC.

7.1.8 Procedures for Resolving Disputes Dispute Resolution (§§357.4(b)(2), 357.4(h))

The Parties agree that all disputes under this Coordination Agreement that concern the applicability and requirements of SGMA by or between GSAs within the Tule Subbasin, shall be handled under the terms of this Agreement. Any GSA may choose to initiate a dispute resolution process by serving written notice to the remaining GSAs of the following: (1) identification of the conflict; (2) description of how the conflict may negatively impact the sustainability of the Tule Subbasin; and (3) a proposal for one or more resolutions. The Parties agree to designate representatives to meet and confer with each other within thirty (30) days of the date such notice is given and said representatives shall then meet within a reasonable time to address all issues identified in the notice. Should the representatives be unable to reach a resolution within ninety (90) days of the written notice, the Parties shall enter into informal mediation in front of a mutually agreeable mediator. After attempting to settle or resolve a dispute or disagreement through informal resolution and mediation, as described above, nothing within this Agreement shall prevent the Parties from pursuing legal action. The resolution of any dispute or claim related to a water right alleged by a Party is outside the scope contemplated in this Section 7.1.8 and the Coordination Agreement.

7.2 Amendments to this Coordination Agreement

This Coordination Agreement shall become effective on the dates executed by all Parties and shall remain in effect until revised or replaced by a subsequent agreement. This Agreement may be amended upon the mutual written agreement of all the Parties. Pursuant to 23 Cal. Code Regs. §357.4(i), this Coordination Agreement shall be reviewed as part of the five-year assessment, revised if necessary, and executed by all parties.

7.3 Construction

This Agreement is for the sole benefit of the Parties and shall not be construed as granting rights to or imposing obligations on any person other than the Parties.

7.4 Good Faith

Each Party shall use its best efforts and work in good faith for the expeditious completion of the purposes and goals of this Agreement and the satisfactory performance of its terms.

7.5 Execution

This Agreement may be executed in counterparts and the signed counterparts shall constitute a single instrument. The signatories to this Agreement represent that they have the authority to sign this agreement and to bind the Party for whom they are signing.

7.6 Third Party Beneficiaries

This Agreement shall not create any right of interest in any non-Party or in any member of the public as a third-party beneficiary.

7.7 Notices

All notices, requests, demands or other communications required or permitted under this Agreement shall be in writing unless provided otherwise in this Agreement, and shall be deemed to have been duly given and received on: (i) the date of service if personally served or served by electronic mail or facsimile transmission on the Party to whom notice is to be given at the address(es) below; (ii) on the first day after mailing, if mailed by Federal Express, U.S. Express Mail, or other similar overnight courier service; or (iii) on the third day after mailing if mailed to the Party to whom notice is to be given by first class mail, registered certified as follows:

Alpaugh Groundwater Sustainability Agency
Attn: Bruce Howarth
P.O. Box 129
Alpaugh, CA 93201

Delano-Earlimart Irrigation District
Groundwater Sustainability Agency
Attn: Eric Quinley
14181 Avenue 24
Delano, CA 93215

Eastern Tule Groundwater Sustainability Agency
Attn: Rogelio Caudillo, Interim Executive Director
881 W. Morton Avenue, Suite D
Porterville, CA 93257

Lower Tule River Irrigation District GSA
Attn: Eric Limas
357 E. Olive Avenue
Tipton, CA 93272

Pixley Irrigation District GSA
Attn: Eric Limas
357 E. Olive Avenue
Tipton, CA 93272

Tri-County Water Authority GSA
Attn: Deanna Jackson
944 Whitley Avenue Suite E
Corcoran, CA 93212

County of Tulare
c/o Denise England
County Administration Building
2800 W. Burrel Avenue
Visalia, California 93291

7.8 No Waiver; No Admission

Nothing in this Coordination Agreement is intended to modify the water rights of any Party or of any Person (as that term is defined under Section 19 of the Water Code) . Nothing in this Coordination Agreement shall be construed as an admission by any Party regarding any subject matter of this Coordination Agreement, including without limitation any water right or priority of any water right that is claimed by a Party or any Person. Nor shall this Coordination Agreement in any way be construed to represent an admission by a Party with respect to the subject or sufficiency of another Party's claim to any water or water right or priority or defenses thereto, or to establish a standard for the purposes of the determining the respective liability of any Party or Person, except to the extent otherwise specified by law. Nothing in this Coordination Agreement shall be construed as a waiver by any Party of its election to at any time assert a legal claim or argument as to water, water right or any subject matter of this Coordination Agreement or defenses thereto. The Parties hereby agree that this Coordination Agreement, to the fullest extent permitted by law, preserves the water rights of each of the

Parties as they may exist as of the effective date of this Coordination Agreement or at any time thereafter. Any dispute or claim arising out of or in any way related to a water right alleged by a Party shall be separately resolved before the appropriate judicial, administrative or enforcement body with proper jurisdiction and is specifically excluded from the dispute resolution procedures set forth under this Coordination Agreement, including without limitation under Section 7.1.8.

7.9 It is understood and agreed that this Coordination Agreement supersedes that certain "Memorandum of Understanding to Develop and Implement a Coordination Agreement" and all oral agreements and negotiations between the Parties relating to the subject matter hereof.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement to be effective as of the date noted below.

[signature] Alpaugh Groundwater Sustainability Agency	01/23/20 Date
[signature] Delano Earlimart Irrigation District GSA	1/22/20 Date
[signature] Eastern Tule Groundwater Sustainability Agency	1-17-20 Date
[signature] Lower Tule River Irrigation District GSA	1/21/2020 Date
[signature] Pixley Irrigation District GSA	1-21-2020 Date
[signature] Tri-County Water Authority GSA	1-22-2020 Date
[signature] Tulare County GSA	1/22/20 Date

TULE SUBBASIN COORDINATION AGREEMENT ATTACHMENT 1

Tule Subbasin Monitoring Plan

January 2020

Prepared for
Tule Subbasin Technical Advisory Committee

Prepared by

Thomas Harder, PG, CHG
Principal Hydrogeologist

CERTIFIED HYDROGEOLOGIST • STATE OF CALIFORNIA •
THOMAS E. HARDER No: 588

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Monitoring Plan Appendices

Acronyms

GSP	Groundwater Sustainability Plan
SGMA	Sustainable Groundwater Management Act, California's framework for the recovery and ongoing management of groundwater basins. SGMA empowers local agencies to form Groundwater Sustainability Agencies (GSAs) to manage basins sustainably and requires those GSAs to adopt Groundwater Sustainability Plans (GSPs) for crucial groundwater basins in California.
DWR	Department of Water Resources
GSA	Groundwater Sustainability Agency
TAC	Technical Advisory Committee
TSMP	Tule Subbasin Monitoring Plan
DO	Dissolved Oxygen
EC	Electrical Conductivity
TDS	Total Dissolved Solids
QAPP	Quality Assurance Project Plan
USGS	United States Geological Society

USBR	United States Bureau of Reclamation
GPS	Global Positioning System
NGS	National Geodetic Survey
TRA	Tule River Association
ACOE	Army Core of Engineers
ILRP	Irrigated Lands Regulatory Program
DMS	Data Management System, an application with a database back-end that will track and manage the data of the end users as well as provide administrative
SQL	structured query language
End User/User	Person who will use the product, but not a member of staff, administration, or development team.
UI	User Interface, the part of the application that end users and staff interact with.

1.0 Background

This monitoring plan has been prepared to describe the monitoring features and monitoring methodologies to be used to collect the data to be included in Tule Subbasin Groundwater Sustainability Plans (GSPs) and annual reports, as required by the Sustainable Groundwater Management Act (SGMA). This plan is for the Tule Subbasin (see Figure A1-1), as described in California Department of Water Resources (DWR) Bulletin 118.[1] The Tule Subbasin is subdivided into six Groundwater Sustainability Agencies (GSAs), each with their own GSP.

As required by Section 10727.2 of the Water Code, each GSP must include:

(d) Components relating to the following, as applicable to the basin:

(1) The monitoring and management of groundwater levels within the basin.

(2) The monitoring and management of groundwater quality, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin.

(3) Mitigation of overdraft.

(4) How recharge areas identified in the plan substantially contribute to the replenishment of the basin.

(5) A description of surface water supply used or available for use for groundwater recharge or in-lieu use.

(e) A summary of the type of monitoring sites, type of measurements, and the frequency of monitoring for each location monitoring groundwater levels, groundwater quality, subsidence, streamflow, precipitation, evaporation, and tidal influence. The plan shall include a summary of monitoring information such as well depth, screened intervals, and aquifer zones monitored, and a summary of the type of well relied on for the information, including public, irrigation, domestic, industrial, and monitoring wells.

(f) Monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence, for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect

[1] DWR, 2016. Final 2016 Bulletin 118 Groundwater Basin Boundaries shapefile. http://www.water.ca.gov/groundwater/sgma/basin_boundaries.cfm

groundwater levels or quality or are caused by groundwater extraction in the basin. The monitoring protocols shall be designed to generate information that promotes efficient and effective groundwater management.

The Tule Subbasin Technical Advisory Committee (TAC) has determined that a single monitoring plan that includes the entire Tule Subbasin is necessary in order to identify the types of data to be collected throughout the subbasin, the minimum number of monitoring features from which to collect data, and the monitoring protocols to be followed by each GSA, in order to ensure that the same methodologies are followed as required by California Water Code Section 10727.6 of SGMA. This Tule Subbasin Monitoring Plan (TSMP) serves that purpose.

1.1 Plan Objectives 354.34 (b)

The TSMP has been prepared to meet the following subbasin-wide objectives:

- To ensure that the data collected within the basin are in sufficient quantities, areal distribution, frequency and accuracy to provide meaningful results for demonstrating progress toward achieving measurable objectives of each GSA and the sustainability goal of the subbasin as a whole.
- To monitor impacts to the beneficial uses and users of groundwater.
- To monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.
- Enable the quantification of annual changes in water budget components.
- To identify data gaps and monitoring features to address the data gaps.
- To provide a standard methodology for the collection of surface water, groundwater, and land surface subsidence data within the Tule Subbasin.
- To provide for a central, secure monitoring database available to the GSAs for their use in preparing their respective groundwater sustainability plans and annual reports.

The TSMP is both flexible and iterative, allowing for the addition or subtraction of monitoring features, as necessary, and to accommodate changes in monitoring frequency and alternative methodologies, as appropriate.

1.2 Area Encompassed by the Monitoring Plan

The area addressed by this plan is the Tule Subbasin, as defined by the latest version of DWR Bulletin 118 as shown on Figure A1-1. The Tule Subbasin area is 744 square miles (475,895 acres). The Tule Subbasin has been subdivided into the following six GSAs (see Figure A1-1):

- Eastern Tule GSA

- Lower Tule River Irrigation District GSA
- Pixley Irrigation District GSA
- Delano-Earlimart GSA
- Tri-County Water Authority GSA
- Alpaugh GSA

1.3 Monitoring Plan Organization

The monitoring plan addresses the following types of data:

- Surface Water Data
- Groundwater Data
- Land Elevation and Subsidence Data

Each data type will be addressed in its own section that includes a description of the monitoring features for collecting data, the data collection protocols, and the monitoring frequency.

The final section of the monitoring plan describes the data management program that includes a description of the database management platform, criteria for data QA/QC, file storage, security and access, database maintenance and documentation.

2.0 Monitoring Networks 354.34

This monitoring plan presents the minimum groundwater monitoring network to be relied on by the Tule Subbasin GSAs to prepare their annual reports. Data to be collected from the monitoring network will include surface water flow, surface water quality, groundwater levels, groundwater quality and land elevation data. Groundwater levels and quality data will be collected from a network of monitoring wells spaced throughout the Tule Subbasin. The monitoring well network includes existing monitoring wells, existing domestic and agricultural wells, and new wells to be added. As some of the existing wells require further investigation prior to formal inclusion in the monitoring network, and the exact locations of new monitoring wells are yet to be determined, it will be necessary to modify the monitoring network over time to add/remove monitoring features and adjust locations.

2.1 Chronic Lowering of Groundwater Levels 354.34 (c) (1)

As there are significant differences in hydraulic head and aquifer characteristics with depth in the Tule Subbasin, monitoring wells have been identified to enable the collection of data from each of the significant subsurface hydrogeologic units in the area. These units include (in order from shallowest to deepest):

- The Upper Aquifer
- The Lower Aquifer
- The Santa Margarita Formation

The depths of each of these units follow the hydrogeological conceptual model of the Tule Subbasin outlined in the hydrogeological conceptual model and incorporated into the Tule Subbasin Groundwater Flow Model.[2] The Upper Aquifer is generally located above the Corcoran Clay in the western part of the subbasin and above other confining beds in the eastern part of the subbasin. The Upper Aquifer is generally unconfined to semi-confined. The Upper Aquifer varies in depth from approximately 400 ft below ground surface (ft bgs) in the western portion of the basin to less than 100 ft bgs in the northeastern portion (see Figure A1-2). The Lower Aquifer is below the Corcoran Clay and extends to depths ranging from approximately 2,200 ft bgs in the western portion of the Tule Subbasin to 400 ft bgs near State Route 99. The Santa Margarita

[2] TH&Co, 2017a. Hydrogeological Conceptual Model and Water Budget for the Tule Subbasin. Prepared for the Tule Subbasin MOU Group. Dated August 1, 2017.

TH&Co, 2019. Groundwater Flow Model for the Tule Subbasin. Prepare for the Tule Subbasin MOU Group. In Progress.

Formation occurs at depths ranging from 700 to 2,000 ft bgs in the southeastern portion of the Tule Subbasin.

Monitoring wells are identified with perforations exclusively in the Upper Aquifer, Lower Aquifer, or Santa Margarita Formation. Individual wells perforated across multiple aquifer layers will not be allowed in the monitoring plan unless no other wells are available for monitoring in the area. Over time, wells in the monitoring network that are perforated across multiple aquifers will be replaced with nested or cluster wells with perforations specific to the Upper or Lower aquifers.

2.1.1 Monitoring Features

2.1.1.1 Upper Aquifer Monitoring Wells

Upper aquifer monitoring wells are shown on Figure A1-2. A total of 66 monitoring wells have been identified for monitoring the Upper Aquifer, as described below.

Existing Upper Aquifer Monitoring Wells with Historical Records

Of the 66 wells identified for monitoring the Upper Aquifer, 22 have historical groundwater level records and meet the minimum criteria specified in Section 3.2.1.1 of the Coordination Agreement (see Figure A1-2). The location, total depth, and perforation interval(s) of each of these wells is known and documented (see Table A1-1; Appendix A).

Existing Upper Aquifer Monitoring Wells – No Historical Records (to be Investigated)

There are numerous existing wells with documented total depth and perforation interval(s) within the Upper Aquifer that could be incorporated into the monitoring network but require further investigation. These wells have no historical groundwater level records and owner permission for access the wells has not been pursued. However, if access is approved by the owner and the wells are demonstrated to meet the minimum criteria for monitoring wells, they may be incorporated into the monitoring plan. Ten existing Upper Aquifer wells, to be confirmed through further investigation, have been identified for consideration in the monitoring plan (see Figure A1-2; Table A1-1). In addition, 34 wells that are part of the water quality monitoring network are included in the groundwater level monitoring network. These wells have been selected to help fill aerial coverage data gaps for monitoring Upper Aquifer groundwater levels.

Potential existing Upper Aquifer wells for which access has been denied or, upon investigation, do not otherwise meet the minimum criteria specified in Section 3.2.1.1 of the Coordination Agreement, will be removed and replaced with an alternate existing well with documented total depth and perforation interval located in the same area. If no other wells exist in the area, a new Upper Aquifer monitoring well may be constructed in the area.

Proposed New Upper Aquifer Monitoring Wells

New monitoring wells will be drilled in areas where there are no existing wells for monitoring in order to fill the data gaps. A total of 12 new Upper Aquifer monitoring wells have been identified for possible inclusion in the plan. Of these wells, four will be completed as a stand-alone Upper Aquifer monitoring well. The remaining eight will be completed as part of a nested monitoring well with separate casings perforated in the Upper and Lower aquifers, each separated by an annular seal that enables monitoring of both Upper Aquifer and Lower Aquifer groundwater levels at the same location.

The depths and perforation intervals of the new Upper Aquifer monitoring wells will vary depending on location within the subbasin. In general, Upper Aquifer monitoring wells will be perforated from approximately 10 ft below the then current static groundwater level to the bottom of the Upper Aquifer, as defined by the Tule Subbasin conceptual model[3] (see Figure A1-2). New Upper Aquifer wells constructed on the west side of the subbasin will be the deepest and new Upper Aquifer wells constructed on the east side of the subbasin will be shallowest. It is noted that the depths presented herein are for planning purposes. The final well construction details will be refined in the field during drilling once site-specific data have been obtained and reviewed. As such, the final well depths and perforation intervals may be adjusted for site specific conditions.

A conceptual well design drawing for new Upper Aquifer monitoring wells is shown on Figure A1-3. In general, new monitoring wells shall be constructed of 5-inch diameter Schedule 80 PVC blank and slotted casing. A filter pack for the new wells will be placed in the annular borehole space opposite the perforations from the total borehole depth to at least 10 feet above the top of perforations. The upper portion of the annular space shall be backfilled with a seal consisting of bentonite or other approved sealing material. The surface completion for each new monitoring well will include a steel above-ground riser equipped with a protective locking cap for keeping the wellhead secure. The above-ground riser will be surrounded by cement-filled steel bollards for further protection.

At some locations, the well will be completed as a nested well with two 5-inch diameter casings within the same borehole. One casing will be constructed in the Upper Aquifer and the other casing will be constructed in the Lower Aquifer (see Figure A1-4). A bentonite seal will be placed in the annular space between the two perforation intervals to ensure that the data collected from each casing will be specific to the aquifer in which it is perforated.

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[3] TH&Co, 2017a. Hydrogeological Conceptual Model and Water Budget for the Tule Subbasin. Prepared for the Tule Subbasin MOU Group. Dated August 1, 2017.

A dedicated reference point shall be established and marked on the top of each monitoring well casing. All groundwater level measurements shall be obtained relative to the reference point. The elevation of the reference point shall be surveyed to an accuracy of 0.1 foot relative to mean sea level (NAVD88) by a California licensed land surveyor. The location of each well will be surveyed to an accuracy of 1 foot.

A summary of new Upper Aquifer monitoring wells is shown in Table A1-2. The table shows planning-level location coordinates, total depths, and perforation intervals for each well.

2.1.1.2 Lower Aquifer Monitoring Wells

Lower Aquifer monitoring wells are shown on Figure A1-5. A total of 65 monitoring wells have been identified for monitoring the Lower Aquifer, as described below.

Existing Lower Aquifer Monitoring Wells with Historical Records

Of the 65 existing wells identified for monitoring the Lower Aquifer, seven are existing wells with historical groundwater level records and meet the minimum criteria specified in Section 3.2.1.1 of the Coordination Agreement (see Figure A1-5). The location, total depth, and perforation interval(s) of each of these wells is known and documented (see Table A1-3; Appendix B).

Existing Lower Aquifer Monitoring Wells – No Historical Records (to be Investigated)

There are numerous existing wells with documented total depth and perforation interval(s) within the Lower Aquifer that could be incorporated into the monitoring network but require further investigation. These wells have no historical groundwater level records and owner permission to access the wells has not been pursued. However, if access is approved by the owner and the wells are demonstrated to meet the minimum criteria for monitoring wells, they may be incorporated into the monitoring plan. Thirty-seven existing Lower Aquifer wells, to be confirmed through further investigation, have been identified for consideration in the monitoring plan (see Figure A1-5; Table A1-3). In addition, 21 wells that are part of the water quality monitoring network are included in the groundwater level monitoring network. These wells have been selected to help fill aerial coverage data gaps for monitoring Lower Aquifer groundwater levels.

Potential existing Lower Aquifer wells for which access is denied or, upon investigation, do not otherwise meet the minimum criteria specified in Section 3.2.1.1 of the Coordination Agreement, will be removed and replaced with an alternate existing well with documented total depth and perforation interval located in the same area. If no other wells exist in the area, a new Lower Aquifer well will be constructed in the area.

Proposed New Lower Aquifer Monitoring Wells

New monitoring wells are planned to be constructed in the Lower Aquifer below the Corcoran Clay (see Figure A1-5). New Lower Aquifer monitoring wells will be drilled in areas where there are no existing wells for monitoring in order to fill data gaps. A total of eleven new Lower Aquifer monitoring wells have been identified for inclusion in the plan. Of these, three will be completed as stand-alone Lower Aquifer monitoring wells and nine will be completed as part of a nested monitoring well with separate casings perforated in the Upper and Lower aquifers, each separated by an annular seal that enables monitoring of both Upper Aquifer and Lower Aquifer groundwater levels at the same location.

The depths and perforation intervals of the new Lower Aquifer monitoring wells will vary depending on location within the subbasin. In general, Lower Aquifer monitoring wells will be perforated below the Corcoran Clay, where it has been mapped, or at depths where the aquifer is assumed to be confined, as defined by the Tule Subbasin conceptual model.[4] New Lower Aquifer monitoring wells will be constructed with total depths ranging from 400 to 1,000 ft bgs, with the deepest wells in the western part of the subbasin and shallowest wells on the east side of the subbasin. It is noted that the depths presented herein are for planning purposes. The final well construction details will be refined in the field during drilling once site-specific data have been obtained and reviewed. As such, the final well depths and perforation intervals may be adjusted for site specific conditions.

A conceptual well design drawing for new Lower Aquifer monitoring wells is shown on Figure A1-6. In general, new monitoring wells shall be constructed of 4-inch diameter PVC blank and slotted casing. A dedicated reference point shall be established and marked on the top of each monitoring well casing. All groundwater level measurements shall be obtained relative to the reference point. The elevation of the reference point shall be surveyed to an accuracy of 0.1 foot relative to mean sea level (NAVD88) by a California licensed land surveyor. The location of each well will be surveyed to an accuracy of 1 foot.

A summary of new Lower Aquifer monitoring wells is shown in Table A1-4. The table shows preliminary location coordinates for each well.

2.1.2 Monitoring Procedure

Groundwater level measurements shall be collected from each well using either a steel tape, a calibrated well sounder, or a pressure transducer. Where possible, groundwater level

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[4] TH&Co, 2017a. Hydrogeological Conceptual Model and Water Budget for the Tule Subbasin. Prepared for the Tule Subbasin MOU Group. Dated August 1, 2017.

measurements shall be collected with a steel tape or an electrical groundwater level sounder calibrated to the nearest 0.01 ft. For pre-existing wells with limited access, a calibrated steel tape and chalk may be used. All equipment must be in good working condition. No damaged or refurbished electrical sounding tape shall be used. All new monitoring wells shall be equipped with calibrated pressure transducers.

Groundwater level measurements must be representative of static (i.e. non-pumping) groundwater level conditions. To ensure measurement of static groundwater levels in active pumping wells, the field technician collecting the data must verify that the pump has been off for at least 24 hours prior to collecting the data.

2.1.2.1 Manual Groundwater Level Measurements

The following monitoring procedure shall be used to obtain manual groundwater level measurements in the field:

- Upon arrival at each site, the field technician shall note the well name, time of day, and date on the standard groundwater level data form (see Appendix C).
- All monitoring equipment shall be cleaned prior to lowering it into the well(s) using the following decontamination procedure:
  - Wash equipment with an Alconox solution which is followed by a deionized water rinse.
  - Triple rinse equipment with deionized water.
  - Place equipment on clean surface such as teflon or polyethylene sheet to air dry.
- To measure the depth to groundwater with a steel tape or an electrical sounder or meter, slowly lower the steel tape or water level electrical tape into the designated sounding port for production wells and into the main well for monitoring wells. Steel tapes and electrical tapes are lowered to the water surface, as determined by the audio signal, meter, or technician. Depths to groundwater are measured relative to the dedicated reference point at the top of the casing or sounding tube. Depth to groundwater shall be immediately recorded on the standard groundwater level data form (see Appendix C). Depths to groundwater shall be compared to previous measurements in the field and re-measured if significantly different.
- For wells with limited access (such as agricultural wells or domestic wells equipped with a pump), a steel tape and chalk may be used. For this method, chalk is applied to a 1- to 3-foot section of the steel tape prior to lowering in the well. The steel tape is lowered to a depth at least 1-ft below the static groundwater level and a whole number on the calibrated tape is matched to the reference point at the surface. Both the foot mark held at the reference point and the groundwater level observed on the chalk shall be recorded on the standard field forms (see Appendix D). The difference between the two is the depth to

groundwater.

- When finished sounding the groundwater level, all downhole equipment shall be removed, and where existing, the well cap shall be replaced, and the riser locked.
- Prior to leaving the monitoring well site, the field representative shall note any physical changes in the concrete well pad and riser pipe, such as erosion, cracks or damage. All changes shall be recorded on the standard field forms provided in Appendices C, D, and E.

2.1.2.2 Automatic Groundwater Level Measurements Using Transducers

Transducers shall be installed in all new monitoring wells and existing monitoring wells identified as representative monitoring sites. Transducers shall be installed below the groundwater level with enough submergence to accommodate anticipated groundwater level fluctuations.

2.1.3 Frequency of Measurement

Groundwater level measurements from existing domestic and irrigation wells shown on Figures A1-2 and A1-5 will be collected semi-annually in the Spring (February) and in the Fall (October/November). To the extent possible, groundwater level monitoring events will be coordinated between GSAs so that measurements are taken at the time of greatest recovery and maximum depth.

Groundwater level measurements from all new monitoring wells and wells designated as representative monitoring sites will be collected using pressure transducers permanently installed in the wells and set to collect one measurement per day. Pressure transducers will be downloaded on a semi-annual basis. During each download session, the field technician will also obtain a manual groundwater level measurement in order to verify transducer readings and ensure that the instruments are working properly.

2.2 Reduction in Groundwater Storage § 354.34 (c) (2)

Changes in groundwater storage within the Tule Subbasin will be estimated using either of the methods identified in Section 3.6 of the Tule Subbasin Coordination Agreement. Groundwater level data to be relied on for the change in groundwater storage estimates will be collected as described in Section 2.1 of this TSMP.

2.3 Seawater Intrusion § 354.34 (c) (3)

Seawater intrusion cannot occur in the Tule Subbasin due to its location with respect to the Pacific Ocean. The Tule Subbasin is approximately 110 miles inland of the Pacific Ocean and is separated from the ocean by approximately 90 miles of sedimentary rocks that make up the Coast Ranges. These sedimentary rocks effectively separate the Pacific Ocean hydraulically from the aquifer system in the San Joaquin Valley. Further, the Coast Ranges are dissected by multiple northwest trending faults, the largest of which is the San Andreas Fault. These faults form groundwater flow barriers, which further act to separate the San Joaquin Valley aquifers from the Pacific Ocean. Accordingly, groundwater pumping in the Tule Subbasin cannot induce seawater intrusion. As such, monitoring for seawater intrusion is not necessary and is not included in this monitoring plan.

2.4 Degraded Water Quality § 354.34 (c) (4)

Groundwater samples shall be collected and analyzed annually, during summer months, from the wells shown on Figure A1-7 consistent with the Tule Basin Water Quality Coalition Groundwater Quality Trend Monitoring Program Workplan.[5] The groundwater sampling protocols described herein will ensure that:

- Groundwater quality data are collected from the correct location
- Groundwater quality data are accurate and reproducible
- Groundwater quality data represent conditions that inform appropriate basin management decisions
- All salient information is recorded to normalize, if necessary, and compare data
- Data are handled in a way that ensures data integrity

2.4.1 Groundwater Quality Constituents to be Analyzed

Annual water quality monitoring of the wells shown on Figure A1-7 will include laboratory analysis for nitrate as N only (see Table A1-5). Prior to collecting the samples in the field, the field technician will collect measurements of temperature, pH, dissolved oxygen (DO) and electrical conductivity (EC) from the well discharge, as described in Section 2.4.2 herein.

Every five years, samples from the wells shown on Figure A1-7 will be analyzed for an expanded list of analytes. In addition to nitrate, samples will be analyzed for total dissolved solids (TDS) and major cations and anions (see Table A1-5). Prior to collecting the samples in the field, the field technician shall collect measurements of temperature, pH, DO and EC from the well discharge, as described in Section 2.4.2 herein.

2.4.2 Groundwater Quality Samples from Existing Domestic Water Supply or Irrigation Wells

Domestic water supply and irrigation wells shall be sampled after purging the well for a period of

[5] Tule Basin Water Quality Coalition, 2017. Groundwater Trend Monitoring Workplan. January 6, 2017.

time adequate to remove at least three well volumes removed prior to sampling (see Appendix E). If the well is currently pumping, this step is not necessary.

During pumping and prior to sample collection, the field technician shall obtain measurements of temperature, pH, DO and EC from water collected from the sample port. Meters for measuring pH, DO and EC shall be field calibrated in accordance with manufacturer's specifications at the beginning of each sampling day. Samples will be collected when: (1) a minimum of four sets of parameter readings have been obtained; and (2) the temperature, pH, and EC reach relatively constant values.

All samples shall be collected from the discharge point nearest the well head and placed in laboratory-prepared sample containers. The technician collecting the sample shall wear new latex or neoprene gloves while collecting the sample. Sample containers shall be labeled before or immediately after sampling with self-adhesive tags having the following information written in waterproof ink:

- Project number
- Sample I.D. number
- Sample location
- Date and time sample was collected
- Initials of sample collector

2.4.3 Groundwater Quality Samples from Monitoring Wells

All groundwater samples from monitoring wells will be collected consistent with procedures described in the United States Environmental Protection Agency's (USEPA's) Low-flow (Minimal Drawdown) Groundwater Sampling Procedures.[6] Low-flow purging can be conducted using either portable or dedicated (leave in well) pump systems. A submersible pump, diaphragm pump, or positive displacement pump, which may contain a bladder, may be used for evacuating (purging) the monitoring well casing and collecting the samples. The pump-intake should be set in the middle or slightly above the middle of the screened interval in the well. Other equipment necessary for collecting groundwater samples using the low-flow sampling method include:

- A water level measurement device, or water level sounder
- In-line flow through cell to monitor water quality parameters
- Field forms for documenting water quality parameters measured at each monitoring well
- Chain of custody forms

[6] Puls, R.W., and Barcelona, M.J., 1996. Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. EPA document 540/S-95-504.

- Laboratory prepared sample containers from a State-certified laboratory with the appropriate labels for the analytes being measured
- Gloves
- Cleaning supplies for decontaminating
- Tubing for the pump

All samples shall be collected from a discharge port at the wellhead and placed in laboratory-prepared sample containers. For dissolved trace metal analyses, samples will be collected in unpreserved bottles, then filtered through a 0.45-micron filter and acidified prior to analysis. The technician collecting the sample shall wear new latex or neoprene gloves while collecting the sample. Sample containers shall be labeled before or immediately after sampling with self-adhesive tags having the following information written in waterproof ink:

- Project number
- Sample I.D. number
- Sample location
- Date and time sample was collected
- Initials of sample collector

2.4.4 Well Sampling Records

Data collected during groundwater sampling will be recorded on the standard forms provided in Appendix F. Information and data to be recorded shall include:

- Sample I.D.
- Duplicate I.D., if applicable
- Date and time sampled
- Name of sample collector
- Well designation (State well numbering system for water supply wells)
- Owner's name, or other common designation
- Well diameter
- Depth to water on day sampled
- Casing volume on day sampled
- Method of purging (bailing, pumping, etc.)
- Extraordinary circumstances (if any)
- Field measurements temperature (0º C), pH, specific electrical conductivity (at 25ºC µs/cm), and dissolved oxygen (mg/l)
- Number and type of sample container(s)
- Times corresponding to water quality measurements

- Pumping rate at time of sampling

In addition to the standard forms for collecting data, the field technician shall keep a daily field record for each day of fieldwork. Following review by the project manager, the original records shall be kept in the project file.

2.4.5 Handling, Storage and Transportation of Samples

Upon collection and labeling, all samples shall be placed immediately into a clean chest/cooler with ice in order to keep samples cool. Exposure to dust, direct sunlight, high temperature, adverse weather conditions, and possible contamination shall be avoided.

All samples will be transported to a State-certified analytical laboratory within 24 hours of collection. Samples shall be transported under chain-of-custody procedures, which document the transfer of custody of samples from the field to the laboratory. Each sample sent to the laboratory for analysis shall be recorded on a Chain-of-Custody Record, which includes instructions to the laboratory for analytical services.

Information contained on the triplicate Chain-of-Custody Record shall include:

- Project number
- Signature of sampler(s)
- Date and time sampled
- Sample I.D.
- Number of sample containers
- Sample matrix (water)
- Analyses required
- Remarks, including preservatives, special conditions, or specific quality control measures
- Turnaround time and person to receive laboratory report
- Method of shipment to the laboratory
- Release signature of sampler(s), and signatures of all people assuming custody
- Condition of samples when received by laboratory

Blank spaces on the Chain-of-Custody Record will be crossed out between the last sample listed and the signatures at the bottom of the sheet.

The field sampler shall sign the Chain-of-Custody Record and record the time and date at the time of transfer to the laboratory or to an intermediate person. A set of signatures is required for each relinquished/reserved transfer, including intermediate transfers. The original imprint of the Chain-of-Custody Record will accompany the sample containers. A duplicate copy shall be placed in the project file.

If the samples are to be shipped to the laboratory, the original Chain-of-Custody will be sealed inside a plastic bag within the ice chest, and the chest shall be sealed with custody tape which has been signed and dated by the last person listed on the Chain-of-Custody. U. S. Department of Transportation shipping requirements shall be followed and the sample shipping receipt retained in the project file as part of the permanent chain-of-custody document. The shipping company (e.g. Federal Express, UPS, DHL) will not sign the chain-of-custody forms as a receiver, instead the laboratory shall sign as a receiver when the samples are received.

2.4.6 Quality Control Samples

Quality control samples shall consist of duplicates and blanks. At least one duplicate sample shall be collected during each day of sampling. The duplicate sample shall be collected from the same well as the original and immediately after the original sample. At least one blank sample shall be included with each batch of samples delivered to the laboratory. Blank samples shall consist of laboratory prepared deionized water that is containerized at the laboratory and delivered with the sample containers. Duplicate and blank samples will be analyzed by the laboratory, as specified in the project Quality Assurance Project Plan (QAPP)[7] or by the project manager (see Appendix E).

2.4.7 Frequency of Measurement

Groundwater quality samples will be collected from the wells shown on Figure A1-7 on an annual basis, during the summer, and analyzed as described in Section 2.4.1 herein.

2.5 Land Subsidence 354.34 (c) (5)

Land surface subsidence has been observed in multiple areas within the Tule Subbasin. Based on United States Geological Survey (USGS) measurements and analysis of land subsidence that occurred in the area in the 1950s and 1960s,[8] it has been determined that the land subsidence is associated with lowered groundwater levels due to groundwater pumping in areas where the subsurface contains a significant amount of clay and silt. Recent land subsidence in the Tule Subbasin has resulted in lowered flow capacity in the Friant-Kern Canal. Subsidence has also been observed from satellite data in the western portion of the subbasin.

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[7] Tule Basin Water Quality Coalition, 2017. Groundwater Trend Monitoring Workplan. January 6, 2017.
[8] Lofgren, B.E., and Klausing, R.L., 1969. Land Subsidence Due to Ground-Water Withdrawal, Tulare-Wasco Area of California. USGS Professional Paper 437-B.

2.5.1 Monitoring Features

Monitoring of changes in land surface elevation related to groundwater withdrawal will be conducted through global positioning surveys, data collected from extensometers, and satellite data.

2.5.1.1 Global Positioning Surveys

The United States Bureau of Reclamation (USBR) measures land surface elevation at eight stations along the Friant-Kern Canal using a Global Positioning System (GPS) (see Figure A1-8). Data from these surveys will be obtained from the USBR.

In addition to the USBR GPS stations, new GPS survey stations will be established at each new monitoring well location throughout the Tule Subbasin, as shown on Figure A1-8 (63 stations). Each monitoring well concrete pad will include a benchmark reference for GPS readings. Further, 39 additional standalone GPS stations have been identified to provide spatial coverage to address data gaps and focus monitoring on areas that have had historical subsidence. Each survey station will be marked with a bench mark labeled with the station identification.

2.5.1.2 Extensometers

The USGS collects data on aquifer system compaction, which causes land subsidence, from one existing extensometer near Porterville (22S/27E-30D2; see Figure A1-8). This station is located adjacent to the Friant-Kern Canal approximately one mile north of the Deer Creek crossing. Data from this extensometer can be accessed via the USGS website.

In addition to the existing extensometer, additional extensometers may be established at strategic locations of the subbasin in the future.

2.5.1.3 Satellite Data (InSAR)

Changes in land surface elevation over time can be observed on a regional scale using satellite data. The data is generated using interferometric synthetic aperture radar (InSAR). Multiple satellite passes are required but annual data that shows changes in land surface elevation over a year are generally available. The data will be analyzed and interpreted by an outside professional in order to develop maps showing regional land surface changes.

2.5.2 Monitoring Procedure

2.5.2.1 Global Positioning Surveys

The GPS network will be established and monitored in accordance with National Geodetic Survey (NGS) Guidelines for Establishing GPS-Derived Ellipsoid Heights (National Oceanographic and Atmospheric Administration and Guidelines for Establishing GPS-Derived Orthometric Heights.[9] All GPS-derived elevations will be constrained to an established NGS benchmark located on Lake Success Dam (KT 200). All land surface elevation readings will be to an accuracy of 0.1 feet relative to NAVD88.

2.5.2.2 Extensometers

The USGS extensometer is equipped with a continuous monitoring device to record aquifer system compaction. Aquifer system compaction data will be downloaded from the USGS website for analysis as data updates are available.

2.5.2.3 Satellite Data (InSAR)

InSAR data will be obtained from the Jet Propulsion Laboratory, USGS, or European Space Agency for processing. The data will be analyzed and interpreted by an outside professional (Neva Ridge Technologies, Inc. or approved equal) in order to develop maps showing regional land surface changes.

2.5.3 Frequency of Measurement

2.5.3.1 Global Positioning Surveys

GPS surveys of the stations shown on Figure A1-8 will be conducted on an annual basis correlated to groundwater quality sampling events. GPS surveys of stations located within the Friant-Kern Canal Monitoring Zone will be conducted on a quarterly basis.

2.5.3.2 Extensometers

Aquifer system compaction is measured on a continuous basis at the USGS extensometer. Aquifer system compaction data will be downloaded from the USGS website for analysis as data updates are available.

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[9] NOAA, 1997.

2.5.3.3 Satellite Data (InSAR)

InSAR data will be obtained and analyzed for six separate periods for the first year of monitoring. Decreases in the frequency of monitoring in later years will depend on the effectiveness of reduced pumping to mitigate land surface subsidence.

2.6 Depletions of Interconnected Surface Water 354.34 (c) (6)

Surface water flow in the Tule River and Deer Creek ultimately flow into the historical Tulare Lake but only during periods of prolonged above-normal precipitation. Surface water flow in the White River does not reach the Tulare Lake bed. Surface water flow in the Tule River, including flow beyond the Tule Subbasin, is monitored and managed by the Tule River Association (TRA). Surface water flow in the Deer Creek and White River are monitored by the USGS and USBR. The monitoring features, monitoring procedures, and monitoring frequency for surface water in the Tule Subbasin follows the features, procedures, and frequency already in place by these organizations.

2.6.1 Monitoring Features

A primary source of water to the Tule Subbasin is surface water runoff originating in the Sierra Nevada Mountains. The primary rivers/streams contributing surface water to the subbasin include the Tule River, Deer Creek, and White River (see Figure A1-9). Each of these rivers/streams contain existing surface water monitoring stations for the collection of both stream flow and surface water quality. The following summarizes the key monitoring features and locations in the subbasin.

2.6.1.1 Tule River

Stream flow in the portion of the Tule River that is within the Tule Subbasin is determined by controlled releases from Lake Success, measured by the Army Corps of Engineers (ACOE). Stream flow entering Lake Success is measured and distributed to various water rights holders as allocated at Success Dam in accordance with the Tule River Water Diversion Schedule and Storage Agreement.[10] The accounting of surface water flow, storage, streambed losses, and diversions is documented for each water year in the TRA annual reports from 1962 through 2017.

[10] TRA, 1966. Tule River Diversion Schedule and Storage Agreement. Dated February 1, 1966; revised June 16, 1966.

Tule River Stream Flow – Main Channel

Stream flow in the Tule River is measured by the ACOE below Success Dam, at Rockford Station downstream of Porterville, and at Turnbull Weir by the TRA (see Figure A1-9). In addition, releases of imported Central Valley Project water into the Tule River and Porter Slough from the Friant-Kern Canal are conducted at two locations, which are measured via weir structures managed by the USBR. Details regarding the location and construction of each stream flow gage are provided in Table A1-6.

Tule River Diversions - Structures and Headgates

Between Lake Success Dam and the Turnbull Weir, water is diverted from the Tule River to various water right holders. Diversion locations are shown on Figure A1-9 and described as follows:

<u>Pioneer Water Company</u>:

> The headgate is a portion of the Success Reservoir outlet works and consists of a 42-inch gated conduit. The gaging station is a standard 5-foot concrete Parshall flume located 100 feet downstream of the reservoir outlet works at a point approximately 2,100 feet south and 1,400 feet east of the northwest corner of Section 35, Township 21 South, Range 28 East, M.D.B.&M., being in the southeast quarter of the northeast quarter of said Section 35.

<u>Porter Slough at Headgate</u>

> The Porter Slough Headgate diverts water from the main channel of the Tule River to the Porter Slough, an ancestral branch of the Tule River that extends from the headgate to the LTRID No. 4 Canal (see Figure A-2). The headgate is located in the southeast quarter of the northeast quarter of Section 4, Township 22 South, Range 28 East, M.D.B.&M. Five bays of flashboards control the diversions from the Tule River in Porter Slough.
>
> Flows at the headgate of Porter Slough are computed by the addition of 5 cubic-feet per second to the daily mean flows measured at the Porter Slough at Porterville (B Lane) gaging station.

<u>Porter Slough at Porterville</u>

> The gaging station is a rated section of the natural channel situated approximately 2,900 feet west and 1,100 feet north of the southeast corner of Section 32, Township 21 South, Range 28 East, M.D.B.&M. and 1.4 miles below the Porter Slough headgate in the Boydston Weir.

Porter Slough Ditch Company

The headgate is located in the Porter Slough check structure at Putnam Street being approximately 2,500 feet west and 1,500 feet north of the Southeast corner of Section 26, Township 21 South, Range 27 East, M.D.B.&M., being in the northwest quarter of the southeast quarter of said Section 26. The gaging station is a rated section 150 feet below the headgate.

Porter Slough Below Avenue 192

Porter Slough terminates with discharge through a concrete check structure into the No. 4 Canal of LTRID located near the center of Section 11, Township 21 South, Range 26 East, M.D.B.&M., one-half mile easterly of Tulare County Road 192. A daily weir measurement is used for recording the flow of Porter Slough Below 192.

Downstream of Avenue 192, the Porter Slough discharges into a series of unlined canals that deliver water to farmers in the LTRID.

Campbell and Moreland Ditch Company:

The headgate is located near the South end of Boydston Weir at a point approximately 600 feet west and 1,700 feet south of the northeast corner of Section 4, Township 22 South, Range 28 East, M.D.B.&M., being in the southeast quarter of the northeast quarter of said Section 4. The gaging station is a rated concrete lined canal section 2,600 feet below the headgate.

Vandalia Ditch Company:

The headgate is located in the south end of Vandalia Weir at a point approximately 1,160 feet west and 170 feet north of the southeast corner of Section 32, Township 21 South, Range 28 East, M.D.B.&M., being in the southeast quarter of the southeast quarter of said Section 32. The gaging station is a rated section 1,000 feet below the headgate.

Hubbs & Miner Ditch Company:

The canal diverts along the North levee of the Tule River at a point approximately 2,600 feet west and 2,100 feet north of the southeast corner of Section 35, Township 21 South, Range 27 East, M.D.B.&M., being in the northwest quarter of the southeast quarter of said Section 35. The gaging station is a rated section 3,100 feet below the canal diversion and 85 feet downstream of the River bypass headgate structure.

Poplar Irrigation Company:

The canal diverts along the south levee of the Tule River at a point approximately 740 feet west and 1,000 feet north of the southeast corner of Section 36, Township 21

South, Range 27 East, M.D.B.&M., being in the southeast quarter of the southeast quarter of said Section 36. The gaging station is a rated section 3,400 feet below the canal diversion and 325 feet downstream of the River bypass headgate structure.

Woods-Central Ditch Company:

The headgate structure is located in the South bank of the Tule River at a point approximately 2,300 feet west and 2,200 feet north of the southeast corner of Section 30, Township 21 South, Range 27 East, M.D.B.&M., being in the northwest quarter of the southeast quarter of said Section 30. The gaging station is a rated section 150 feet below the River diversion.

2.6.1.2 Deer Creek

Deer Creek is a natural drainage that originates in the Sierra Nevada Mountains, flowing in a westerly direction north of Terra Bella and between Pixley and Earlimart (see Figure A1-9). The Deer Creek channel extends to the Homeland Canal, although surface water flow rarely reaches that location.

Deer Creek Stream Flow

Stream flow in Deer Creek is measured at the United States Geological Survey (USGS) gage at Fountain Springs (five miles east of, and outside of, the Tule Subbasin boundary), Trenton Weir, and at the point where Deer Creek outlets to the Homeland Canal (see Figure A1-9). Details regarding the location and construction of each stream flow gage are provided in Table A-1 and summarized below.

Friant-Kern Canal Discharges into Deer Creek

Friant-Kern Canal water is also discharged into Deer Creek approximately five miles upstream of Trenton Weir and measured by the USBR (see Figure A1-9).

2.6.1.3 White River

The White River drains out of the Sierra Nevada Mountains east of the community of Richgrove in the southern portion of the Tule Subbasin (see Figure A1-9). The White River channel extends as far as State Highway 99 but does not reach the historical Tulare Lake bed. Streamflow in this river is currently monitored manually at Road 208 by the Tule Basin Water Quality Coalition and the Delano-Earlimart Irrigation District.

2.6.2 Monitoring Procedure

2.6.2.1 Surface Water Flow Measurements

With the exception of the White River Turnbull Weir at Road 208, Porter Slough at 192, and Deer Creek outlet to Homeland Canal, all gaging stations and diversion structures on the Tule River and Deer Creek are equipped with water stage recorders that collect water stage readings automatically every 15 minutes. The gage on the Tule River Below Success Dam is operated and managed by the ACOE. The Trenton Weir on Deer Creek is operated and managed by the ACOE. All other gages (with the exceptions noted) report data electronically in real time to the TRA/LTRID.

Stream flow at the Turnbull Weir is measured manually when flow passes the gage. Manual measurements involve recording the reading on the staff gage in the river and conducting current meter measurements for verifying the rating curve and table. Current meter measurements will be collected within the rated section of the natural channel under laminar flow conditions. The required frequency of manual measurements at the Turnbull Weir is addressed in Section 2.6.3. Staff gage and current meter readings are recorded immediately after completion of the measurement and any significant shifts are verified immediately by re-measurement. All readings are recorded on standard forms that include the time the measurement began, the time the measurement was completed, the staff gage height in feet to the nearest hundredth, and any other pertinent data with respect to channel conditions, growth, etc.

For water stage recorders, should the flow double within any 24-hour period, the bi-hourly gage heights shall be converted to second-foot flows and the mean daily flow computed from the second-foot quantities rather than utilizing the normal procedure of obtaining a mean daily gage height and the gage height to a second-foot flow. In the final review of gage sheets, shifts shall be prorated through the period during which the change occurred as determined from the current meter measurements, unless the Hydrographer determines a specific reason for the shift to occur at a definite time.

2.6.2.2 Surface Water Quality Measurements

Surface water quality samples have historically been collected and analyzed from the Tule River, Deer Creek and White River by the Tule Basin Water Quality Coalition surface water quality program. Surface water quality monitoring stations are shown on Figure A1-9.

Surface Water Quality Monitoring Locations – Tule River

Porter Slough at Road 192

Surface water quality samples are collected from Porter Slough upstream of the discharge into the LTRID canal (see Figure A1-9). This surface water monitoring site is located approximately eight miles northwest of Porterville, California.

Tule River at Road 144

Surface water quality samples are collected from the North Fork of the Tule River at Road 144, approximately 3.5 miles northwest of Woodville, California.

Tule River at Road 92

Surface water quality samples are collected from the Tule River at Road 92, approximately four miles northwest of Tipton, California.

Surface Water Quality Monitoring Locations – Deer Creek

Surface water samples are collected from the following locations in Deer Creek:

Deer Creek at Road 248

Located approximately 2.5 miles northeast of Terra Bella in the foothills of the Sierra Nevada Mountains.

Deer Creek at Road 176

Located at Trenton Weir.

Deer Creek at Road 120

Located approximately six miles southeast of Pixley, California at the Road 120 bridge.

Surface Water Quality Monitoring Locations – White River

Surface water quality samples are collected from the White River at Road 208 when flow occurs.

2.6.2.3 Surface Water Quality Constituents

Each surface water quality sample is analyzed by a State certified analytical laboratory for the constituents listed in Table A1-7. In general, these constituents include electrical conductivity (EC), pH, dissolved oxygen (DO), E. Coli bacteria, total organic carbon (TOC), total suspended solids (TSS), total dissolved solids (TDS), turbidity, selected metals, hardness, ammonia, nitrate as N, orthophosphate, and phosphorus.

2.6.3 Frequency of Measurement

2.6.3.1 Stream Flow

Stream flows at gaged stations and diversion points are measured on a continuous basis and electronically transmitted to the TRA/LTRID.

For stream flows at locations with no established gage (e.g. Turnbull Weir and Porter Slough at 192), a current meter measurement is made at least once every two weeks when flows occur. An initial current meter measurement is made as soon as flow is detected and a final current meter measurement is made just prior to discontinuance of flow. Current meter measurements are made when a major change in the stage of flow occurs whether the flow is an increase or a decrease.

2.6.3.2 Surface Water Quality

Surface water quality samples are collected from all of the surface water quality monitoring locations shown on Figure A1-9 on a monthly basis when flow occurs.

2.6.4 Stream Gage Calibration and Maintenance

Manual readings are conducted at each active gaging station at least once per month in order to assess the accuracy of the gage reading to the rating curve. Adjustments are made as necessary.

All gaging stations undergo maintenance at least once per year to clean and backwash inlet pipes, clean and adjust recorder and appurtenances, check and repair time clocks, and repaint the station enclosures, as needed. If the time is off more than one-half hour, or the pen is off more than 0.05 feet, the recorder is reset to correct readings, the pen shall conform to the tape, and the drum shall be rolled for restarting the operation on a new coordinate with revised gage heights denoted.

Gage sheets are reduced as readily as possible after removal from the recorder withadditional notations made for assistance in subsequent reviews. Such notations includeestimated flows should the recorder provide an incomplete recording due to fouling, clock malfunction or if growth is observed in the channel.

3.0 Representative Monitoring §354.36

3.1.1 Groundwater Levels

A subset of groundwater level monitoring features in the monitoring plan have been identified as representative monitoring sites to be relied on for the purpose of assessing progress with respect to groundwater level sustainability in the subbasin. The representative groundwater level monitoring sites are shown on Figures A1-2 and A1-5. At least one representative groundwater level monitoring site has been identified within each management area. Where possible based on available wells, representative monitoring sites have been chosen with perforations exclusively in either the Upper or Lower Aquifer. To provide adequate spatial coverage of the subbasin, some representative monitoring sites include perforations across multiple aquifers until new monitoring features can be constructed. Representative groundwater level monitoring wells will be equipped with pressure transducers to measure groundwater levels on a daily basis.

3.1.2 Reduction of Groundwater Storage

Changes in groundwater storage within the Tule Subbasin will be estimated using either of the methods identified in Section 3.6 of the Tule Subbasin Coordination Agreement. Groundwater level data to be relied on for the change in groundwater storage estimates will be collected as described in Section 2.1 of this TSMP from the monitoring network shown on Figures A1-2 and A1-5. As such, there are no single representative monitoring sites for evaluating progress with respect to groundwater sustainability as it relates to changes in groundwater storage in the subbasin.

3.1.3 Seawater Intrusion

Seawater intrusion cannot occur in the Tule Subbasin due to its location with respect to the Pacific Ocean (see Section 2.3 herein). As such, representative monitoring sites for evaluating progress with respect to groundwater sustainability as it relates to seawater intrusion are not needed.

3.1.4 Degraded Groundwater Quality

Groundwater quality degradation in the Tule Subbasin is being monitored and regulated under the Irrigated Lands Regulatory Program (ILRP) and CV Salts. Monitoring of groundwater quality as it relates to the sustainability of the Tule Subbasin is focused on potential changes in the direction and/or flow rate of existing point-source groundwater contaminant plumes. These plumes have been identified and described in Section 2.2.4 of the Tule Subbasin Setting (Attachment 2 of the Tule Subbasin Coordination Agreement). As changes in the movement of contaminant plumes occurs as a result of changes in groundwater levels, the representative monitoring sites identified for groundwater levels (Section 3.1.1 herein) serve as proxy representative monitoring sites for the potential movement of existing groundwater contaminant plumes.

3.1.5 Land Subsidence

Representative monitoring sites for land subsidence within the Tule Subbasin consist of eight established GPS stations located along the Friant-Kern Canal (see Figure A1-8). Land subsidence has been measured along the canal in the past and further land subsidence is considered an undesirable result as it restricts the ability to deliver water downstream of the area of subsidence. Measured subsidence at these GPS stations will inform progress as it relates to arresting future land subsidence along the canal.

3.1.6 Interconnected Surface Water

As described in Section 2.2.7 of the Tule Subbasin Setting (Tule Subbasin Coordination Agreement Attachment 2), there are no interconnected surface water systems within the Tule Subbasin. As such, representative monitoring sites for evaluating progress with respect to groundwater sustainability as it relates to interconnected surface water are not needed.

4.0 Assessment and Improvement of Monitoring Network §354.38

The TSMP is both flexible and iterative, allowing for the addition or subtraction of monitoring features, as necessary, and to accommodate changes in monitoring frequency and alternative methodologies, as appropriate.

4.1 Data Gaps §354.38 (b)

4.1.1 Groundwater Monitoring Data Gaps

Despite the number of existing monitoring wells that have been identified within the Tule Subbasin, there remain data gaps that, if addressed, would improve the ability to monitor groundwater level changes and flow patterns specific to the Upper and Lower aquifers. The current data gaps relate primarily to spatial coverage of monitoring features necessary to prepare complete groundwater level contour maps specific to the Upper and Lower aquifers in the subbasin. The 15 additional proposed monitoring wells identified herein will address many of the groundwater level monitoring data gaps in the subbasin.

In addition to groundwater level data gaps, there is a lack of aquifer parameter data, as obtained from controlled pumping tests of wells. The groundwater flow model has been developed based predominantly on short-term pumping tests, which enable the development of estimates of aquifer transmissivity. However, these tests are not as representative as long-term pumping tests (24-hr tests or longer). Further, pumping tests where groundwater level interference is measured in nearby monitoring wells have not been conducted. These tests enable the estimation of aquifer storage properties. During the construction of new monitoring features, it is anticipated that long-term pumping tests will be conducted to obtain aquifer parameter data specific to both the Upper and Lower aquifers. Further, pumping tests will be planned, where feasible, on existing high-capacity groundwater production wells.

Recommended Monitoring Features and Testing to Address Data Gaps §354.38 (d)

In order to address the groundwater level data gaps, new monitoring well locations have been identified for monitoring the individual aquifers in the Tule Subbasin. New wells for monitoring the Upper Aquifer are shown on Figure A1-2 and described in Section 2.1.1.1 herein. The new monitoring wells, combined with existing Upper Aquifer monitoring wells, will improve the Tule Subbasin TAC's ability to develop detailed and representative Upper Aquifer groundwater contour maps and provide a better network of calibration targets for the subbasin-wide groundwater model. It is further anticipated that many of the new monitoring wells will eventually replace currently assigned representative monitoring sites.

New wells for monitoring the Lower Aquifer are shown on Figure A1-5 and described in Section 2.1.1.2 herein. The new monitoring wells, combined with existing Lower Aquifer agricultural monitoring wells, will improve the Tule Subbasin TAC's ability to develop detailed and representative Lower Aquifer groundwater contour maps and provide a better network of calibration targets for the subbasin-wide groundwater model.

As described in Section 2.1.1.1 herein, some of the new monitoring wells will be constructed as nested wells with two casing installed in the same borehole, each perforated in a distinct aquifer and isolated with a seal to ensure measurement of data unique to either the Upper or Lower aquifer.

In order to address the aquifer parameter data gaps, it is recommended to conduct controlled, long-term pumping tests in selected wells within the subbasin. Tests should be conducted in wells perforated exclusively in the Upper Aquifer and exclusively in the Lower Aquifer. Pumping wells will be selected near proposed monitoring wells in order to enable pumping interference measurements during the test. Each test will consist of a 24-hr constant rate pumping test.

4.1.2 Land Surface Monitoring Data Gaps

With the exception of some elevation benchmark stations and one extensometer along the Friant-Kern Canal in the eastern portion of the subbasin, there are few existing land subsidence monitoring features in the Tule Subbasin. InSAR data that cover the entire Tule Subbasin have been historically available and indicate areas where land subsidence has been occurring. However, it has not been possible to ground truth these data with more conventional land based survey methods such as GPS. The USGS has refurbished one extensometer, which is located approximately one mile north of Deer Creek along the Friant-Kern Canal and is included in this plan. However, characteristics of aquifer system compaction in the northwestern portion of the subbasin, which is hydrogeologically different than the area where the existing extensometer is located, is unknown and represents a data gap.

Recommended Monitoring Features to Address Land Surface Monitoring Data Gaps §354.38 (d)

In order to address the lack of land elevation data throughout most of the subbasin, 93 new GPS monitoring stations will be established as described herein. These stations will enable the development of land elevation change maps that can be used to constrain the InSAR data that is also proposed for use in evaluating regional land elevation changes.

At least one new extensometer is recommended for the vicinity of the Homeland Canal at Highway 43 in the northwest portion of the subbasin. This instrument will provide the most accurate assessment of aquifer system compaction in the area of greatest subsidence in the subbasin.

4.1.3 Surface Water Monitoring Data Gaps

The following surface water monitoring data gaps have been identified for the Tule Subbasin:

- Tule River near Porterville - Channel infiltration losses in the upper portion of the Tule River are currently calculated between the gage below Success Dam and the gage at the Rockford Station, which is a 10-mile stretch of the river. It appears that more of the infiltration losses occur in the upper portion of the channel reach than in the lower. An intermediate gage between the Poplar diversion and Woods Central would be beneficial to understand the volume of infiltration losses above and below this point.

- Tule River at McCarthy Check - Channel infiltration losses between the Rockford Station and the Turnbull Weir are not well documented. An additional gage at the McCarthy Check at Road 96 (see Figure A-2) would provide additional information on the channel losses upstream of this point and between McCarthy Check and Turnbull Weir.

- Deer Creek at Friant-Kern Canal – While the releases of imported water from the Friant-Kern Canal to the Deer Creek channel are well documented, the channel infiltration losses between the Friant-Kern Canal and the Trenton Weir are not. An additional gage immediately upstream of the Friant-Kern Canal would enable the measurement of flows attributed to both imported water and natural stream flow as well as a better estimate of channel losses between these two points.

- Deer Creek at Homeland Canal – Stream flows at the downstream end of Deer Creek periodically reaches, and are discharged to, the Homeland Canal (see Figure A1-9). The nature and historical records of this discharge are not available and present a data gap for the surface water budget of the subbasin. Further, a gage record at this location would provide information on streambed infiltration during periods of time when surface water in Deer Creek reaches Homeland Canal.

- White River – Historical stream flow in the White River has been measured by the USGS at the gage near Ducor (see Figure A-2). However, this gage is no longer active leaving a data gap for the volume of surface water entering the subbasin from this river (current estimates of flow into the subbasin are based on correlations with flows of Deer Creek). Further, there are no established gages downstream of this point.

Recommended Surface Water Monitoring Features to Fill the Data Gaps §354.38 (d)

The following surface water monitoring features are recommended to address the surface water data gaps:

- Tule River – Establish a rated section of channel, concrete weir structure and water stage recorder at an appropriate location between the Poplar diversion and the Rockford Station gage; and establish a rated section of channel, concrete weir structure and water stage recorder at the McCarthy Check.

- Deer Creek – Establish a stream gage immediately upstream of the Friant-Kern Canal to enable the portion of flow in the channel attributed to native stream flow and the portion attributed to imported Central Valley Project releases. Investigate the discharge structure at the Deer Creek inlet to Homeland Canal and develop a gaging station.

- White River – Refurbish and reinstate the USGS gage immediately east of the Tule Subbasin boundary near Ducor. Establish a rated section of channel, concrete weir structure and water stage recorder at Road 208 (if this has not already occurred).

5.0 Tule Subbasin Data Management System

Efficient data management will be a critical aspect of the Coordination Agreement in order to ensure that each GSA can access the data needed to prepare their respective annual reports in a timely manner and to ensure that the Tule Subbasin TAC can meet deadlines for submittal of the coordinated reports. Data to be managed will include:

A. Historical data used as a basis for the Water Budget of the Tule Subbasin.
B. Data to be collected in accordance with the Tule Subbasin Monitoring Plan.

Both historical and future data collected as part of this TSMP will be stored in a single comprehensive electronic database. This section satisfies § 352.6 of SGMA Regulations, which requires each agency to develop and maintain a data management system (DMS) that is capable of storing and reporting information relevant to the development and implementation of the plan and monitoring of the basin. The following table outlines the sections of the Tule Subbasin DMS as they relate to the various components of the SGMA Regulations.

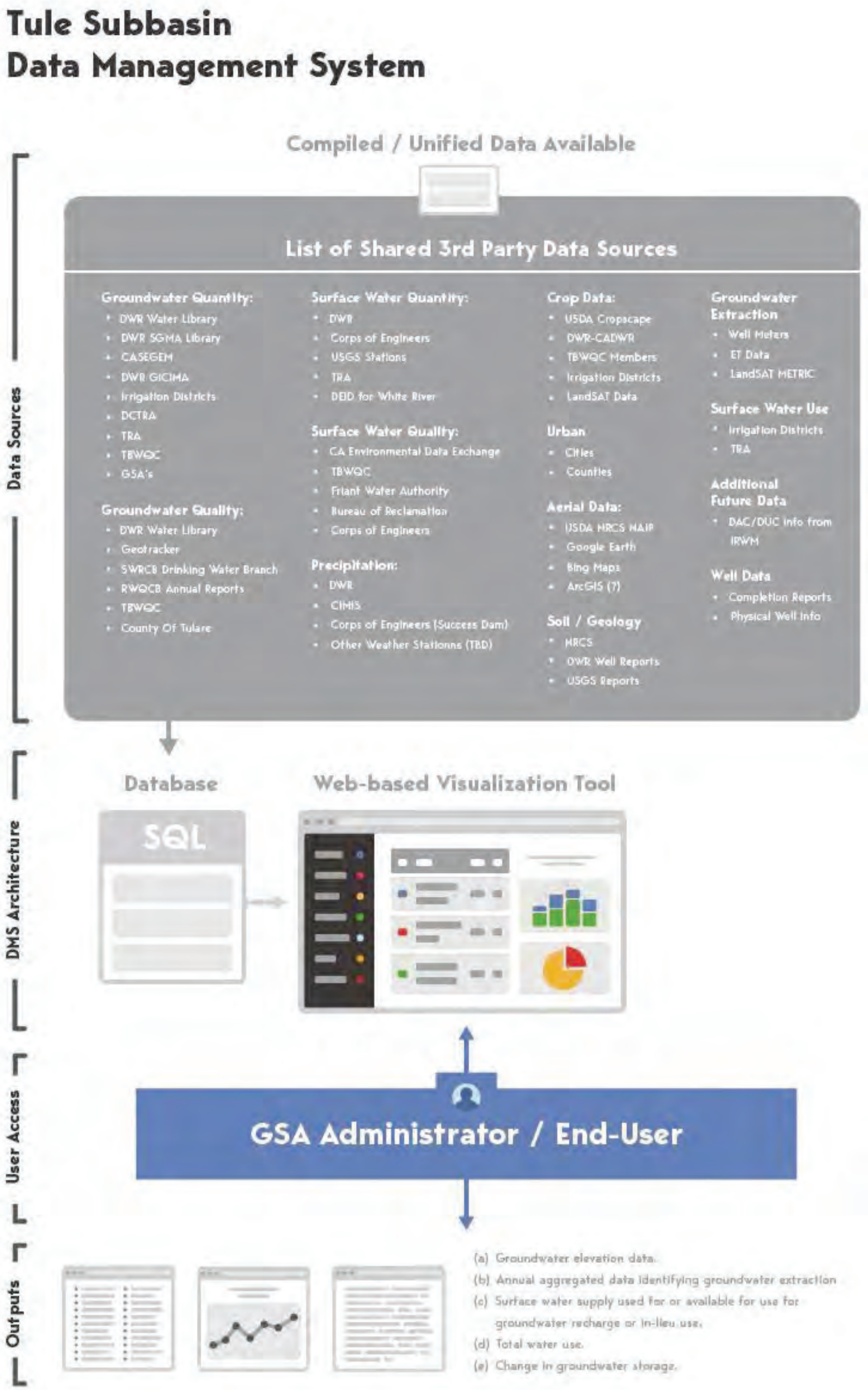
Table A1-8 – Tule Subbasin DMS SGMA Requirements

Tule Subbasin DMS SGMA Requirements		
SGMA Regulation Section No.	Coordination Agreement Corresponding Section	Description
§ 352.4	Section 5.2	Data and Reporting Standards
§ 352.6	Section 5	Data Management System
§ 353.4	Section 5.2.4.2	Reporting Provisions
§ 354.4	Section 5.2.4.2	Reporting Monitoring Data to the Department
§ 356.2	Section 5.2.4.2	Annual Reports

5.1 Overview of Tule Subbasin Data Management System

The Data Management System will allow users to view program data in comparison with all publicly available data from federal, state, and local jurisdictions to make the most informed decisions. Users will be able to submit, query, view, and analyze data as needed. The Tule Subbasin Data Management System (DMS) is comprised of two separate coordinated systems that include a SQL server and a web-based visualization platform. SQL will function as the storage and retrieval system to display the data in the web-based visualization platform. Users will have access to data sets through the web-based platform, to export data, import data, and view data in a dashboard format.

Figure A1-10: Data Management System Overview



5.2 Functionality of the Data Management System

The DMS will be comprised of various tools designed to assist GSAs in the development and implementation of their groundwater sustainability plans. At its Core, the DMS is a data storage system which grants users access to interact and upload data required to comply with SGMA regulations. Guiding the implementation of the DMS are the rules laid out in the following sections.

5.2.1 User and Data Access Permissions

User data access and permissions will be based on the predetermined user type and data source by the system administrator. User types include:

- System Admin - Users with this permission can perform all administrative functions.
- SGMA End-User - Users with this permission can perform all APN / Parcel Level functions and have access to Basin Level and GSA Level Public Data.
- End User Delegate - Users with this permission can perform all APN / Parcel Level functions and have access to Basin Level and GSA Level Public Data.
- GSA Staff - Users with this permission can perform all Farm Level and GSA Level functions and have access to Basin Level Public Data.
- GSA Manager - Users with this permission can perform all APN / Parcel Level and GSA Level functions and have access to Basin Level Public Data.
- Public User - Users may view published data but cannot import or edit information

Data viewing and access will be limited on geographic extent based on the user, such as a landowner will only be able to view data for land he/she owns or an administrator of the GSA can view data for the GSA he/she represents. Data from private or user sources will be protected in the system while publicly available data will be available basin wide. Data Source types include:

- Public - Federal, State, or local published data
- Private - District or agency specific data
- Shared - SGMA data available for all users of DMS excluding public users
- User - user specific data
- DMS - Data available from other programs (IRLP)
- Published - Data from SGMA/GSA sources available for public consumption

5.2.2 Data Entry and Validation

To encourage agency and user participation in the DMS, data entry and import tools are easy-to-use, accessible via web-based interface, and help maintain data consistency and standardization.

The DMS allows GSA Administrators and Users to enter data either manually via easy-to-use interfaces, or through an import tool utilizing standardized Microsoft Excel templates, ensuring data may be entered into the DMS consistently. The data imported will require validation by the managing GSAs Administrators or Users using a number of quality control checks prior to final import into the DMS. All data included in the system will comply with data standards laid out in § 352.4 of the SGMA Act.

5.2.2.1 Data Collection

The Tule Subbasin DMS is populated with data from various sources including public, private, contributing DMSs, and user data. Data collected in accordance with the Tule Subbasin Monitoring Plan as well as data regarding key water management areas, include:

- Precipitation
- Evapotranspiration
- Surface water flow
- Groundwater levels
- Groundwater quality
- Groundwater extraction
- Imported water deliveries
- Managed recharge
- Land surface elevation
- Land Subsidence measurements

5.2.2.2 Monitoring Data Entry (QA / QC)

For purposes of this plan, quality assurance (QA) is defined as the integrated program designed to assure reliability of monitoring and measurement data. Quality control (QC) is defined as the routine application of specified procedures to obtain prescribed standards of performance in the monitoring and measurement process.

Different monitoring protocols exist for the various data types stored in the DMS. Public sources included in the DMS as published from the source and referenced as such. User entry and private sourced data will be closely monitored for formatting and accuracy, in addition requiring chain of custody and acknowledgement of following protocols defined in the Monitoring Plan. These sources will be required to submit through pre-established forms to maintain the validity of the DMS.

5.2.2.3 Data Validation

Data Validation is required for non-public sources and will be performed in the following ways:

- **Standardized Form Input:** meant to comply with what is required by law

- **Using known possible values for a dataset:** This would represent a baseline range of what can be typed into an input. Ex: Parcels Assessed Acreage vs Irrigated Acreage
- **Data/Field Normalization:** Establishing unit consistency between datasets. The DMS will keep a normalized value behind the scenes for each variation of a reported unit. Regular Expressions on inputs to control the type/format of information being submitted to the DMS.
- **Outlier filtering:** Outlier filtering when interacting with publicly available data or data that has been mass imported. Using Statistical Analysis methods, any statistical outliers will be filtered out of reports unless the end user opts to have them included.

5.2.3 Visualizations and Analysis

The DMS will host a robust visualization and analysis component to allow end users the ability to view and provide context to the data. This can be performed in Map and Tabular views, as shown in Figure A1-11.

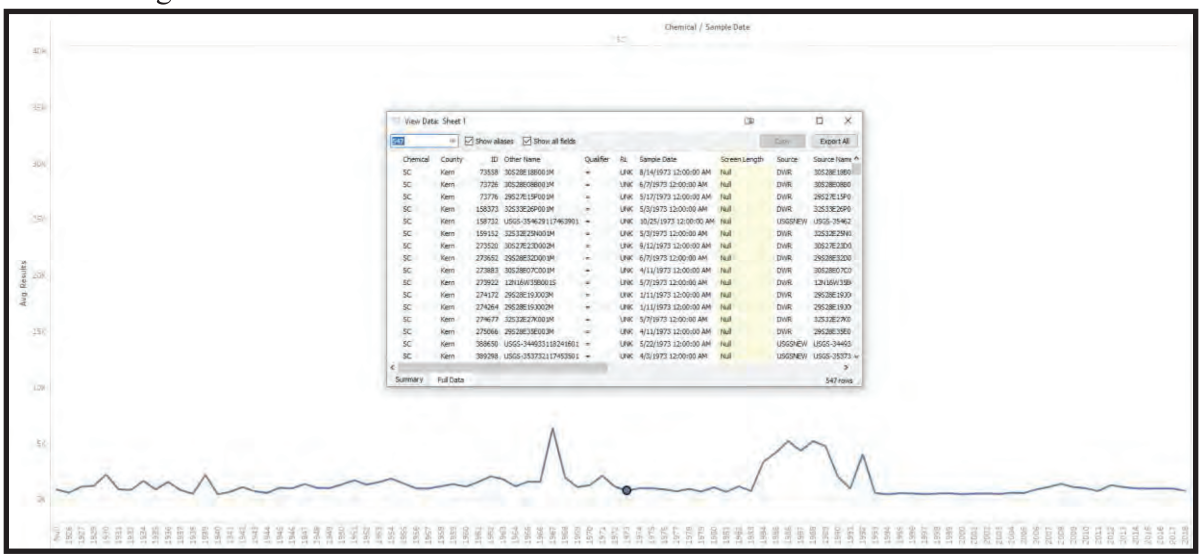


Figure A1-11: DMS Data Visualization Example - Average Specific Conductivity by Year within the Tule Sub Basin.

5.2.3.1 Map View

Map view in the DMS will allow users to visualize data that has spatial characteristics (wells, stream gages, precipitation stations, etc). **Figure A1-12** is an example of well data in the DMS. In map view users can scroll around the selected source data and click on the sites to bring up site specific information.

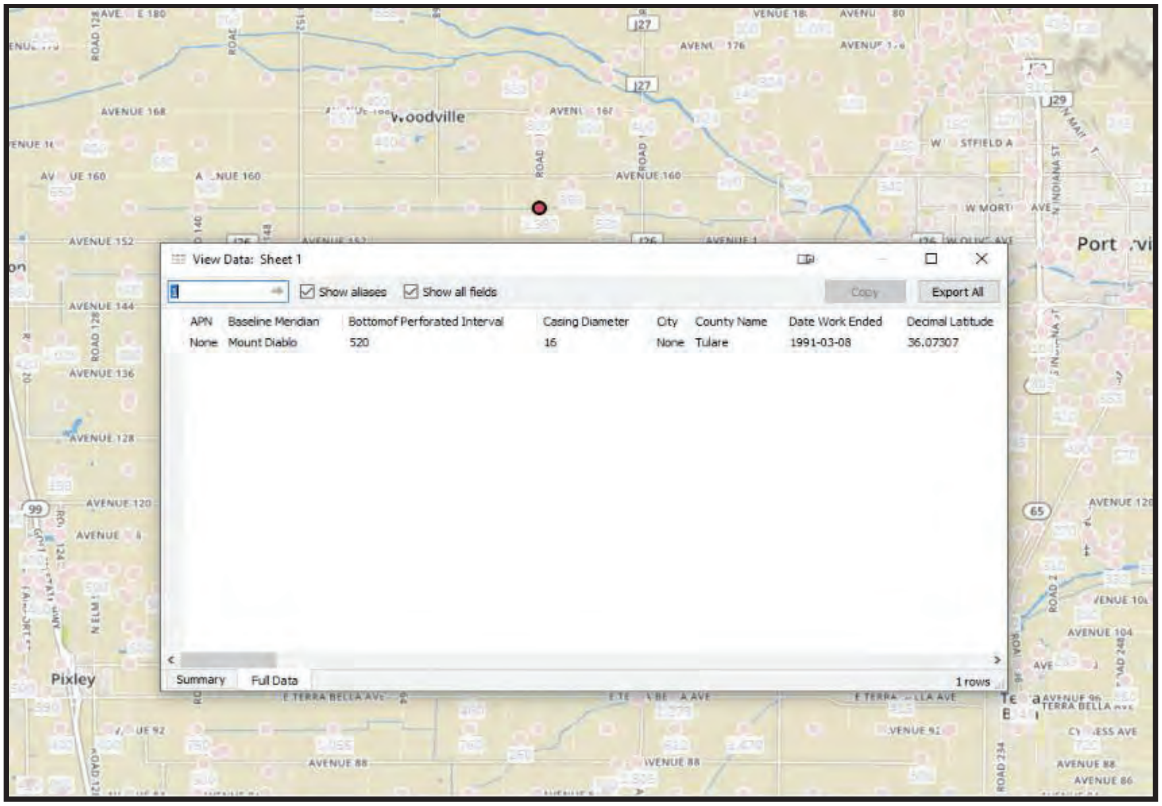


Figure A1-12: DMS Map View Example - Total Completed Well Depth Map

5.2.3.2 List View

List view presents all the data of a given dataset in tabular form. It will allow users to see all the data in the chosen data set and their attributes. Data is able to be filtered for specific attributes, geographic extent, and various other criteria.

5.2.4 Query and Reporting

Data in the DMS can be queried and reporting using various filtering and querying tools. The options are dependant on the source of the data. Reports can be prepared from the queried DMS for various formats based on the submitting agency.

5.2.4.1 Ad-hoc Query

As a relational database the DMS will have the ability to be queried by users with designed limitations for various end users (see section 5.2.1). Putting these limitations aside, any data included in the DMS can be queried based on the attributes which adhere to the data source (i.e data type, data source, parameters, geographic location, etc.). See **Figures A1-13 and A1-14** for querying examples.

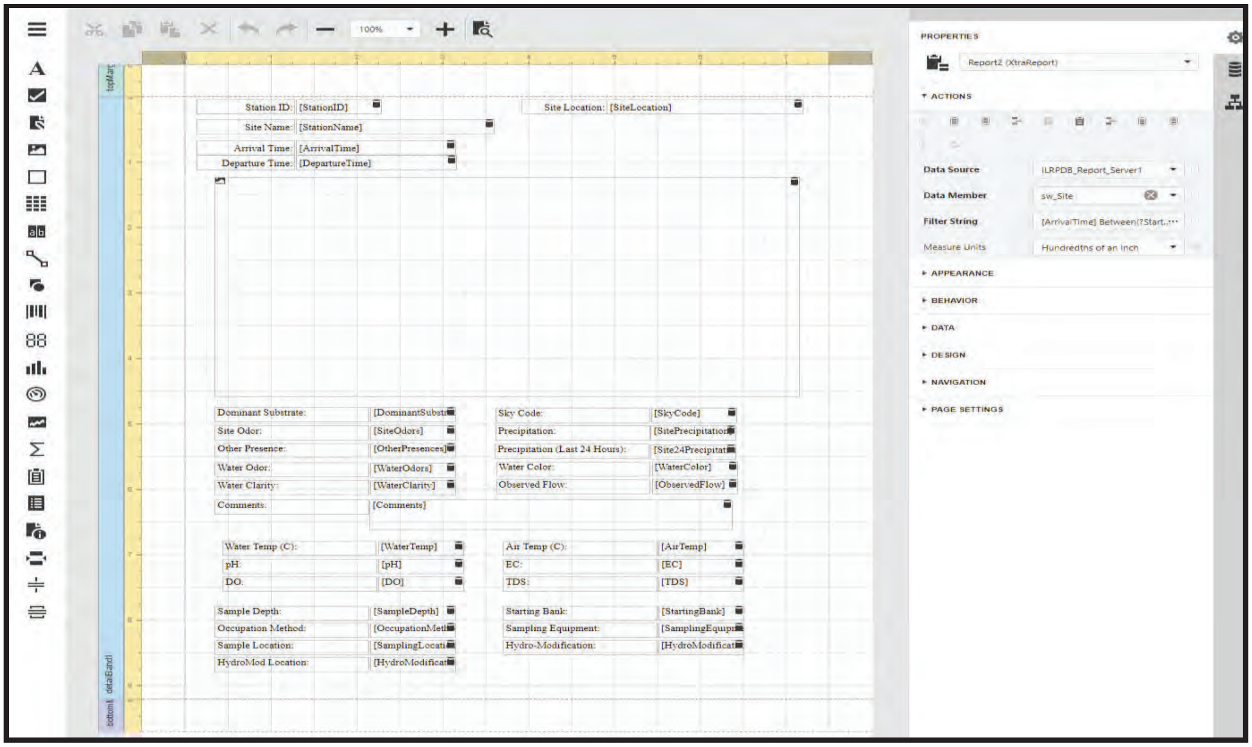


Figure A1-13: Ad Hoc Report Builder Designer View

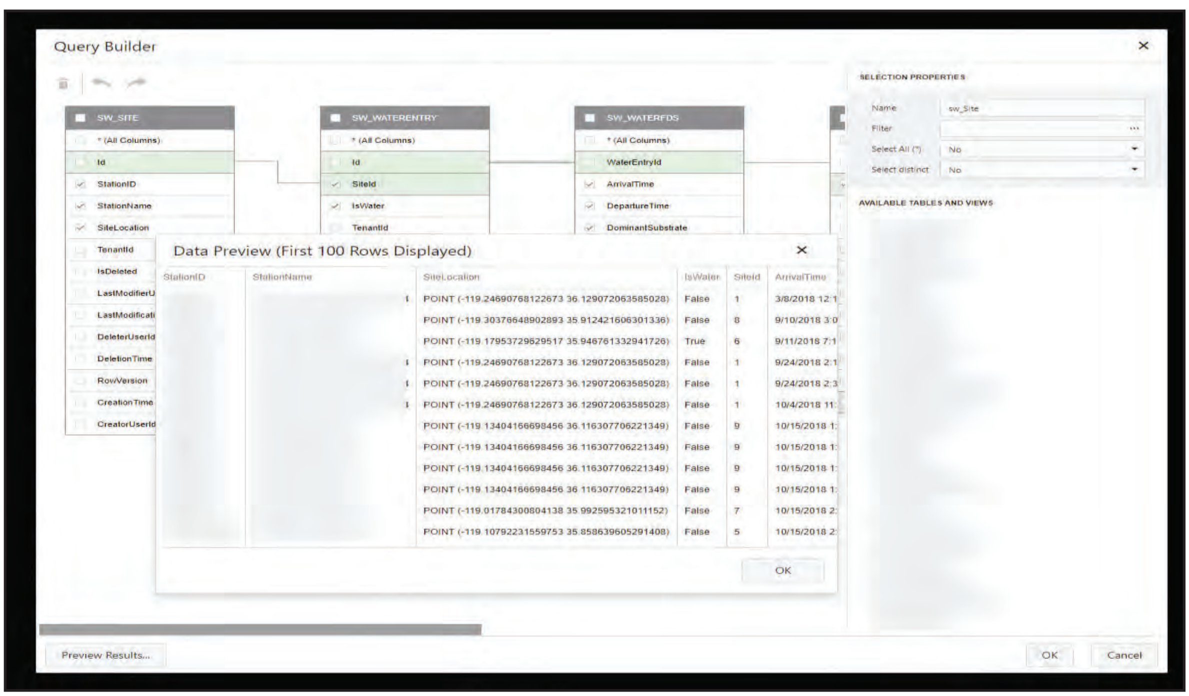


Figure A1-14: Redacted Ad Hoc Query Builder Example

5.2.4.2 Standard Reports

Standard report chart and table formats such as those included in the annual and 5-year reports can be generated utilizing the DMS. Additional reporting requirements can be created by end users. In order to provide end users with flexibility in reporting, the tools are intended to be self-serviced by the end-users. End-users will be able to create their own reports using data they have permission to access.

If commonality is discovered between participating agencies, a Standardized report can be created and shared with all agencies that as required. All generated reports and reporting tools will be built to comply with § 352.4 of the SGMA Act.

5.3 Data Included in the Data Management System

Table A1-9: Summary of Data included in DMS identifies the specific data type, the source of the data, and entry of the data in to the DMS.

Table A1-9: Summary of Data

Data Type	Source Name		Entry Type
Groundwater Quantity	DWR Water Library		Public Source
	DWR GICIMA		Public Source
	CASGEM		Public Source
	Irrigation Districts		Private Source
	DCTRA		Private Source
	TRA		Private Source
	TBWQC		DMS Transfer
	GSA'S		
	>	LTRID GSA	User Entry
	>	Pixley GSA	User Entry
	>	ET GSA	User Entry
	>	DEID GSA	User Entry
	>	Tri- County GSA	User Entry
		Tulare County GSA	User Entry

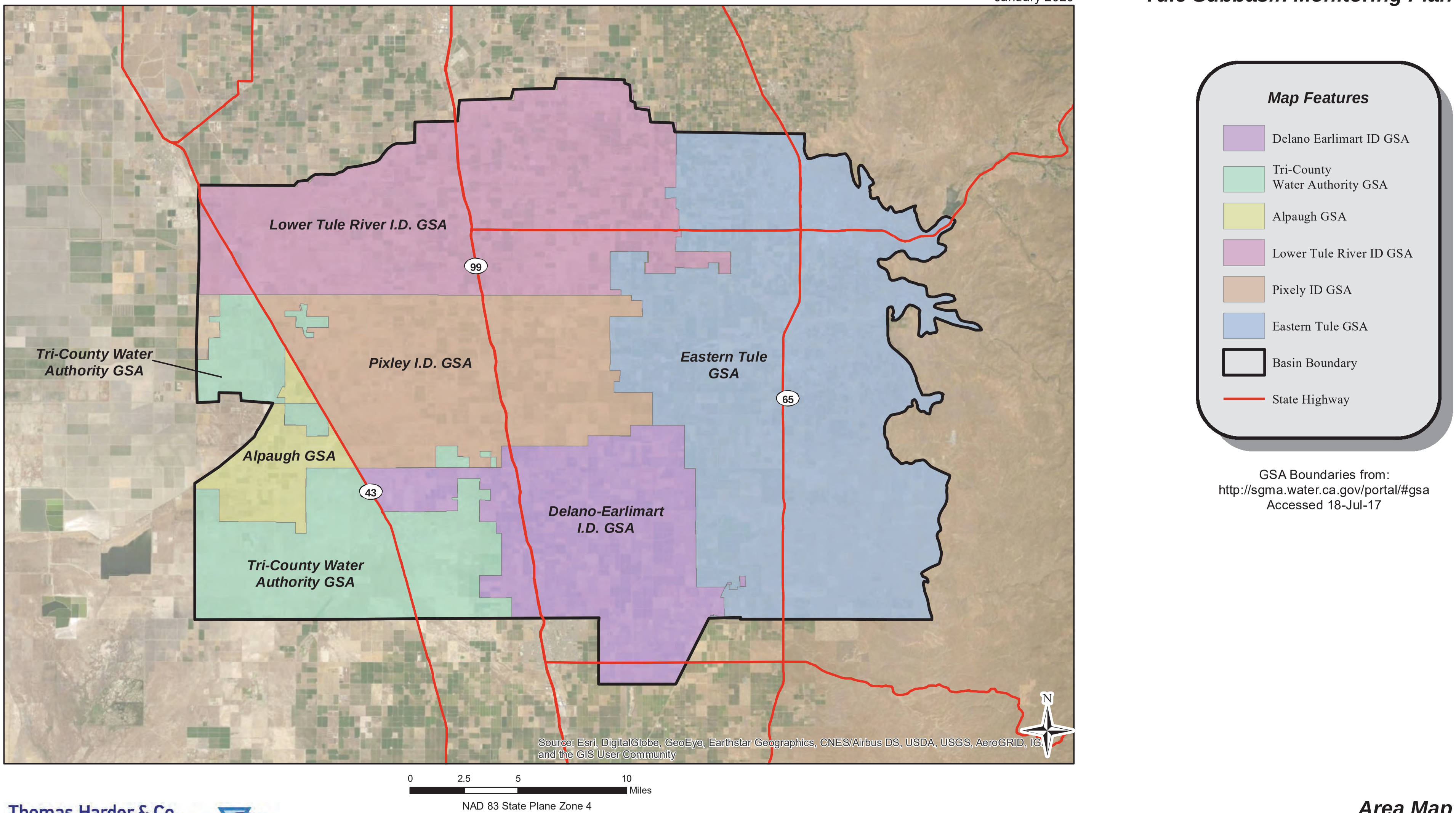
	>	Alpaught GSA	User Entry
Groundwater Quality	DWR Water Library		Public Source
	GAMA Geotracker		Public Source
	SCWRB Drinking Water Branch		Public Source
	RWQCB Annual Reports		Public Source
	TBWQC		Public Source
	County of Tulare		Public Source
Surface Water Quantity	Army Corps of Engineers		Public Source
	USGS Gaging Stations		Public Source
	Bureau of Reclamation		Public Source
	Tule River Authority		Private Source
	DWR - CDEC Stations		Public Source
Surface Water Quality	CA Environmental Data Exchange		Public Source
	TBWQC		DMS Transfer
	Friant Water Authority		Public Source
	Corps of Engineers		Public Source
Precipitation	DWR		Public Source
	CIMIS		Public Source
	Corps of Engineers		Public Source
	TBD		N/A
Crop Data	USDA Cropscape		Public Source
	DWR-CADWR		Public Source
	TBWQC Members		DMS Transfer
	Irrigation Districts		Public Source
	FMMP		Public Source
	LandSAT		Public Source
Urban	Cities		Public Source
	Counties		Public Source

Soil/Geology	NRCS	Public Source
	DWR Well Reports	Public Source
	USGS Reports	Public Source
Subsidence	USGS	Public Source
	TBWQC	Public Source
	UNAVCO	Public Source
Groundwater Extraction	Well Meters	TBD
	ET Data	DMS Transfer
	LanSAT Metric	DMS Transfer
Surface Water Use	Irrigation Districts	Private Source
	TRA	Private Source
Future Sources	DAC/DUC IRWM Info	Private Source
Well Data	Well Completion Reports	Annually
	Physical Well Info	TBD

Figures

Tule Subbasin

January 2020



Tule Subbasin Monitoring Plan

GSA Boundaries from:
http://sgma.water.ca.gov/portal/#gsa
Accessed 18-Jul-17

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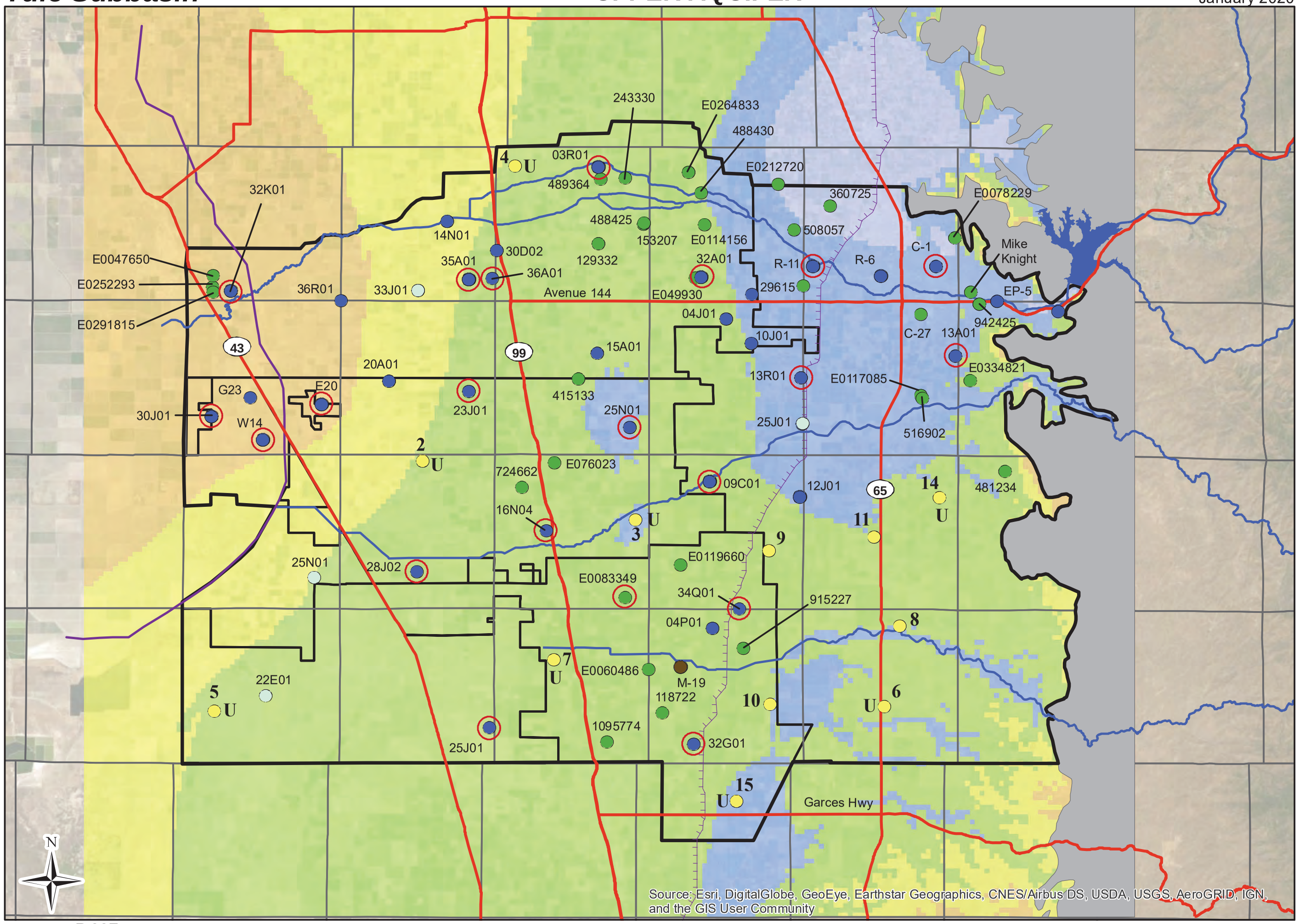
Area Map
Figure A1-1

Tule Subbasin | **UPPER AQUIFER** | January 2020



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Tule Subbasin Monitoring Plan

Map Features

- Existing Upper Aquifer Monitoring Well with Known Depth, Perforation Interval, and Historical Record
- Existing Upper Aquifer Well with Known Depth, Perforation Interval, and Historical Record
- Existing Upper Aquifer Well with Known Depth and Historical Record
- Well To Be Used For Water Quality and Water Level Monitoring
- Proposed Upper Aquifer Well Location*
- Upper Aquifer Representative Monitoring Site

Depth to Bottom of Shallow Aquifer (ft bgs)

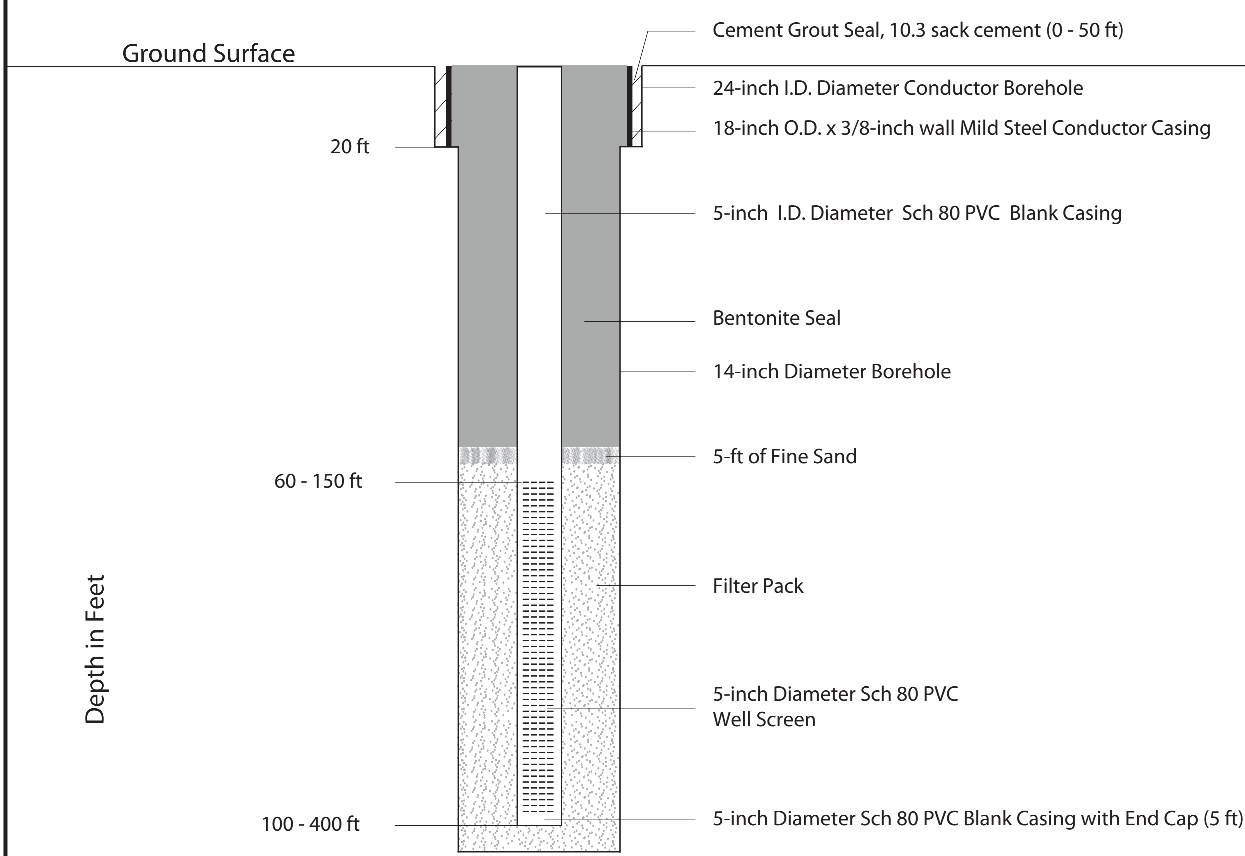
- < 100
- 100 - 200
- 200 - 300
- 300 - 400
- > 400
- Canal
- Friant-Kern Canal and California Aqueduct
- Basin Boundary
- GSA Boundaries
- State Highway/Major Road

Note: ft bgs = feet below ground surface

*Numbers indicate order of priority for construction (1 = highest priority, 10 = lowest priority)

Existing and Proposed Upper Aquifer Groundwater Level Monitoring Well Locations

Figure A1-2



Note:
1. Not to Scale.
2. Centralizers to be placed every 60 ft in screened sections only.
3. Casing to include at least one compression section.

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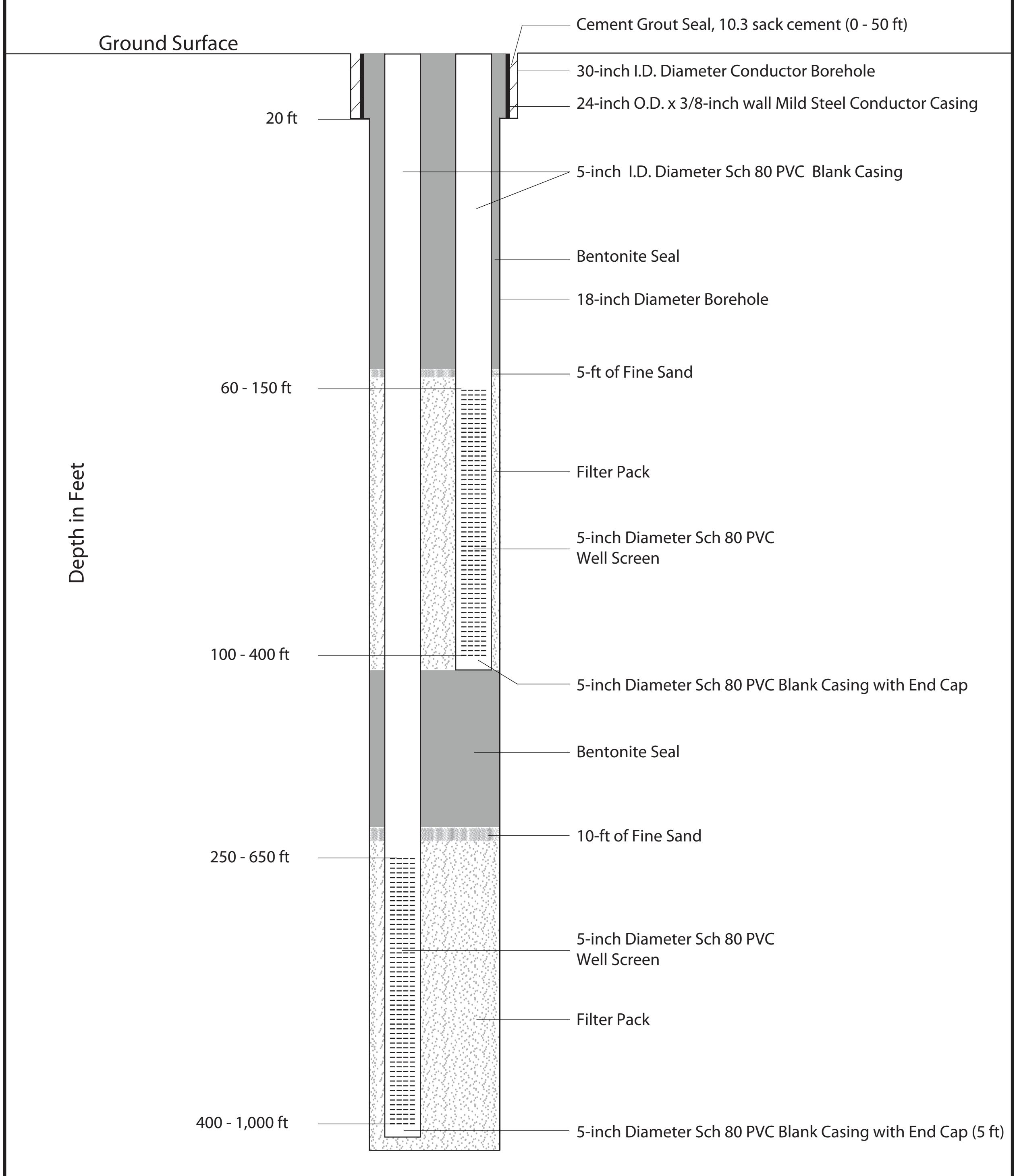
Figure A1-3
Conceptual Upper Aquifer Well Construction Diagram



Note:
1. Not to Scale.
2. Centralizers to be placed every 60 ft in screened sections onlu.
3. Each casing to include at least one compression section.

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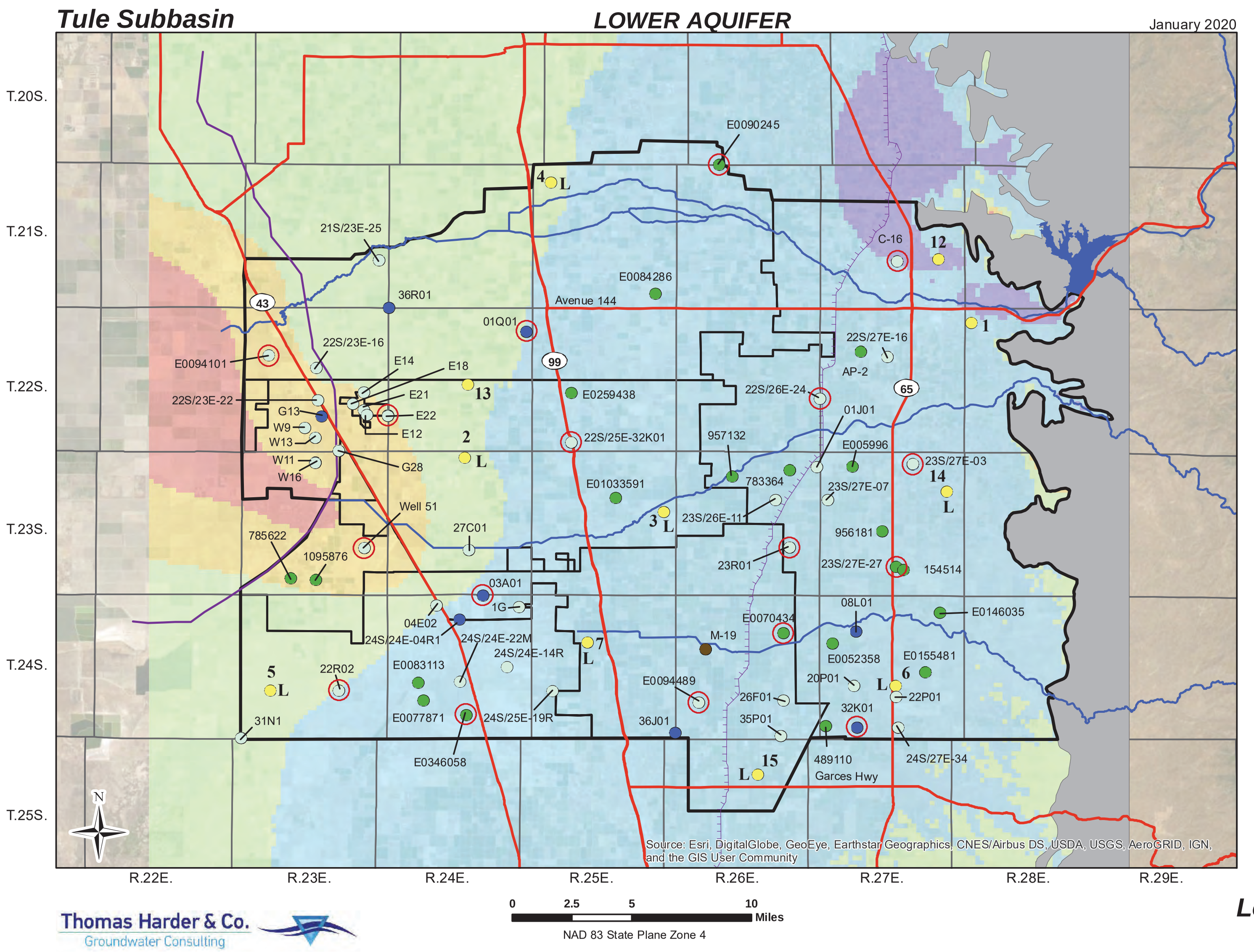
Figure A1-4
Conceptual Nested Well Construction Diagram

Tule Subbasin Monitoring Plan



Map Features

- Existing Lower Aquifer Monitoring Well with Known Depth, Perforation Interval, and Historical Record
- Existing Lower Aquifer Well with Known Depth, Perforation Interval, and Historical Record
- Existing Lower Aquifer Well with Known Deep Depth and Perforation Interval, without Historical Record
- Well To Be Used For Water Quality and Water Level Monitoring
- Proposed Lower Aquifer Well Location*
- Lower Aquifer Representative Monitoring Site

Depth to Bottom of Confining Aquifer (ft bgs)

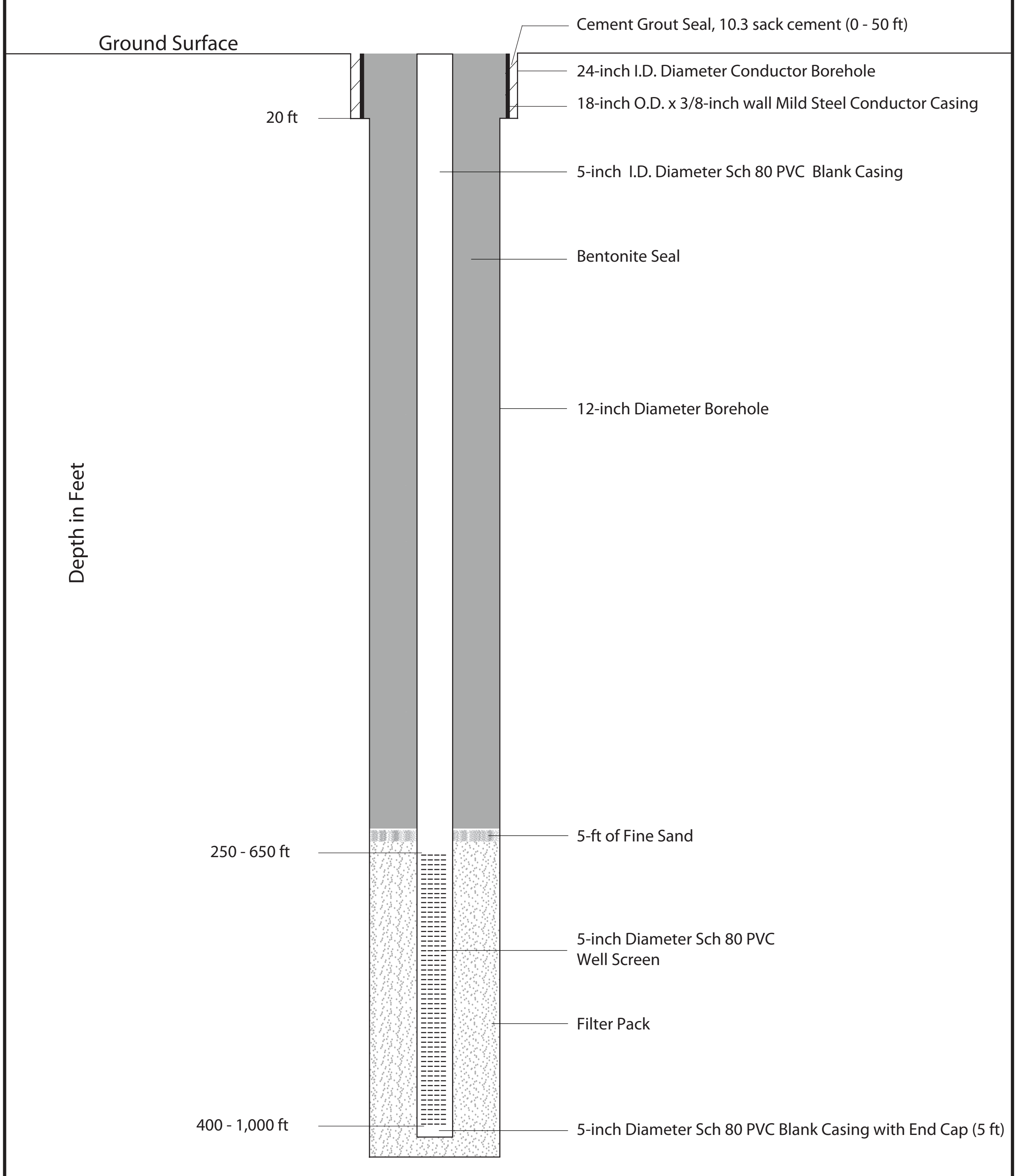
- <200
- 200-400
- 400-600
- 600-800
- >800
- Canal
- Friant-Kern Canal and California Aqueduct
- Basin Boundary
- GSA Boundaries
- State Highway/Major Road

Note: ft bgs = feet below ground surface

*Numbers indicate order of priority for construction (1 = highest priority, 10 = lowest priority)

Existing and Proposed Lower Aquifer Groundwater Level Monitoring Well Locations

Figure A1-5



Note:
1. Not to Scale.
2. Centralizers to be placed every 60 ft in screened sections only.
3. Casing to include at least one compression section.

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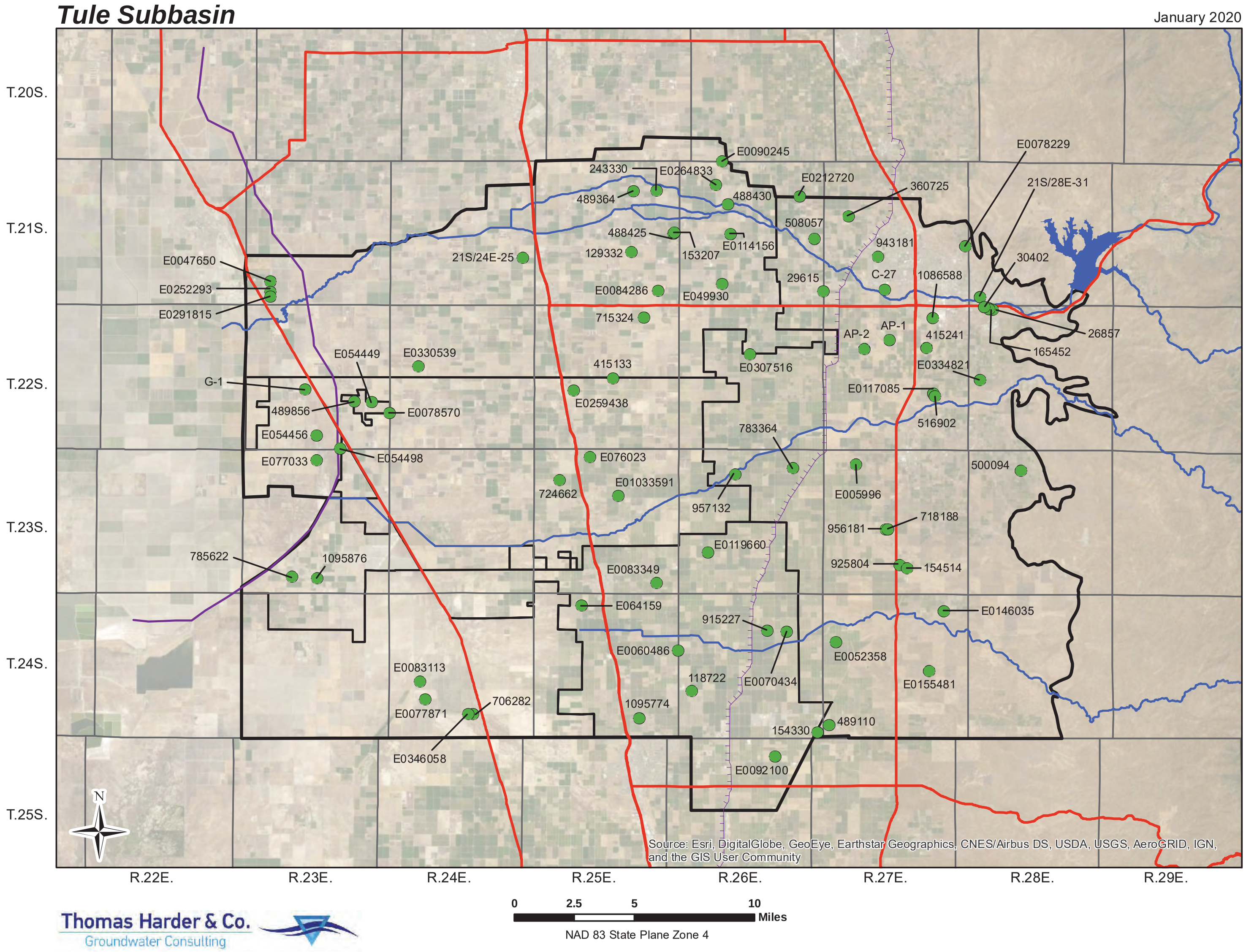
Figure A1-6
Conceptual Lower Aquifer Well Construction Diagram



Map Features

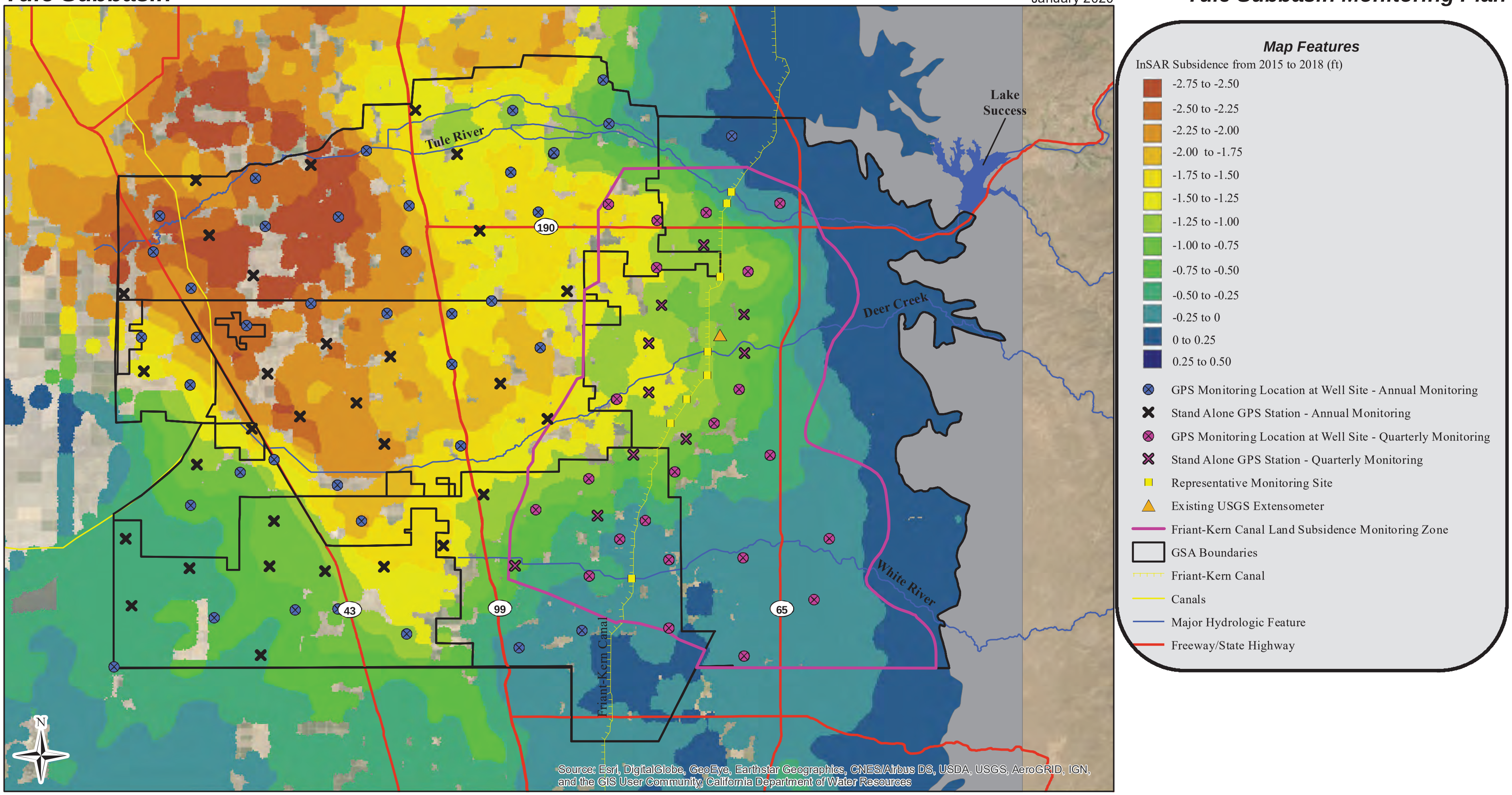
- Groundwater Quality Well Location
- Canal
- Friant-Kern Canal
- Basin Boundary
- GSA Boundaries
- State Highway/Major Road

Well Location data from:
Tule Basin Water Quality Coalition, 2017

Groundwater Quality Monitoring Network

Figure A1-7

Tule Subbasin



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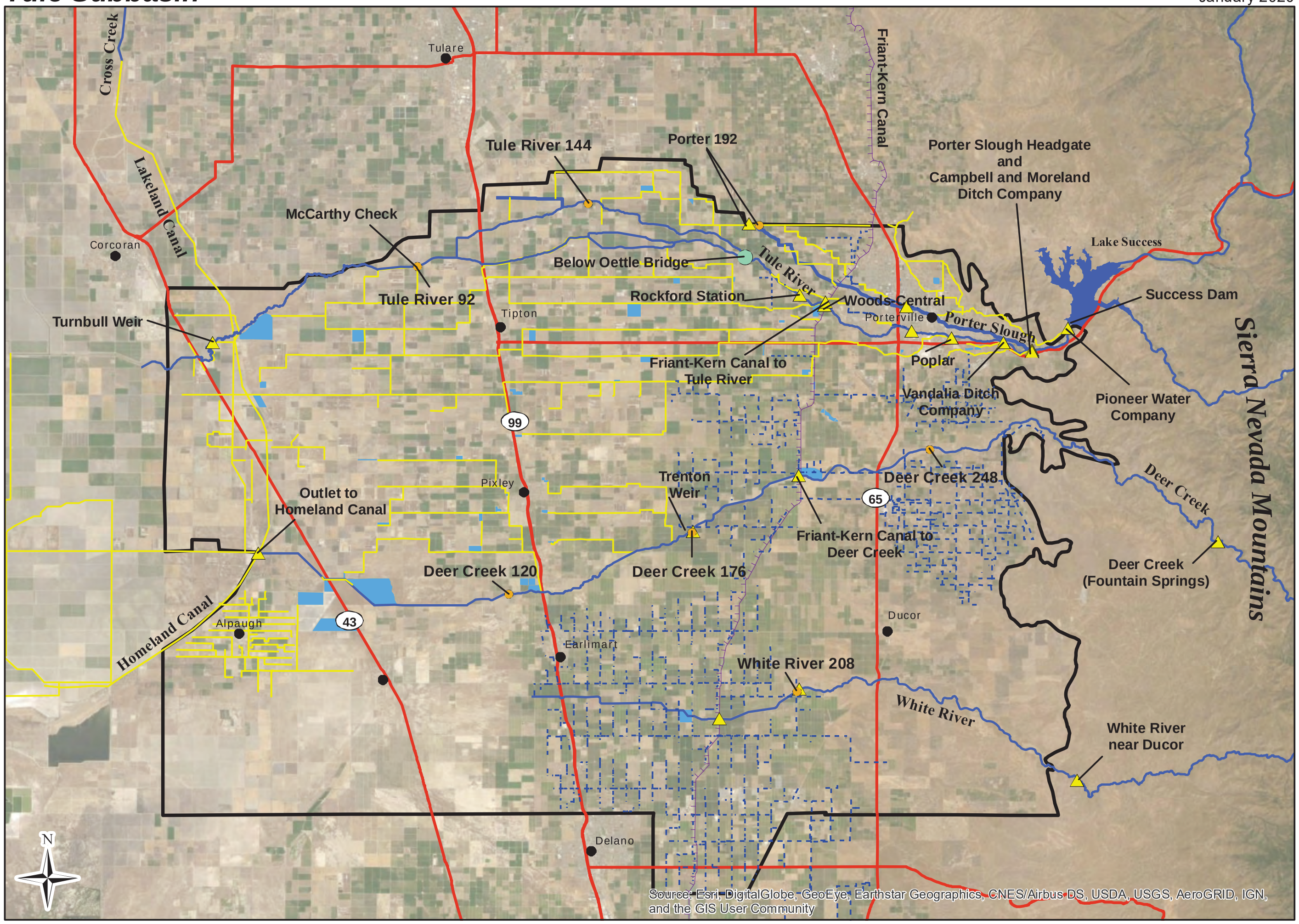
Land Subsidence Monitoring Features

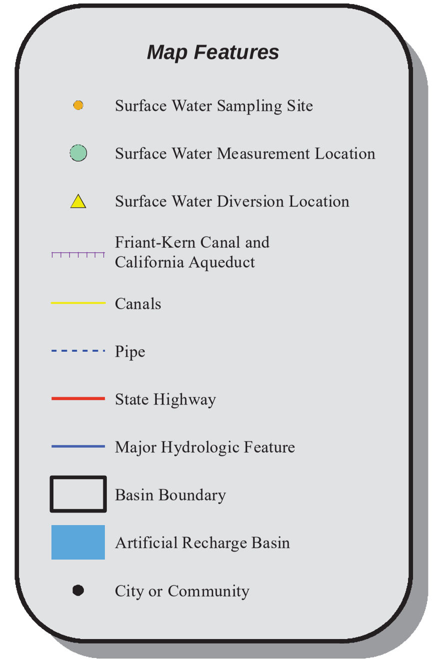
Figure A1-8

Tule Subbasin

January 2020

Tule Subbasin Monitoring Plan





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Surface Water Monitoring Features

Figure A1-9

Tables

Summary of Existing Upper Aquifer Monitoring Wells

CASGEM State Well Number	Short State Well Number	Well Name/ Well Log[1]	Borehole Depth (ft bgs)	Casing Depth (ft bgs)	Top of Perforations (ft bgs)	Bottom of Perforations (ft bgs)	Aquifer[2]	Groundwater Level Record	X-Coordinate[3] (ft)	Y-Coordinate[4] (ft)
21S23E32K001M	21S/23E-32K01	32K01	N/A[5]	406	104	402	U	1973 - 2016	6412095.50	1903994.20
21S23E36R001M	21S/23E-36R01	36R01	1,000	1,000	400	1,000	C	1970 - 2006	6434801.70	1902051.70
21S24E35A001M	21S/24E-35A01	35A01	328	328	245	302	U	1954 - 2018	6461000.50	1906317.80
21S24E36A001M	21S/24E-36A01	36A01	N/A	N/A	N/A	N/A	N/A	1957 - 2011	6465847.00	1906554.60
21S25E03R001M	21S/25E-03R01	03R01	328	274	145	238	U	1961 - 2016	6487723.90	1929460.30
21S25E30D002M	21S/25E-30D02	30D02	492	475	190	475	U	1963 - 2013	6466835.20	1912299.00
21S26E32A001M	21S/26E-32A01	32A01	267	267	153	261	U	1932 - 2016	6508783.60	1906873.40
N/A	21S/26E-34	Poplar CSD	400	400	120	400	U	N/A	6519268.00	1903301.00
22S23E30J001M	22S/23E-30J01	30J01	460	450	240	450	U	1998 - 2014	6408171.22	1878179.10
22S26E13R001M	22S/26E-13R01	13R01	385	380	240	380	U	1960 - 2017	6529368.50	1886156.20
22S27E13A001M	22S/27E-13A01	13A01	400	400	120	380	U	1945 - 2017	6561150.80	1890682.60
23S24E28J002M	23S/24E-28J02	28J02	500	500	200	500	U	1953 - 2017	6450365.70	1846351.30
23S25E16N004M	23S/25E-16N04	16N04	250	240	200	240	U	1959 - 1982	6476961.27	1854787.88
23S26E34Q001M	23S/26E-34Q01	34Q01	372	372	20	372	U	1957 - 2010	6516682.30	1838677.90
23S26E12J001M	23S/26E-12J01	12J01	280	280	233	278	U	1952 - 2008	6529147.00	1861684.10
23S26E09C001M	23S/26E-09C01	09C01	440	N/A	200	390	U	1957 - 2016	6510577.90	1864848.50
24S24E25J001M	24S/24E-25J01	25J01	210	210	159	210	U	1970 - 2017	6465264.59	1814220.76
24S26E04P001M	24S/26E-04P01	04P01	402	393	216	393	U	1979 - 2014	6511203.86	1834634.23
N/A	N/A	E20	500	490	240	480	U	2008 - 2017	6430745.43	1880707.24
N/A	N/A	G23	438	430	210	420	U	2017	6416155.20	1882056.88
N/A	N/A	W14	490	490	240	480	U	2008 - 2017	6418660.35	1873382.93
N/A	N/A	C-1	330	240	120	240	U	1982 - 2017	6557098.52	1909023.64
N/A	N/A	EP-5	154	154	60	144	U	1976 - 2016	6569711.00	1901858.00
N/A	N/A	R-6	144	144	55	144	U	1984 - 2016	6545757.48	1907098.41
N/A	N/A	R-11	216	216	0	216	U	1984 - 2016	6531833.43	1909116.17
N/A	N/A	M-19	810	N/A	200	350	U	2017	6504600.71	1826705.78
21S24E14N001M	21S/24E-14N01	14N01	124	N/A	N/A	N/A	U	1964 - 2011	6456635.30	1918367.10
21S24E33J001M	21S/24E-33J01	33J01	269	269	N/A	N/A	U	1973 - 2017	6450610.90	1904124.00
22S24E20A001M	22S/24E-20A01	20A01	170	N/A	N/A	N/A	U	1944 - 2014	6444622.00	1885479.90
22S24E23J001M	22S/24E-23J01	23J01	400	N/A	N/A	N/A	U	1947 - 2013	6461033.80	1883354.70
22S25E15A001M	22S/25E-15A01	15A01	440	N/A	N/A	N/A	U	1937 - 2011	6487438.80	1891185.30
22S25E25N001M	22S/25E-25N01	25N01	437	N/A	N/A	N/A	U	1959 - 2018	6494108.30	1875965.20
22S26E25J001M	22S/26E-25J01	25J01	500	500	N/A	N/A	U	1945 - 2017	6529609.00	1876737.90
22S26E04J001M	22S/26E-04J01	04J01	300	N/A	N/A	N/A	U	1950 - 2016	6513911.80	1898306.80
22S26E10J001M	22S/26E-10J01	10J01	351	351	N/A	N/A	U	1949 - 2014	6519177.10	1893212.50
23S23E25N001M	23S/23E-25N01	25N01	N/A	N/A	N/A	N/A	U	1990 - 2017	6429319.99	1845090.46
N/A	24S/23E-22E01	22E01	N/A	N/A	N/A	N/A	U	1980 - 2007	6419301.68	1820863.07
24S26E32G001M	24S/26E-32G01	32G01	470	N/A	N/A	N/A	U	1932 - 2009	6507271.70	1810869.60
N/A	N/A	E0047650	N/A	400	200	400	U	N/A	6408486.38	1907192.00
N/A	N/A	E0252293	N/A	440	200	440	U	N/A	6408438.17	1904886.78
N/A	N/A	E0291815	N/A	440	300	440	U	N/A	6408445.46	1903828.47
N/A	N/A	129332	N/A	507	262	506	U	N/A	6487711.08	1913720.62
N/A	N/A	415133	N/A	510	270	510	U	N/A	6483612.74	1885945.30
N/A	N/A	E0264833	N/A	500	160	500	U	N/A	6506192.28	1928386.26

Summary of Existing Upper Aquifer Monitoring Wells

CASGEM State Well Number	Short State Well Number	Well Name/ Well Log[1]	Borehole Depth (ft bgs)	Casing Depth (ft bgs)	Top of Perforations (ft bgs)	Bottom of Perforations (ft bgs)	Aquifer[2]	Groundwater Level Record	X-Coordinate[3] (ft)	Y-Coordinate[4] (ft)
N/A	N/A	942425	N/A	460	180	450	U	N/A	6566053.70	1901361.79
N/A	N/A	C-27	N/A	625	110	315	U	N/A	6553924.61	1899159.35
N/A	N/A	489364	N/A	366	192	366	U	N/A	6488123.19	1927041.36
N/A	N/A	243330	N/A	425	210	420	U	N/A	6493181.82	1927186.32
N/A	N/A	488425	N/A	257	175	225	U	N/A	6496913.37	1917715.71
N/A	N/A	488430	N/A	325	150	210	U	N/A	6508861.64	1924193.53
N/A	N/A	E0114156	N/A	262	184	262	U	N/A	6509494.64	1917599.62
N/A	N/A	E049930	N/A	280	200	260	U	N/A	6507607.41	1906657.61
N/A	N/A	E076023	N/A	495	415	495	U	N/A	6478648.96	1868669.39
N/A	N/A	724662	N/A	420	340	420	U	N/A	6471973.75	1863599.29
N/A	N/A	E0083349	N/A	305	265	305	U	N/A	6493166.76	1841069.22
N/A	N/A	E0060486	N/A	300	120	220	U	N/A	6497958.53	1826199.39
N/A	N/A	118722	N/A	350	250	350	U	N/A	6500884.75	1817362.43
N/A	N/A	1095774	N/A	340	160	320	U	N/A	6489467.92	1811332.15
N/A	N/A	915227	N/A	300	200	300	U	N/A	6517509.14	1830582.90
N/A	N/A	E0119660	N/A	300	160	300	U	N/A	6504557.55	1847672.52
N/A	N/A	E0212720	N/A	250	190	250	U	N/A	6524618.52	1925900.30
N/A	N/A	508057	N/A	300	140	300	U	N/A	6527912.85	1916543.69
N/A	N/A	29615	N/A	152	N/A	N/A	U	N/A	6529864.22	1905052.04
N/A	N/A	360725	N/A	300	150	300	U	N/A	6535325.75	1921533.07
N/A	N/A	E0078229	N/A	200	140	200	U	N/A	6561010.70	1914934.24
N/A	N/A	N/A	N/A	154	60	144	U	N/A	6564298.96	1903785.70
N/A	N/A	E0117085	N/A	300	140	300	U	N/A	6553981.62	1882593.06
N/A	N/A	516902	N/A	512	113	493	U	N/A	6554300.05	1881957.00
N/A	N/A	E0334821	N/A	510	190	510	U	N/A	6564216.34	1885626.39
N/A	N/A	153207	N/A	124	N/A	N/A	U	N/A	6497078.07	1917958.02
N/A	N/A	481234	N/A	150	26.5	76.5	U	N/A	6571352.62	1866958.59

Note:
[1]

[2] U = Well Perforated in Upper Aquifer
[3] X-Coordinates in State Plane Zone 4 (feet)
[4] Y-Coordinates in State Plane Zone 4 (feet)
[5] N/A = Not Available

Summary of Proposed New Upper Aquifer Monitoring Wells

GSA	Name	X-Coordinate (ft)	Y-Coordinate (ft)
LTRID	4U[1]	6470559	1929673
Eastern Tule	6U	6546470	1818649
Eastern Tule	8	6549619	1835101
Eastern Tule	9	6522816	1850583
Eastern Tule	11	6544409	1853404
Eastern Tule	14U	6557843	1861531
Pixley	2U	6451539	1869024
Pixley	3U	6495374	1856980
Delano-Earlimart	7U	6478589	1828230
Delano-Earlimart	10	6523033	1819116
Delano-Earlimart	15U	6516121	1799091
Tri-County	5U	6408771	1817667

Notes:

[1] U = Nested Monitoring Well in Upper Aquifer

Summary of Existing Lower Aquifer Monitoring Wells

CASGEM State Well Number	Short State Well Number	Well Name/ Well Log[1]	Borehole Depth (ft bgs)	Casing Depth (ft bgs)	Top of Perforations (ft bgs)	Bottom of Perforations (ft bgs)	Aquifer[2]	Groundwater Level Record	X-Coordinate[3] (ft)	Y-Coordinate[4] (ft)
21S23E36R001M	21S/23E-36R01	36R01	1,000	1,000	400	1,000	C	1970 - 2016	6434801.70	1902051.70
22S24E01Q001M	22S/24E-01Q01	01Q01	720	700	480	700	C	1963 - 2016	6465167.90	1896726.90
24S24E03A001M	24S/24E-03A01	03A01	1,602	1,602	804	1,602	L	1961 - 2014	6455569.94	1838609.71
24S25E36J001M	24S/25E-36J01	36J01	1,415	1,398	437	1,398	C	1953 - 2008	6497983.50	1808316.10
24S24E04R001M	24S/24E-04R01	04R01	N/A	N/A	800	1,600	L	1974 - 2017	6450364.19	1833278.17
N/A[5]	N/A	G13	N/A	1,604	782	1,604	L	1962 - 2017	6420049.12	1878148.78
24S27E08L001M	24S/27E-08L01	08L01	1,747	1,747	522	1,747	L	1982 - 2016	6537756.15	1830621.30
24S27E32K001M	24S/27E-32K01	32K01	1,800	1,800	1,002	1,800	L	1987 - 2016	6537999.71	1809516.91
N/A	E0117919	M-19	810	N/A	705	805	L	2017	6504600.71	1826705.78
N/A	21S/23E-25	Well #1	1,280	1,270	640	1,260	L	N/A	6432651.62	1912487.53
N/A	22S/23E-07	E0094101	1,020	1,000	660	1,000	L	N/A	6408374.89	1891525.53
N/A	22S/23E-16	N/A	1,300	1,210	560	1,210	L	N/A	6418887.00	1888796.00
N/A	22S/23E-22	E072308	1,090	1,050	670	1,030	L	N/A	6419172.25	1881612.85
N/A	22S/26E-24	E0094537	1,270	1,240	670	1,220	L	N/A	6529798.27	1881998.97
N/A	22S/27E-16	N/A	1,240	1,240	800	1,240	L	N/A	6544648.00	1891172.00
N/A	23S/24E-24	Well 51	1,515	1,400	770	1,400	L	N/A	6429394.74	1849064.47
23S24E27C001M	23S/24E-27C01	27C01	1,602	1,602	804	1,602	L	N/A	6452419.30	1848580.60
23S26E01J001M	23S/26E-01J01	01J01	1,830	1,830	1,370	1,830	L	N/A	6529185.80	1866958.90
N/A	23S/26E-11	Road 208 Ranches	1,069	1,011	567	1,011	L	N/A	6520095.00	1859642.00
N/A	23S/26E-23R01	23R01	1,720	1,700	600	1,700	L	N/A	6523098.00	1849144.00
N/A	23S/27E-07	942277	1,800	1,800	625	1,800	L	N/A	6531568.34	1859684.45
24S23E22R002M	24S/23E-22R02	22R02	1,205	1,200	500	1,200	L	N/A	6423825.93	1817704.00
24S23E31N001M	24S/23E-31N1	118716	1,190	1,190	490	1,190	C	N/A	6402252.83	1807129.85
N/A	24S/24E-1G	49066 (1G)	1,405	1,382	640	1,382	L	N/A	6463568.45	1836049.64
N/A	24S/24E-04E02	04E02	1,200	1,200	798	1,200	L	N/A	6445339.36	1836429.04
24S26E26F001M	24S/26E-26F01	26F01 (74)	1,402	1,400	550	1,400	L	N/A	6521800.00	1815487.10
N/A	24S/26E-30	E0094489	1,410	1,150	530	1,150	L	N/A	6503110.41	1814991.24
N/A	24S/26E-35P01	35P01	1,600	1,400	600	1,400	L	N/A	6521182.00	1807682.00
24S27E20P001M	24S/27E-20P01	20P01	1,824	1,824	648	1,824	L	N/A	6537355.10	1818727.70
24S27E22P001M	24S/27E-22P01	22P01	N/A	884	503	884	L	N/A	6546649.60	1816315.76
N/A	24S/27E-34	118749	1,750	1,750	600	1,750	L	N/A	6547077.10	1809466.12
N/A	22S/25E-32K01	32K01	700	700	500	700	L	N/A	6475029.00	1872343.10
N/A	23S/27E-03	120307	600	600	200	590	C	N/A	6550348.00	1867500.585
N/A	24S/24E-14R	N/A	N/A	N/A	580	1,395	L	N/A	6460903.82	1822868.19
N/A	24S/24E-22M	N/A	N/A	N/A	650	1,320	L	N/A	6450477.18	1819618.63
N/A	24S/25E-19R	N/A	N/A	N/A	720	1,100	L	N/A	6470931.01	1817586.16
N/A	N/A	C-16	560	548	240	548	C	N/A	6546905.85	1912286.77
N/A	N/A	E12	N/A	2,018	1,260	1,854	L	N/A	6430007.76	1878451.77
N/A	N/A	E14	N/A	1,788	597	1,788	L	N/A	6429364.34	1883346.59
N/A	N/A	E18	960	960	580	930	L	N/A	6426904.38	1880821.15
N/A	N/A	E21	1,220	1,200	640	1,200	L	N/A	6429351.35	1879426.80
N/A	N/A	E22	1,160	1,140	640	1,120	L	N/A	6434650.16	1878355.26
N/A	N/A	G28	1,120	1,120	762	1,122	L	N/A	6423830.05	1870502.10

Summary of Existing Lower Aquifer Monitoring Wells

CASGEM State Well Number	Short State Well Number	Well Name/ Well Log[1]	Borehole Depth (ft bgs)	Casing Depth (ft bgs)	Top of Perforations (ft bgs)	Bottom of Perforations (ft bgs)	Aquifer[2]	Groundwater Level Record	X-Coordinate[3] (ft)	Y-Coordinate[4] (ft)
N/A	N/A	W9	N/A	1,836	674	1,836	L	N/A	6416335.33	1875523.70
N/A	N/A	W11	N/A	1,830	808	1,825	L	N/A	6418652.49	1867891.17
N/A	N/A	W13	N/A	1,830	747	1,809	L	N/A	6418665.26	1873369.95
N/A	N/A	W16	1,332	1,312	870	990	L	N/A	6418611.69	1867979.07
N/A	N/A	E0090245	N/A	680	320	680	C	N/A	6507628.23	1933559.65
N/A	N/A	957132	N/A	1,000	400	1,000	C	N/A	6510431.02	1864866.94
N/A	N/A	AP-2	N/A	720	270	720	C	N/A	6538858.37	1892320.63
N/A	N/A	785622	N/A	1,020	800	1,000	C	N/A	6413250.92	1842366.61
N/A	N/A	1095876	N/A	1,245	1,025	1,210	L	N/A	6418751.35	1842025.74
N/A	N/A	E0083113	N/A	1,000	600	1,000	L	N/A	6441270.92	1819422.91
N/A	N/A	E0077871	N/A	1,000	600	1,000	L	N/A	6442496.57	1815506.46
N/A	N/A	E0346058	N/A	1,260	440	970	C	N/A	6451860.34	1812265.02
N/A	N/A	E01033591	N/A	800	320	800	C	N/A	6484766.18	1860104.52
N/A	N/A	E0070434	N/A	760	260	760	C	N/A	6521740.06	1830270.25
N/A	N/A	489110	N/A	850	480	830	C	N/A	6531099.23	1809811.80
N/A	N/A	E0052358	N/A	1,870	1,281	1,860	L	N/A	6532531.94	1828018.91
N/A	N/A	E0155481	N/A	1,500	1,090	1,500	L	N/A	6553106.33	1821698.65
N/A	N/A	E0146035	N/A	1,435	422	1,435	C	N/A	6556353.14	1834766.91
N/A	23S/27E-27	925804	N/A	1,405	1,035	1,385	L	N/A	6546651.22	1844949.66
N/A	N/A	154514	N/A	1,341	1,136	1,336	L	N/A	6548254.61	1844217.46
N/A	N/A	956181	N/A	770	340	700	C	N/A	6543581.82	1852748.44
N/A	N/A	E005996	N/A	1,000	520	1,000	L	N/A	6536939.02	1866999.73
N/A	N/A	783364	N/A	612	246	612	C	N/A	6523188.53	1866237.80
N/A	N/A	E0084286	N/A	650	320	640	C	N/A	6493617.81	1905178.76
N/A	N/A	E0259438	N/A	840	340	840	C	N/A	6475059.65	1883261.03

Note:

[1]

[2] L = Well Perforated in Lower Aquifer
C = Well Perforated Across Multiple Aquifers (i.e. Composite)

[3] X-Coordinates in State Plane Zone 4 (feet)

[4] Y-Coordinates in State Plane Zone 4 (feet)

[5] N/A = Not Available

Summary of Proposed New Lower Aquifer Monitoring Wells

GSA	Name	X-Coordinate (ft)	Y-Coordinate (ft)
LTRID	4L[1]	6470559	1929673
Eastern Tule	1	6563239	1898658
Eastern Tule	6L	6546470	1818649
Eastern Tule	12	6555939	1912715
Eastern Tule	14L	6557843	1861531
Pixley	2L	6451539	1869024
Pixley	3L	6495374	1856980
Pixley	13	6452211	1885136
Delano-Earlimart	7L	6478589	1828230
Delano-Earlimart	15L	6516121	1799091
Tri-County	5L	6408771	1817667

Notes:

[1] L = Nested Monitoring Well in Lower Aquifer

Groundwater Quality Trend Monitoring Constituents

Annual Sampling				Five Year Sampling			
Field Analysis	**Units**	**Laboratory Analysis**	**Units**	**Field Analysis**	**Units**	**Laboratory Analysis**	**Units**
Electrical Conductivity (EC)	µmhos/cm[1] (at 25˚C)	Nitrate as N	mg/L	Electrical Conductivity (EC)	µmhos/cm (at 25˚C)	Total Dissolved Solids (TDS)	mg/L
pH	Standard Unit	-	-	pH	Standard Unit	Nitrate as N	mg/L
Dissolved Oxygen (DO)	mg/L[2]	-	-	Dissolved Oxygen (DO)	mg/L	Carbonate	mg/L
Temperature	˚C[3]	-	-	Temperature	˚C	Bicarbonate	mg/L
-	-	-	-	-	-	Chloride	mg/L
-	-	-	-	-	-	Sulfate	mg/L
-	-	-	-	-	-	Boron	mg/L
-	-	-	-	-	-	Calcium	mg/L
-	-	-	-	-	-	Sodium	mg/L
-	-	-	-	-	-	Magnesium	mg/L
-	-	-	-	-	-	Potassium	mg/L

Note:

[1] µmhos/cm = micromhos per centimeter

[2] mg/L = milligrams per liter

[3] ˚C = Degrees Celcius

Stream Gages in the Tule Subbasin

River	Stream Gage	Location (Latitude, Longitude)	Period of Record	Gage Type	Comments
Tule River	Success Dam	Lat 36° 03' 23", Long 118° 55' 22"	October 1953 - Present	Water stage recorder	The discharge at this station is controlled by the release from Success Reservoir. The recorder is operated and maintained by the U.S. Army Corps of Engineers.
	Rockford Station	Lat. 36° 04' 40", Long 119° 06' 22"	February 1957 - Present	Concrete weir equipped with a water stage recorder	The recorder is operated and maintained by the Tule River Association.
	Turnbull Weir	Lat 36° 03' 4", Long 119° 30'	1942 - Present	Rated section of the natural channel equipped with a staff gage	Records currently maintained by the TRA with the assistance of Downstream Kaweah and Tule Rivers Association. Manual measurements of stream velocity and stage are conducted by LTRID.
	Friant-Kern Canal Discharge into the Tule River	Lat. 36° 04' 25", Long 119° 05' 15"	June 1950 - Present	Modified 20 ft parshall flume	Records are furnished by the U.S. Bureau of Reclamation.
	Friant-Kern Canal Discharge into the Porter Slough	Lat. 36° 05' 00", Long. 119° 04' 50"	June 1950 - Present	15 ft rectangular weir	Records are furnished by the U.S. Bureau of Reclamation.
Deer Creek	Deer Creek at Fountain Springs	Lat 35° 56' 30", Long 118° 49' 19"	1968 - Present	Water stage recorder	Gage operated, managed and data collected by the USGS.
	Deer Creek at Trenton Weir*	Lat 36° 56' 46", Long 119° 10' 52"	N/A	Concrete weir equipped with a water stage recorder	Records currently maintained by the U.S. Army Corps of Engineers.
	Deer Creek at Homeland Canal	N/A[1]	N/A	N/A	
White River	Road 208*	Lat 35° 51' 32", Long 119° 6' 28"	N/A	N/A	Streamflow in this river is currently monitored manually at Road 208 by the Tule Basin Water Quality Coalition and Delano-Earlimart Irrigation District.

Notes:

[1] N/A = Not Available

* Latitude and Longitude are estimated from ArcGIS for Deer Creek at Trenton Weir and at Road 208 along the White River. All other latitude and longitude measurements are reported by the United States Geological Survey.

Surface Water Quality Constituents for Analysis

Constituent	Units	Trigger Limit	Tule River Poplar Avenue (2004 - 2005)	Deer Creek Road 248 (2010 - 2013)	White River Road 208 (2011)
Electrical Conductivity	µS/cm[1]	*1,000.00*	67.7 - 157.8	148 - 284	272 - 304
pH	n/a[6]	*6.5 - 8.3*	7.02 - 8.94	7.7 - 8.9	8.18 - 9.03
Total Dissolved Oxygen	mg/L[2]	*min. 7.0*	6.3 - 9.4	7.0 - 11.1	8.94 - 10.64
E. Coli	MPN[5]/100 mL	*235.00*	n/a	81.3 - 2,419	980.40
Total Organic Carbon	mg/L	*n/a*	0.58 - 6.77	1.65 - 7.2	6.2 - 8.7
Hardness (as $CaCO_3$)	n/a	*n/a*	22.4 - 66.6	51.5 - 95.5	97.8 - 109.0
Total Suspended Solids	mg/L	*n/a*	n/a	4.75 - 574	73.3 - 91.0
Total Dissolved Solids	mg/L	*450.00*	50.0 - 120.0	99 - 398	180 - 211
Turbidity	NTU[4]	*n/a*	4.4 - 35	1.58 - 12.0	55.8 - 86.9
Arsenic	µg/L[3]	*10*	1.47 - 2.37	1.71 - 2.36	n/a
Boron	µg/L	*700.00*	19 - 38	28.6 - 93.7	n/a
Cadmium (Total)	µg/L	*5*	0.011 - 0.050	0.03 - 0.2	n/a
Copper (Total)	µg/L	*1,300.00*	3.54 - 5.93	1.58 - 3.82	n/a
Lead (Total)	µg/L	*15.00*	0.23 - 0.81	0.32 - 5.43	n/a
Molybdenum (Total)	µg/L	*10 / 35*	n/a	0.0044 - 0.0082	n/a
Nickel (Total)	µg/L	*100.00*	0.47 - 2.23	0.51 - 3.84	n/a
Selenium (Total)	µg/L	*50.00*	0.36	1.0 - 2.0	n/a
Zinc (Total)	µg/L	*n/a*	2.54 - 6.19	4.86 - 34.5	n/a
Phosphorus as P	mg/L	*n/a*	21.1 - 64.1	0.01 - 0.014	0.06 - 0.34
Ammonia	mg/L	*1.50*	0.07	0.05 - 0.028	0.069 - 0.20
Nitrate as N	mg/L	*10.00*	0.07 - 0.30	0.03 - 1.00	0.70 - 2.90
Orthophosphate as P	mg/L	*n/a*	0.01 - 0.16	0.03 - 0.022	0.23 - 0.84
Phosphorus as P	mg/L	*n/a*	21.1 - 64.1	0.01 - 0.014	0.06 - 0.34

Note:
[1] µS/cm = microsiemen per centimeter
[2] mg/L = milligrams per liter
[3] µg/L = micrograms per liter
[4] NTU = Nephelometric Turbidity Unit
[5] MPN = Most Probable Number
[6] n/a = Not Available

Appendices

Appendix A

Driller's Logs and Hydrographs for Existing Upper Aquifer Wells

DUPLICATE 21/24-35A1
File Original, Duplicate and Triplicate with the
DIVISION OF WATER RESOURCES
P. O. BOX 1079
SACRAMENTO 5, CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SHEET 1 — 524 Tulare

elev 257 PDG 21/24-35A1 (G.S.)

Do Not Fill In
State Well No. 21/24E-34A1
Other Well No.
Region 5

WATER WELL DRILLERS REPORT

Dec. 21, 1950 (Sections 7076, 7077, 7078, Water Code)

(1) Driller:
Name: Knapp & Graham
Address: 463 W. Inyo, Tulare, Calif.
License No. 44956 Classification C-57

(2) Proposed use or uses (check):
Domestic ☐ Municipal ☐
Irrigation ☒ Industrial ☐
Domestic and Irrigation ☐ Test well ☐
Other

(3) Equipment used (check):
Rotary ☐
Cable ☒
Dug well ☐
Other

[redacted]

(4) Type of work (check):
New well ☒ Reconditioning of well ☐
Deepening existing well ☐

(5) Well log:
Total depth of well 315 ft.

Give details of formations penetrated, such as silt, peat, muck, sand, gravel, clay, shale, sandstone, hardpan, rock. Include size of gravel (diameter) and sand (fine, medium, coarse), color of material, structure (loose, packed, cemented, soft, hard, brittle).

Depth From Ground Surface (ft. to ft.)		Formation
0	4	Soil
4	23	Yellow Clay
23	26	Sand Med.
26	63	Sandy Clay
69	104	Pack Sand
104	106	Med Sand
106	134	Sandy Clay
134	137	Pack Sand
137	154	Sandy Clay
154	168	Coarse Sand
168	204	Sandy Clay
204	213	Blue Clay
213	246	Blue Sandy Clay
246	268	Blue Sand Med.
268	279	Sticky Blue Clay
279	302	Coarse Blue Sand
302	315	Sticky Blue Clay
315	?	Black Clay

If additional space is required, continue on DWR Form No. 246—Supplement, and attach to respective report copies.

(6) Casing left in well: 1-X

LENGTH FT.	DIAMETER INCHES	SINGLE, DOUBLE, WELDED, OTHER	LBS. PER FOOT OR GAGE OF CASING	SEATING BELOW GROUND SURFACE, FT.
328	12	✓	10 ga.	315
			(.134)	

11-062-08

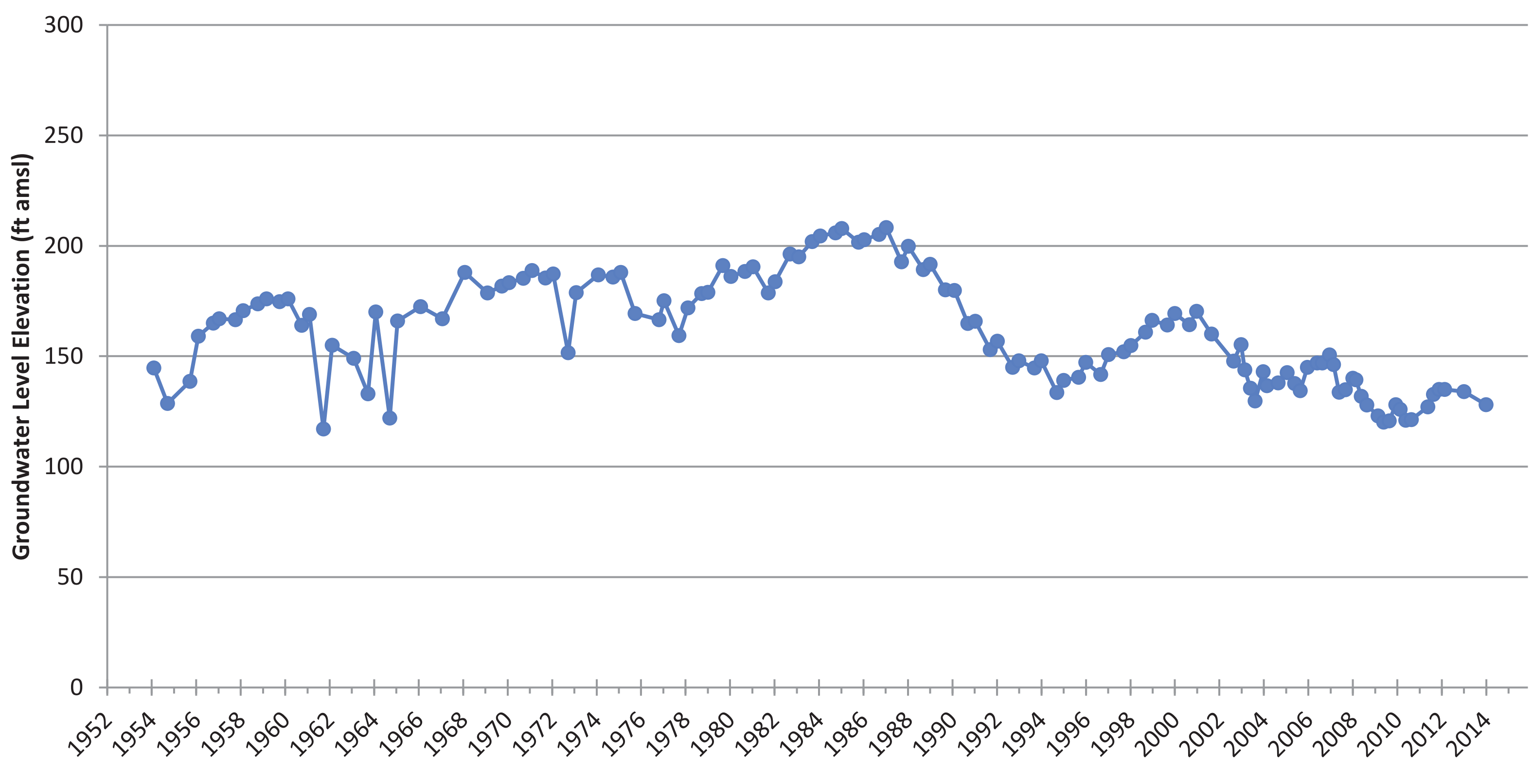
Type and size of shoe or well ring 12"x8"x5/8" steel Welded joints ☒ Yes ☐ No

CONFIDENTIAL

D.W.R. FORM NO. 248

Groundwater Hydrographs - Shallow

21S/24E-35A01



21/23-32K1TOP 21/23-32K1

Well Log #2

[redacted]

Corcoran, Calif

W.H. Lambert-Driller
Phone 546R2-Corcoran, CAL.

Top	109'	Plain.
	5'	Perf & screen.
	6'	Plain.
	14'	Perf & screen.
	21'	Plain.
	6'	Perf & screen.
	11'	Plain.
	14'	Perf & screen.
	3'	Plain.
	6'	Perf. & screen.
	22'	Plain.
	10'	Perf & screen.
	25'	Plain.
	10'	Perf & screen.
	5'	Plain.
	11'	Perf & screen.
	3'	Plain.
	12'	Perf & screen.
	8'	Plain.
	6'	Perf & screen.
	2'	Plain.
	8'	Perf & screen.
	11'	Plain.
	14'	Perf & screen.
	2'	Plain.
	8'	Perf & screen.
	28'	Plain
	10'	Perf & Screen
	5'	Plain.
	7'	Perf & screen.
Bottom	4'	Plain

Plain Pipe = 265'
Perf & screen = 141'
Total ft. = 406

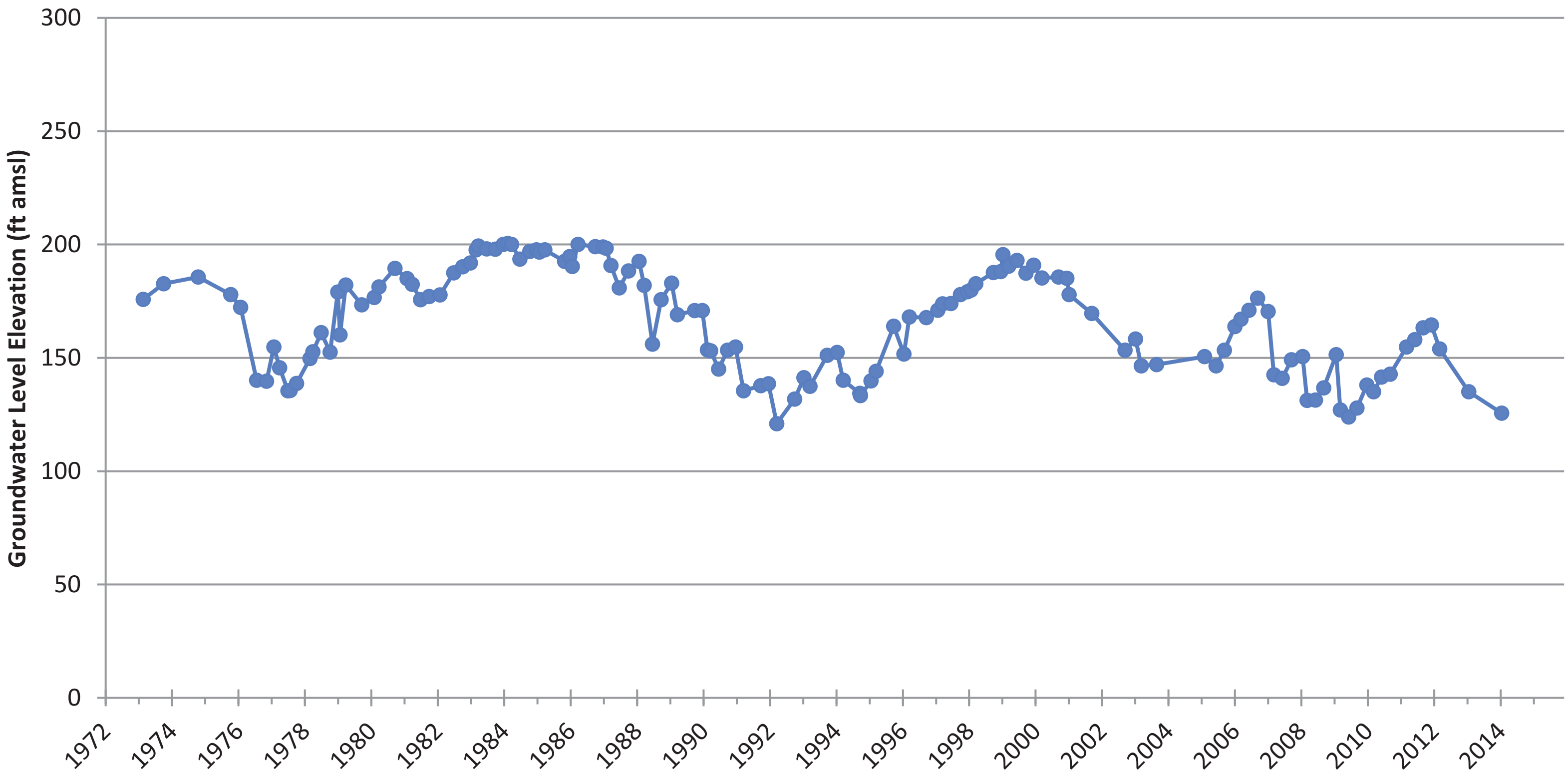
Relin 32-21-23
Southeast well
March 4-1937

DESCRIPTION:

JOB NO.	CONSOLIDATED PIPE CO. BAKERSFIELD ENGINEERING DEPARTMENT	DATE
NUMBER REQUIRED		SALESMAN

Groundwater Hydrographs - Shallow

21S/23E-32K01



DUPLICATE 21/25-3R1 STATE OF CALIFORNIA
File Original, Duplicate and Triplicate with the DIVISION OF WATER RESOURCES P. O. BOX 1079 SACRAMENTO 5, CALIFORNIA PEG
DEPARTMENT OF PUBLIC WORKS

DIVISION OF WATER RESOURCES

21/25-3R1 (G.S.)

LSD 300

WATER WELL DRILLERS REPORT

Feb. 3, 1950 (Sections 7076, 7077, 7078, Water Code)

SHEET 1 501
Tulare
21/25-3R1

Do Not Fill In
State Well No. 21S/24E-3R1
Other Well No.
Region 5

(1) Driller:
Name Knapp & Graham 104
Address 416 W. Inyo Tulare Calif.
License No. 69956 Classification C-57

(2) Proposed use or uses (check): Domestic ☐ Municipal ☐ Irrigation ☑ Industrial ☐ Domestic and Irrigation ☐ Test well ☐ Other

(3) Equipment used (check): Rotary ☐ Cable ☑ Dug well ☐ Other

Owner:
Name [redacted]
Address

(4) Type of work (check): New well ☑ Reconditioning of well ☐ Deepening existing well ☐

(5) Well log:
Total depth of well 328 ft.

Give details of formations penetrated, such as silt, peat, muck, sand, gravel, clay, shale, sandstone, hardpan, rock. Include size of gravel (diameter) and sand (fine, medium, coarse), color of material, structure (loose, packed, cemented, soft, hard, brittle).

CONFIDENTIAL

Depth From Ground Surface (ft. to ft.)		Formation
0	6	Soil
6	82	Sandy Clay
82	90	Sand
90	102	Sandy Clay
102	108	Sand
108	115	Fine Sand
115	122	Sandy Clay
122	152	Coarse Sand perf up to 145 ft.
152	168	Fine Sand
168	180	Sandy Clay
180	188	Fine Sand
188	198	Sandy Clay
198	208	Fine Sand
208	231	Sandy Clay
231	238	Sand
238	292	Sandy Clay
292	296	Coarse Sand stayed open
296	324	Sandy Clay
324	328	Fine Sand

If additional space is required, continue on DWR Form No. 246—Supplement, and attach to respective report copies.

(6) Casing left in well:

LENGTH FT.	DIAMETER INCHES	SINGLE, DOUBLE, WELDED, OTHER	LBS. PER FOOT OR GAGE OF CASING	SEATING BELOW GROUND SURFACE, FT.
274	14	D. Casing	12 ga (.105)	274

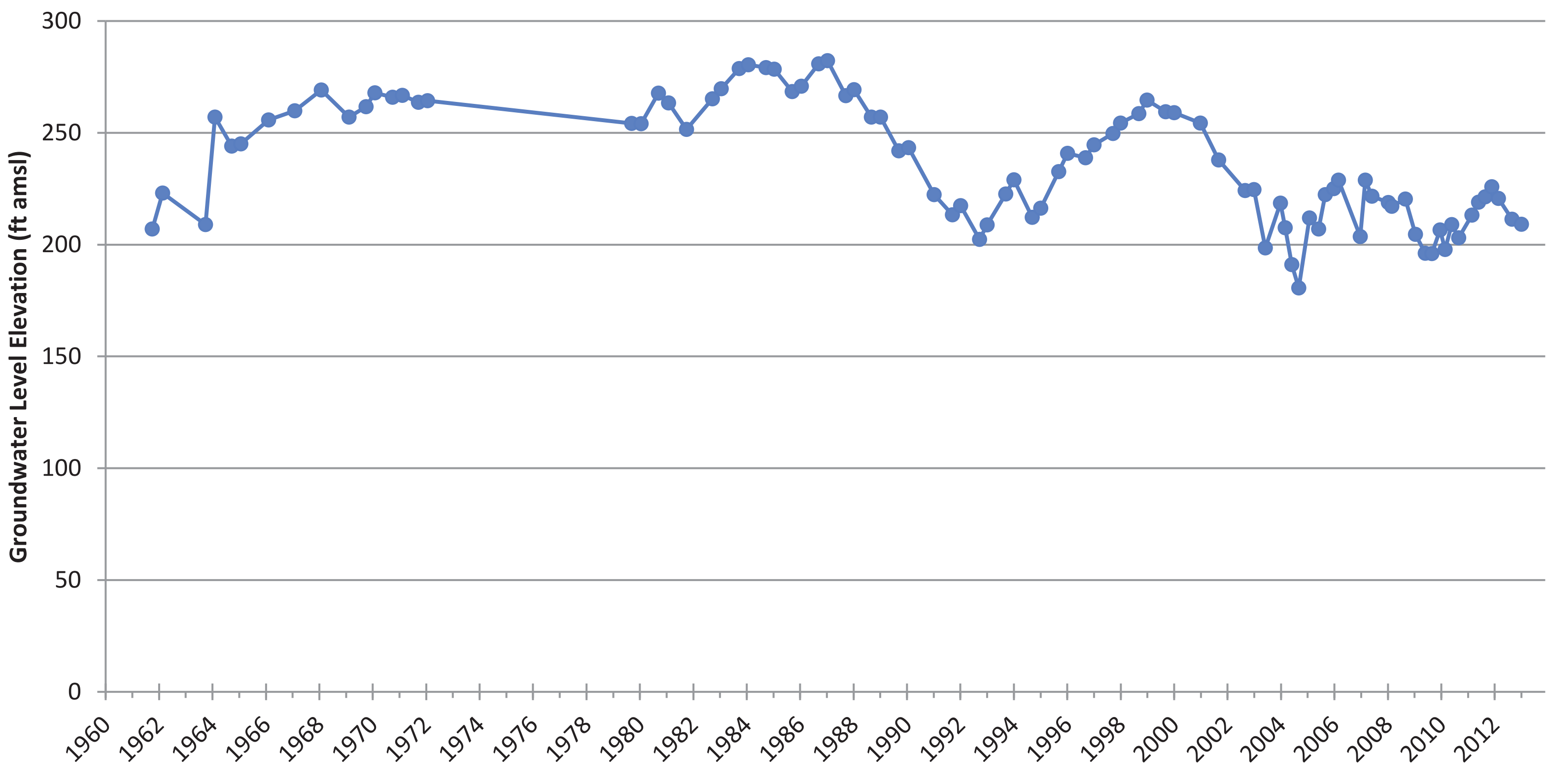
Type and size of shoe or well ring 14" x 8" x 5/8" Shoe Welded joints ☑ Yes ☐ No

D.W.R. FORM NO. 240

400 feet north, 250 feet west of SE corner of section 3 (USGS)

Groundwater Hydrographs - Shallow

21S/25E-03R01



DUPLICATE- File Original, Duplicate and Triplicate with the DIVISION OF WATER RESOURCES P. O. BOX 1079 SACRAMENTO 5, CALIFORNIA

21/26-32A1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

PERT

21/26-32A1 (G.S.)

SHEET 1 19

Do Not Fill In
State Well No.
Other Well No.
Region

WATER WELL DRILLERS REPORT
(Sections 7076, 7077, 7078, Water Code)

LSD Elev. 348

CONFIDENTIAL

(1) Driller:
Name O.E. (Ed) Owens 190
Address 700 E. Harrison St.
Porterville
License No. ______ Classification ______

Owner:
Name [redacted]
Address

(2) Proposed use or uses (*check*):
Domestic ☐ Municipal ☐ Test well ☐
Irrigation ☐ Industrial ☐
Domestic and Irrigation ☑ 1
Other

(3) Equipment used (*check*):
Rotary ☐
Cable ☑
Dug well ☐
Other 2

(4) Type of work (*check*):
New well ☐ Reconditioning of well ☐
Deepening existing well ☑

(5) Well log:
Total depth of well 267 ft.

Give details of formations penetrated, such as silt, peat, muck, sand, gravel, clay, shale, sandstone, hardpan, rock. Include size of gravel (diameter) and sand (fine, medium, coarse), color of material, structure (loose, packed, cemented, soft, hard, brittle).

Depth From Ground Surface		Formation
215 ft.	to 222 ft.	Sandy clay - Brown
222	230	Sand & Gravel
230	240	Sandy clay - Brown
240	253	Sand & coarse
253	258	Sandy - clay - Brown
258	262	Sand - Medium
262	267	Sandy clay - Brown

If additional space is required, continue on DWR Form No. 246—Supplement, and attach to respective report copies.

(6) Casing left in well:

LENGTH FT.	DIAMETER INCHES	SINGLE, DOUBLE, WELDED, OTHER	LBS. PER FOOT OR GAGE OF CASING	SEATING BELOW GROUND SURFACE, FT.
120'	10"	Single welded	12 Ga.	267
			.125	

Type and size of shoe or well ring No Welded joints ☑ Yes ☐ No

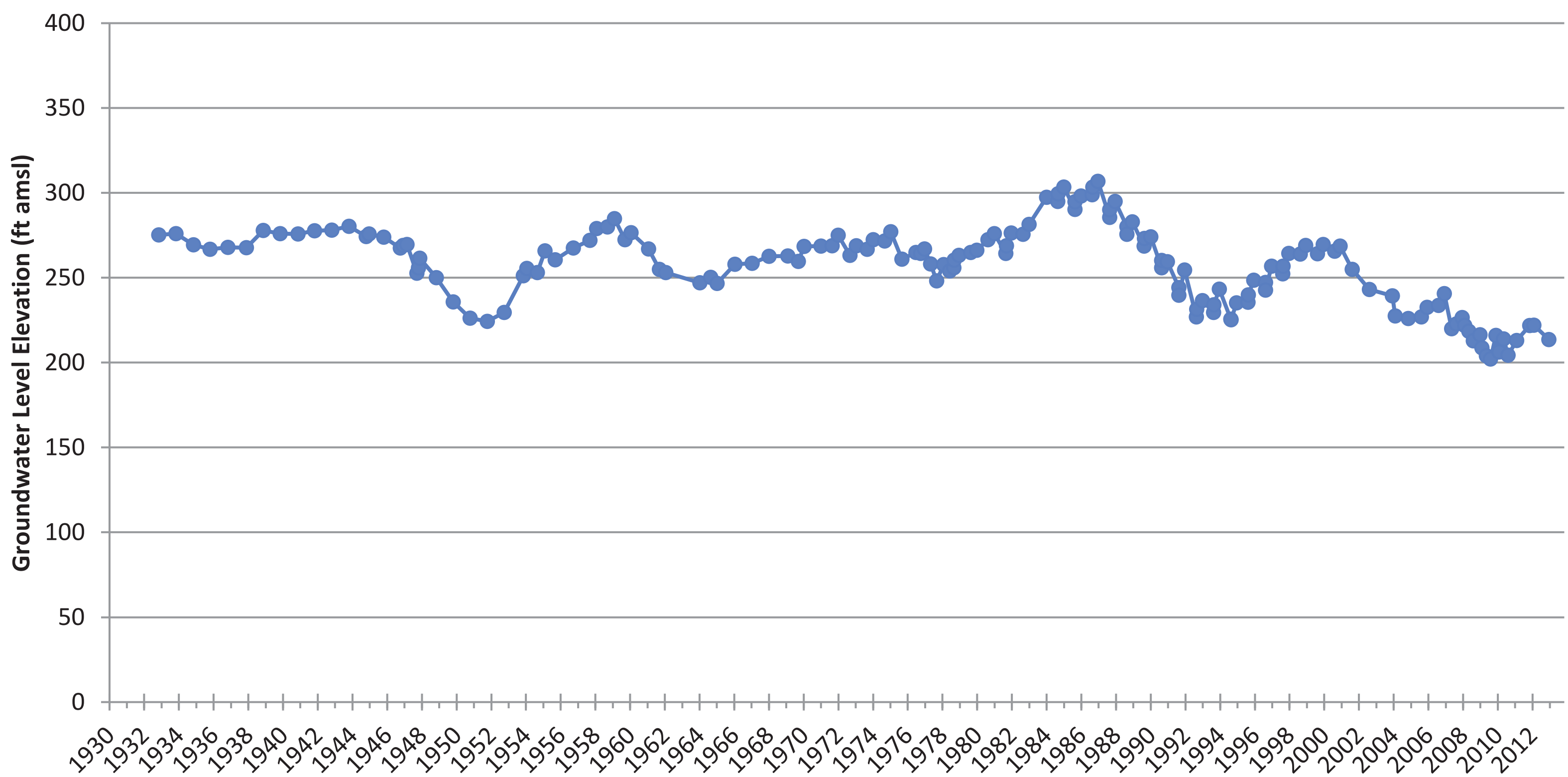
D.W.R. FORM NO. 246

5100 foot north, 75 foot west of SE corner of section 32 (USGS)

23071 3-50 40M DUIN SPO

Groundwater Hydrographs - Shallow

21S/26E-32A01



22/24-9A1

U.S. DEPARTMENT OF THE INTERIOR - [illegible] OF RECLAMATION - REGION II
WELL [illegible]

22/24-9A1

County [illegible] Owner [redacted] U.S.B.R. No. [illegible]
Dist. Use [illegible] Local No.
Quad. [illegible] Driller [illegible] Date [illegible]
Location [illegible]

Surf. Elev. [illegible] Groundwater Elev. Date
Depth [illegible] Groundwater Elev. Date
Yield Aquifers
Drawdown Artesian Head Date
Casing [illegible] Sand-Gravel

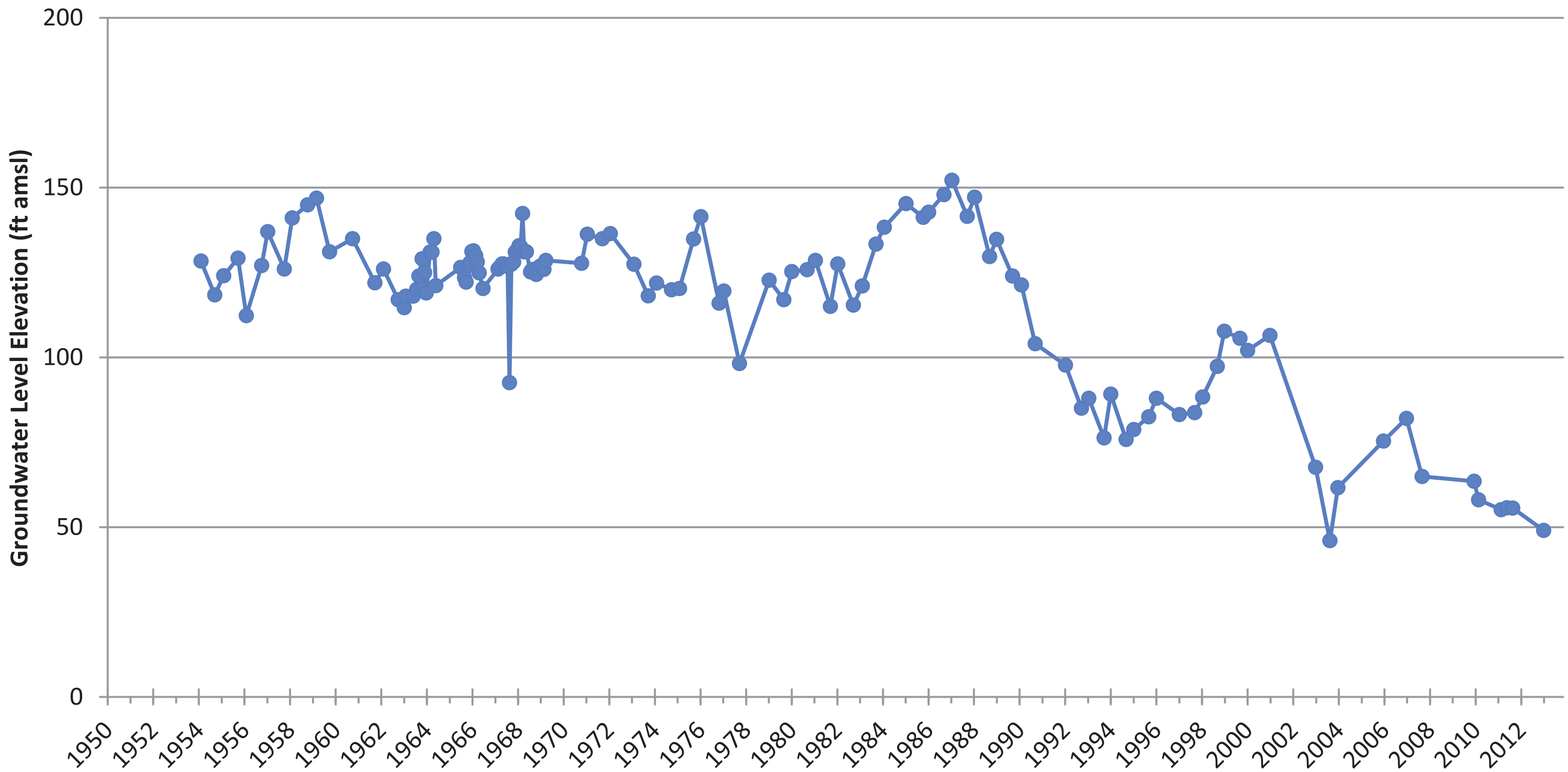
Source of data [illegible] Type drill [illegible] Diam. hole [illegible]

Depth	Elev.	Thick	Description
0	[illegible]	8	[illegible]
8	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible] clay
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible] clay
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible] clay

	50	100	200
G			
S	[illegible]	[illegible]	[illegible]
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Groundwater Hydrographs - Shallow

22S/24E-09A01



LSD Elev 373 22/26-10J1

U.S. DEPARTMENT OF THE INTERIOR - BUREAU OF RECLAMATION - REGION II
WELL LOG

22/26-10J1

County Tulare — Owner [redacted] — U.S.B.R. No. 22-26-10A
Dist. — Use Irrigation — Local No.
Quad. Woodville — Driller James Woods — Date March 15, 1947
Location 22-26-10 (0.98-0.41)

Surf. Elev. 373 — Groundwater Elev. 278 — Date March 15, 1947
Depth 351 — Groundwater Elev. — Date
Yield — Aquifers
Drawdown — Artesian head — Date
Casing 351'x14" perf. — % Sand-Gravel 10%

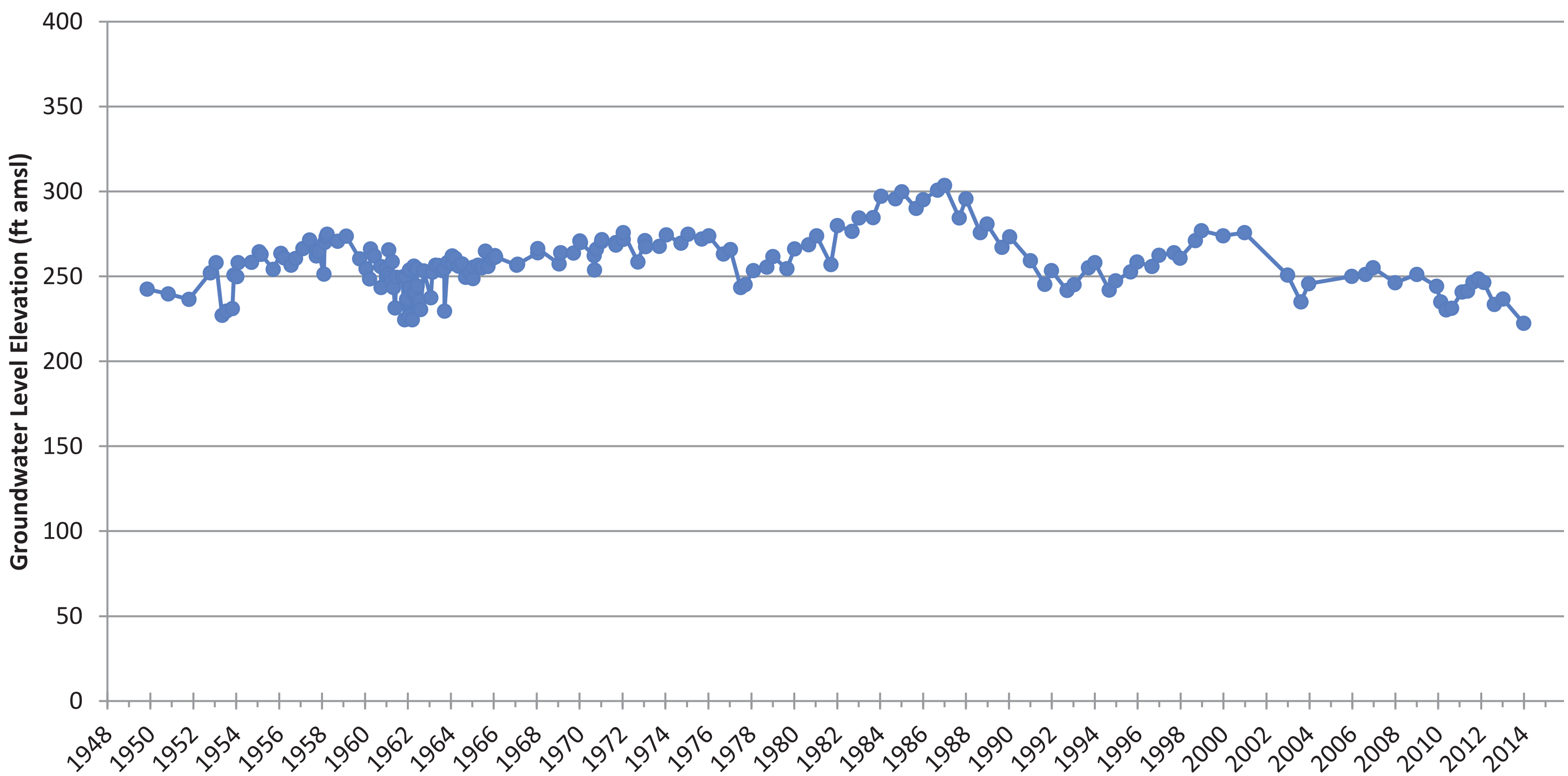
Source of data Anderson — Type drill Cable-Tools — Diam. hole 14"

Depth	Elev.	Thick	Description
0	373	8	(Top soil - Brown, soft, fine sandy loam, poor permeability)
8	365	62	(Sandy silt, light brown, hard sandy silt, relatively impermeable)
70	303	4	(Sand - brown, subrounded, fairly well sorted, loose, 0.50mm to 1.00mm in diameter, sand, predominently quartzose)
74	299	56	(Sandy silt, brown, hard sandy silt, poor permeability)
130	243	36	(Sand and cobbles, gray to brown, subrounded, 0.50mm to 1.00mm in diameter, loose, quartz sand and subroudned cobbles up to $2\frac{1}{2}$" in diameter)
166	207	19	(Sandy clay, brown, very hard, sandy clay, relatively impermeable)
185	188	11	(Cobbles, subrounded, loose, cobbles up to 2" in diameter)
196	177	24	(Sandy clay, brown, hard, sandy clay, relatively impermeable)
220	153	108	Clay
328	45	7	Sand and gravel
335	38	10	Clay
345	28	6	Hard clay
351	22		Bottom

X

Groundwater Hydrographs - Shallow

22S/26E-10J01



Ir 207

R-6

R-6 R#6

ROY PULLIAM

WATER WELL DRILLING

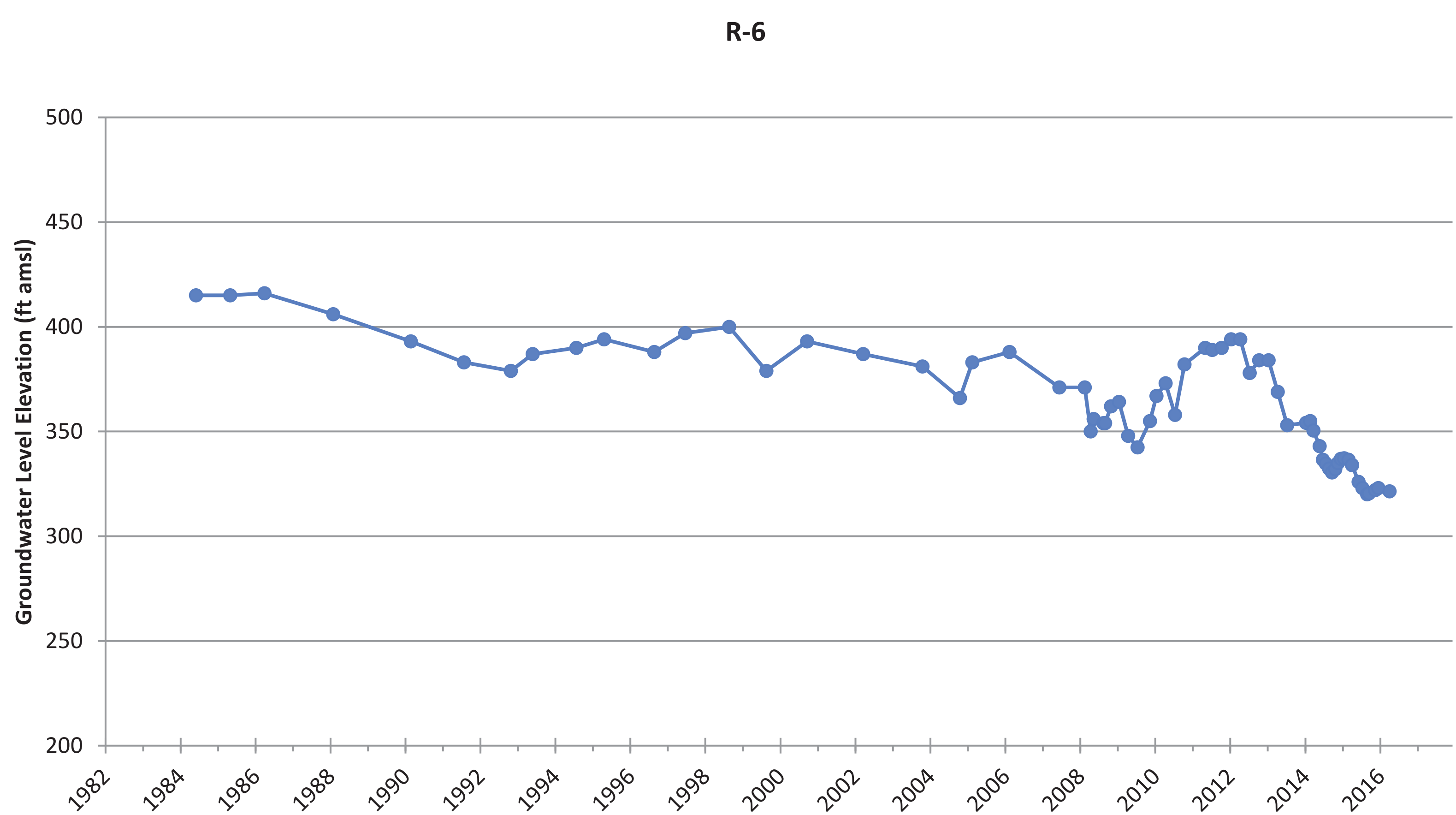
ROUTE I BOX 744 SU 4 I593

Log of IO in. Well

0 to 4I ft.	Sandy Clay
4I to 80 ft.	Water, Sand and Gravel
80 toI23 ft.	Sandy Clay
I23 toI35 ft.	Water, Sand and Gravel
I35 toI50 ft.	Clay

Cast to I44 ft.
6 ft. open hole
Perforated from 4I ft. to I44 ft.
Water Level 32 ft.

Groundwater Hydrographs - Shallow



Thomas Harder & Co. Groundwater Consulting

TRIPLICATE
Retain this copy

R#11

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

R-11

Do Not Fill In
№ 67312
Other Well No. R-11

(1) OWNER:
Name [redacted]
Address [redacted]

(2) LOCATION OF WELL:
County Tulare   Owner's number, if any
Township, Range, and Section 5 miles west of Porterville
Distance from cities, roads, railroads, etc. on Olive, ¼ North on Cedar, on last st in back of Rowland Tract.

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☐
Cable ☒
Other ☐

(6) CASING INSTALLED:
STEEL: X OTHER:
SINGLE ☒ DOUBLE ☐
If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	84	14	10			
0	212	10	10			

Size of shoe or well ring: 3/4x6x14   Size of gravel: 3/4x4x10
Describe joint Plain End

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen None

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☒ No ☐ To what depth 84 ft.
Were any strata sealed against pollution? Yes ☒ No ☐ If yes, note depth of strata
31 ft. to 36 ft. Fine Sand
56 ft. to 79 ft. Cobbers & Sand
Method of sealing Grout

(9) WATER LEVELS:
Depth at which water was first found, if known 32 ft.
Standing level before perforating, if known 32 ft.
Standing level after perforating and developing 32 ft.

(10) WELL TESTS:
Was a pump test made? Yes ☒ No ☐ If yes, by whom? By Owner
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water   Was a chemical analysis made? Yes ☐ No ☒
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:
Total depth 216 ft. Depth of completed well 216 ft.
Formation: Describe by color, character, size of material, and structure

ft. to ft.	Formation
0 - 31	Sandy Loam
31 - 36	Fine Sand
36 - 43	Very soft Silt
43 - 48	Very Fine Sand
48 - 56	Very Soft Silt
56 - 65	Cobbers & Sand
65 - 70	Cobbers
70 - 79	Cobbers & Sand
79 - 101	Brown Clay
101 - 114	Fine Sand
114 - 120	Med Sand & Gravel
120 - 131	Coarse Sand & Cobbers
131 - 178	Brown Clay
178 - 180	Tight Dark Sand
180 - 216	Tough Brown Clay
216 - 220	Coarse Sand & Sm. Rocks

Well Log
Lot 40 Tr. 213

R#11

Work started 1/24 1972 Completed 2/7 1972

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ROGER L. NATION
(Person, firm, or corporation) (Typed or printed)

Address 26521. South Mooney
Visalia, California

[SIGNED] Roger L. Nation (Well Driller)

License No. 259884 Dated 2/9, 1972

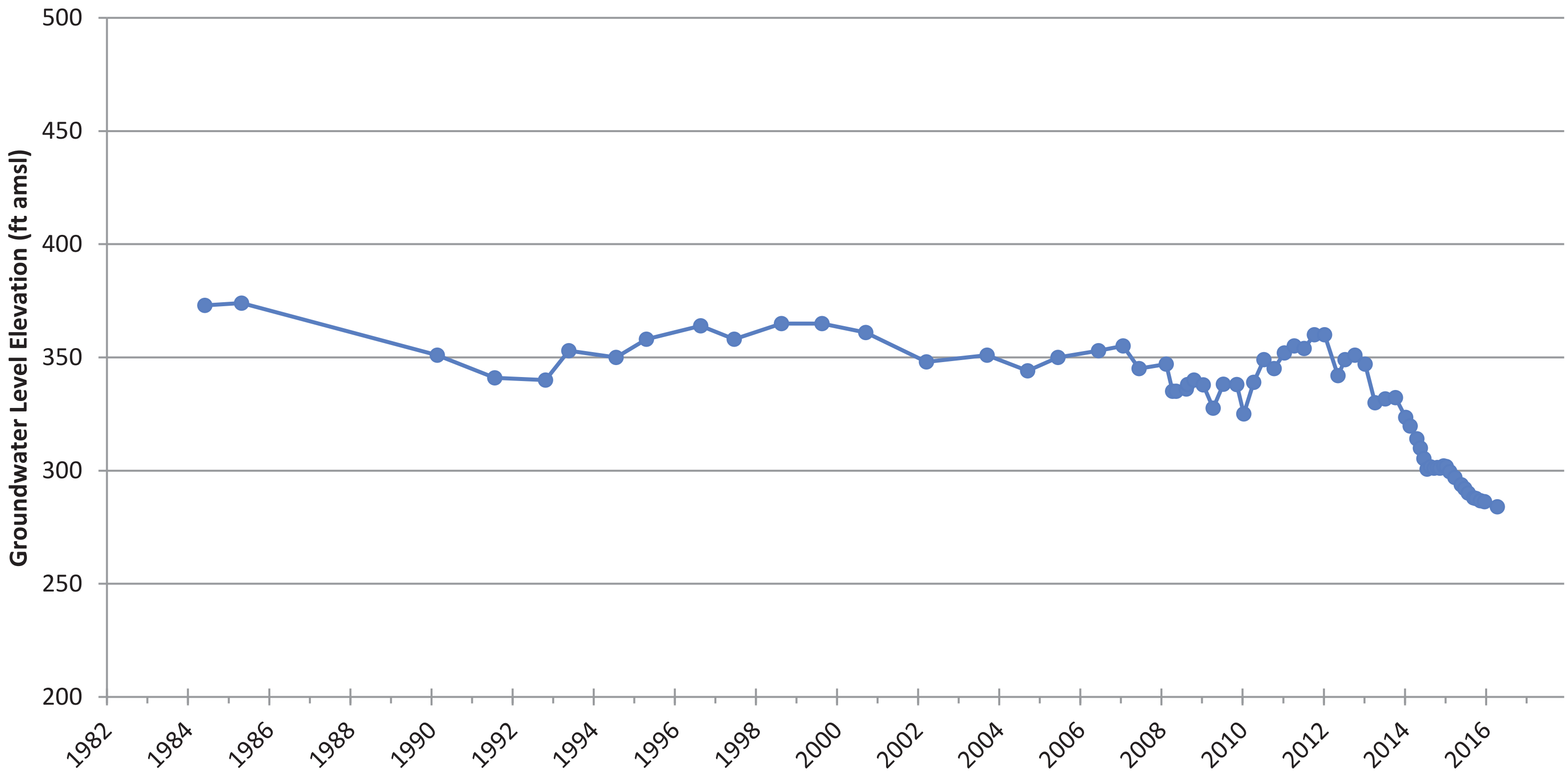
SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-68)

88178-050 9-68 50M TRIP ΔD OSP

Groundwater Hydrographs - Shallow

R-11



DUPLICATE
File Original, Duplicate and Triplicate with the
DIVISION OF WATER RESOURCES
P. O. BOX 1079
SACRAMENTO 5, CALIFORNIA

23/26-9C1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

23/26-9C1

PEG

SHEET 1 694

Tulare

Do Not Fill In
State Well No. ______
Other Well No. ______
Region ______

WATER WELL DRILLERS REPORT (GS)

(Sections 7076, 7077, 7078, Water Code)

LSD Elev. 440

(1) **Driller:**
Name L. R. Henderson
Address 675 Vandalia Ave
Porterville Calif
License No. 125434 Classification C 57

Owner:
Name [redacted]
Address

(2) **Proposed use or uses** *(check)*:
Domestic ☐ Municipal ☐
Irrigation ☒ Industrial ☐
Domestic and Irrigation ☐ Test well ☐
Other ______

(3) **Equipment used** *(check)*:
Rotary ☐
Cable ☒
Dug well ☐
Other ______

(4) **Type of work** *(check)*:
New well ☒ Reconditioning of well ☐
Deepening existing well ☐

CONFIDENTIAL

(5) **Well log:**
Total depth of well 440 ft.

Give details of formations penetrated, such as silt, peat, muck, sand, gravel, clay, shale, sandstone, hardpan, rock. Include size of gravel (diameter) and sand (fine, medium, coarse), color of material, structure (loose, packed, cemented, soft, hard, brittle).

Depth From Ground Surface		
0 ft.	to 45 ft.	soil & clay
45	56	sand
56	117	clay
117	125	sand
125	148	clay
148	170	sand
170	195	clay
195	203	sand
203	215	clay
215	228	sand
228	245	clay
245	260	sand
260	278	clay
278	295	sand
295	312	clay
312	325	sand
325	330	clay
330	360	sand
360	380	clay
380	440	sand
		clay

If additional space is required, continue on DWR Form No. 246—Supplement, and attach to respective report copies.

(6) **Casing left in well:**

LENGTH FT.	DIAMETER INCHES	SINGLE, DOUBLE, WELDED, OTHER	LBS. PER FOOT OR GAGE OF CASING	SEATING BELOW GROUND SURFACE, FT.
400	14	duble	12 gaye	
			105	

Type and size of shoe or well ring 14 Welded joints—☒ Yes ☐ No

5150 feet north 3250 feet west of SE Corner of section 9 (USGS)

D.W.R. FORM No. 246

DUPLICATE
File Original, Duplicate and Triplicate with the
DIVISION OF WATER RESOURCES
P. O. BOX 1079
SACRAMENTO 5, CALIFORNIA

23/26-9C1

SHEET 2 94
Tulare

Do Not Fill In
State Well No.
Other Well No.
Region

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

CONFIDENTIAL

(7) Perforations:

Type of perforator used: mills Perforator.
Perforated 200 ft. to 390 ft. Hole size ______ No. of holes ______

(8) Water levels:

Depth at which water first encountered: 190 ft.
Depth to water before perforating: ______ ft.
Depth to water after perforating: ______ ft.
Note any change in water level while drilling: ______

(9) Well pumping test:

Date of test ______ By whom ______
Depth to water when test started ______ ft.
G.P.M. at beginning of test ______
Drawdown from standing level ______ ft.
G.P.M. at completion of test ______
Drawdown at completion of test ______ ft.
Length of time tested ______
Temperature of water ______
Was gas present in water? ☐ Yes ☐ No

(10) General:

Was well gravel packed? No Size of rock ______ Thickness of pack ______
Was a surface sanitary seal provided? ______
Were any strata sealed against pollution? ☐ Yes ☒ No If yes, attach detailed description.
Strata sealed ______
Was analysis made of water? ☐ Yes ☒ No If yes, attach copy.
Was electric log made of well? ☐ Yes ☒ No If yes, attach copy.
If well abandoned, was it plugged and sealed? ______
Method of plugging and sealing ______

(11) Location:

North

	X 0		

1 MILE

Section No. 9
Township 23-South
Range 26-East
Base & Meridian M.D.
Show location of well in Section, thus (X).
Distances to section lines from well, N or S 100 ft. and E or W 2000 ft.
Show location of nearest known well, thus (O)
Distance to nearest known well 800 ft.

(12) Time of work:

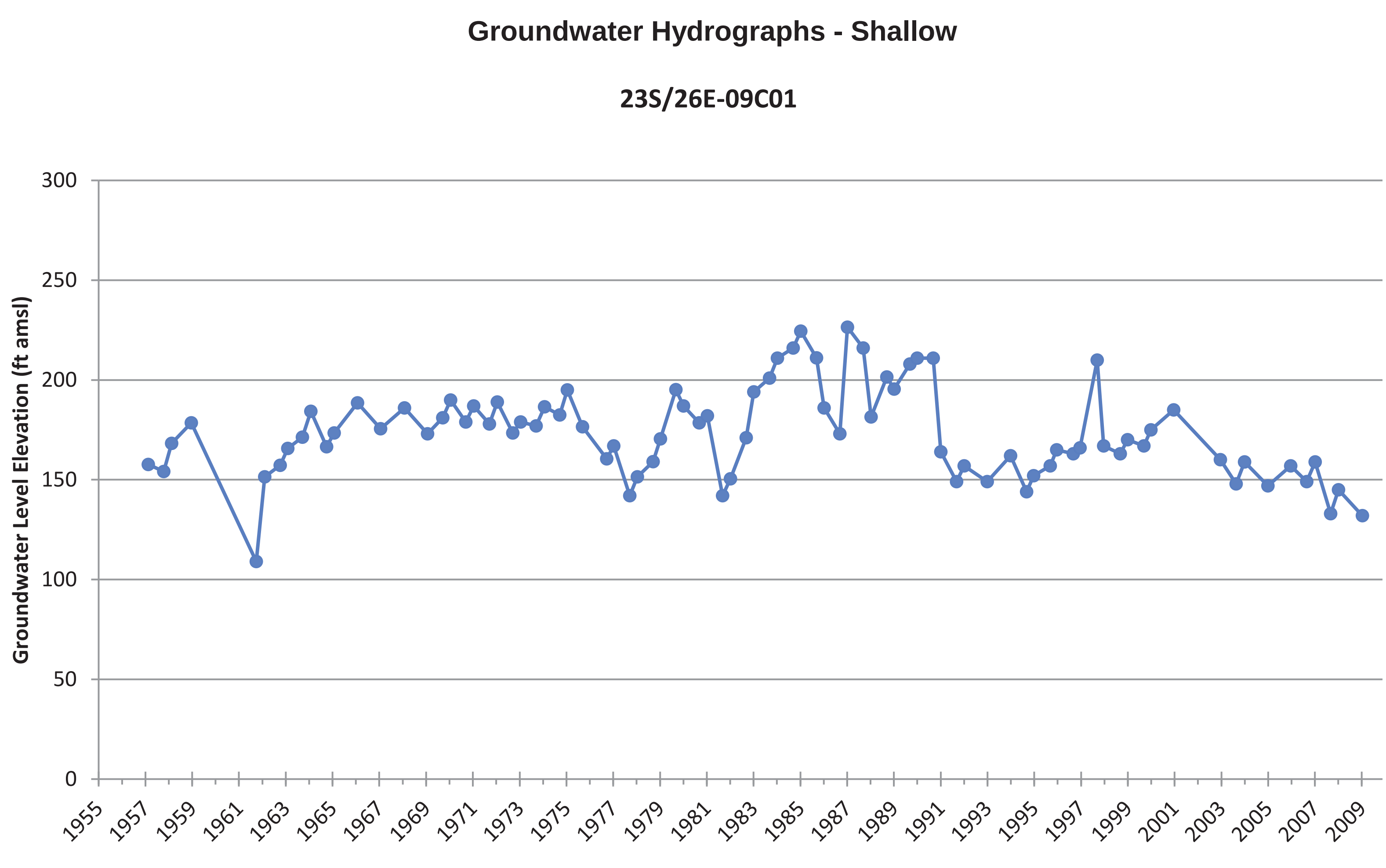
Work started date Feb 12 Completed date Mar 27 52
Date of this report March 24 52

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[Signed] L. R. Henderson
Well Driller
By Mrs L. R. Henderson
License No. 125434 Classification C 57
Dated March 24, 1952

D.W.R. Form No. 246


Groundwater Hydrographs - Shallow
23S/26E-09C01
Groundwater Level Elevation (ft amsl)
300
250
200
150
100
50
0
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009

23/26-12J1

PEG

23/26-12J1

Local Form No. 483 LSD Elev. 419

U.S. DEPARTMENT OF THE INTERIOR - BUREAU OF RECLAMATION - REGION II

WELL LOG

County [illegible] Owner [redacted] U.S.B.R. No. 23-26-12
Dist. Use [illegible] Local No.
Quad. [illegible] Driller [illegible] Date March 1930
Location [illegible]

Surf. Elev. 120 Groundwater Elev. Date
Depth 280 Groundwater Elev. Date
Yield Aquifers
Drawdown Artesian head Date
Casing 230-278' perf. % Sand-Gravel

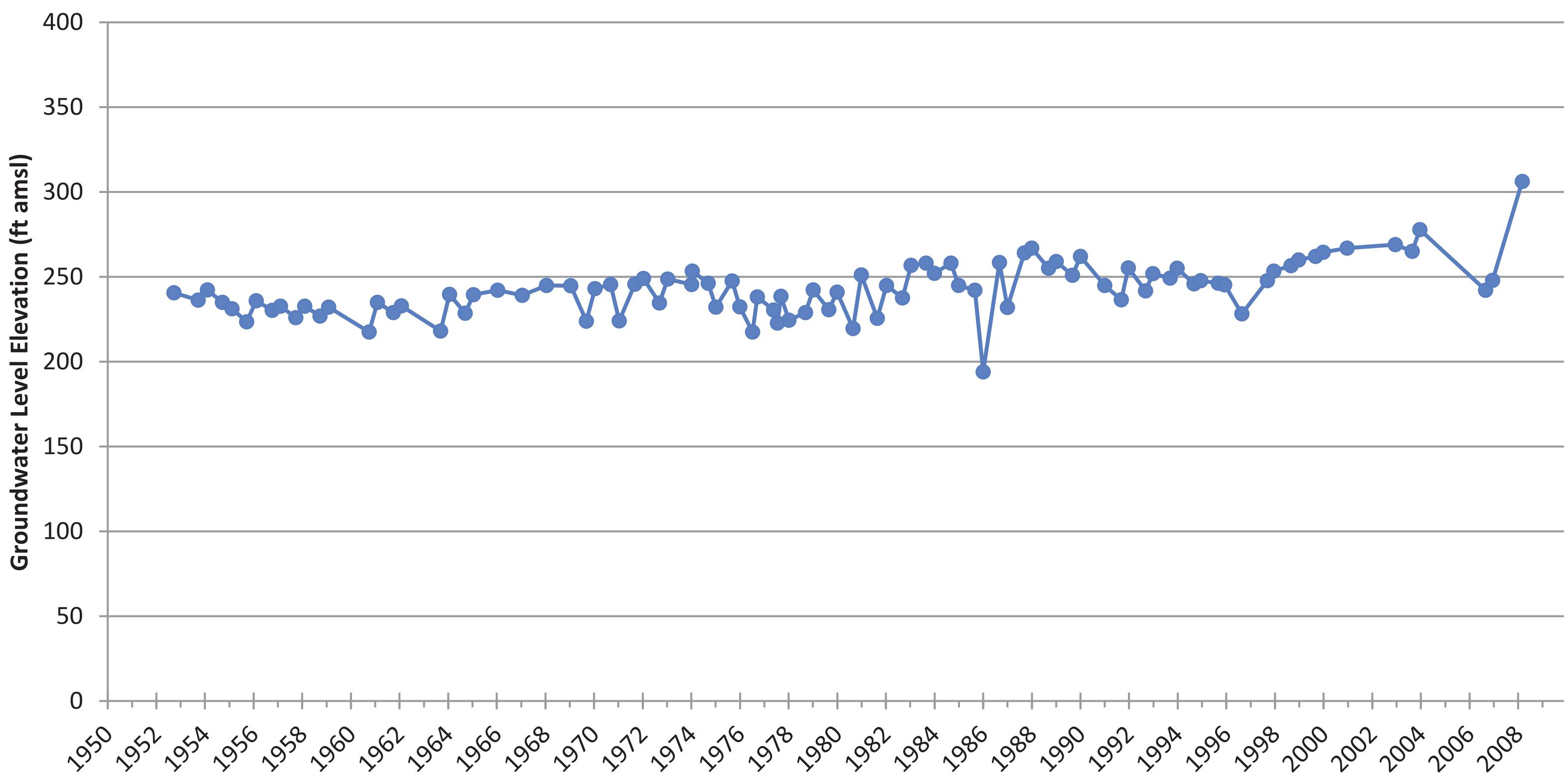
Source of data [illegible] Type drill [illegible] Diam. hole 10"

Depth	Elev.	Thick	Description
0	-120	130	yellow shale 40/50/30 C
130	[illegible]	5	flint clay 5 C
135	[illegible]	30	sandy shale 30 G
165	[illegible]	2	sand, some water 2 F
167	[illegible]	28	sandy shale 28 G
195	[illegible]	10	flint clay 5/5 C
205	[illegible]	58	sticky clay
263	[illegible]	4	sand, water showing
267	[illegible]	13	sandy shale, gray
280	[illegible]		bottom of well

	50	100	200
[illegible]			
[illegible]			
[illegible]			2
[illegible]			58
C	40	50	40
	40	50	100

Groundwater Hydrographs - Shallow

23S/26E-12J01



MSD Elev. ___ 22/24-23J1

U.S.DEPARTMENT OF THE INTERIOR - BUREAU OF RECLAMATION - REGION II
WELL LOG

✓

22/24-23J1

County: Tulare
Dist.:
Quad.:
Location:

Owner: [redacted]
Use:
Driller:

U.S.B.R. No.: 22-24-23J
Local No.:
Date:

Surf.Elev.:
Depth: 400
Yield:
Drawdown:
Casing:

Groundwater Elev.:
Groundwater Elev.:
Aquifers:
Artesian head:
Sand-Gravel

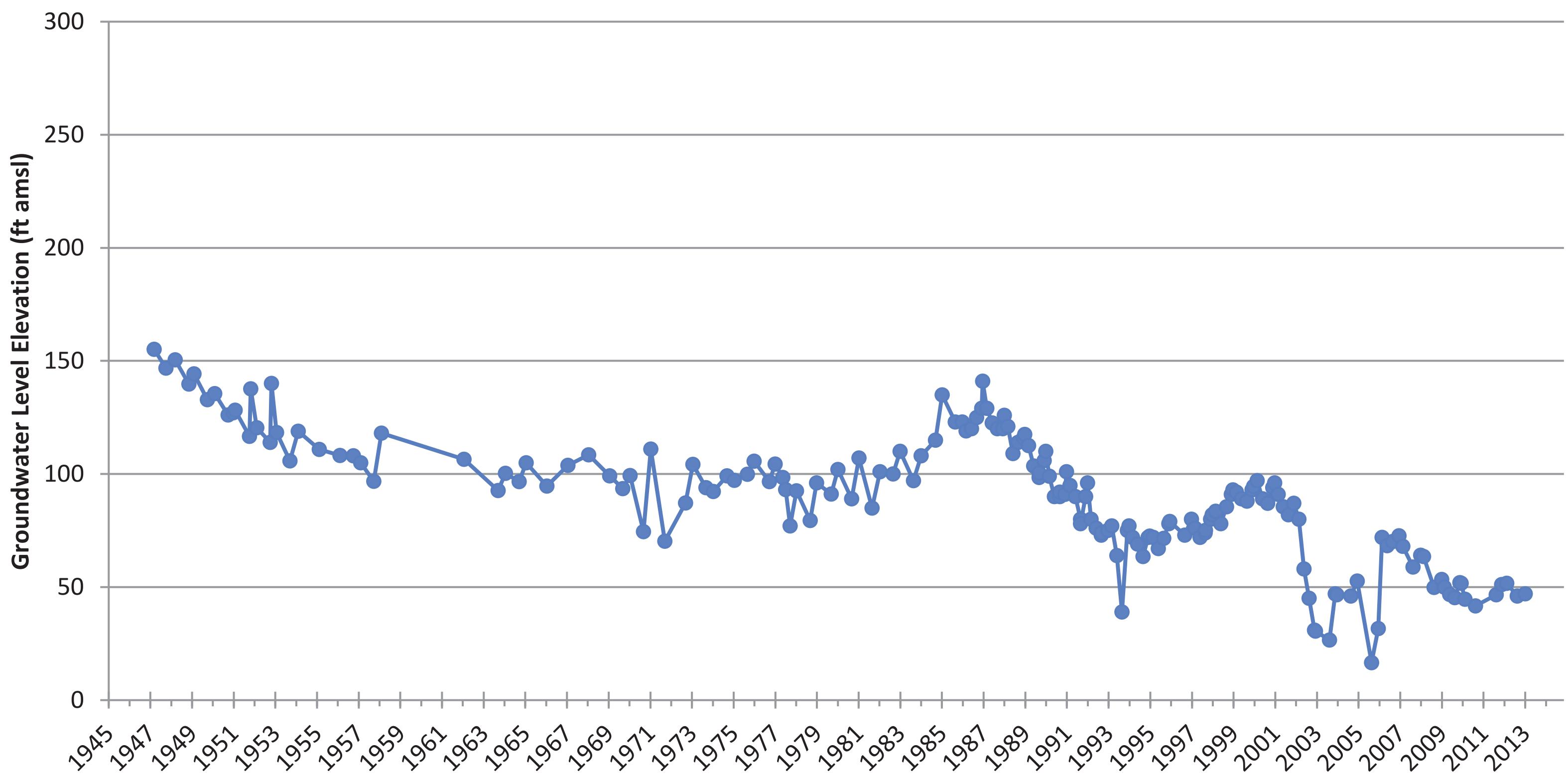
Date: 7/12/46
Date:
Date:

Source of data: ___ Type drill: ___ Diam. hole: ___

Depth	Elev.	Thick	Description
0	357	2	
2	355	61	
63	294	2	
65	292	18	
83	274	7	
90	267	6	
96	261		
117	240	9	
126	231	9	
135	222	5	

Groundwater Hydrographs - Shallow

22S/24E-23J01



LSD Elev. [illegible] 22/25-25

U.S. DEPARTMENT OF THE INTERIOR - BUREAU OF RECLAMATION - REGION II

WELL LOG

[illegible] -25N1

County Tulare | Owner [redacted] | U.S.B.R. No. 22-25-25
Dist. | Use Irrigation | Local No.
Quad. Saucelito School | Driller [illegible] & Graham | Date March 25, 1937
Location 22-25-25 (0.25 - 0.07)

Surf. Elev. 315 | Groundwater Elev. | Date
Depth 437 | Groundwater Elev. | Date
Yield | Aquifers
Drawdown | Artesian head | Date
Casing | % Sand-Gravel

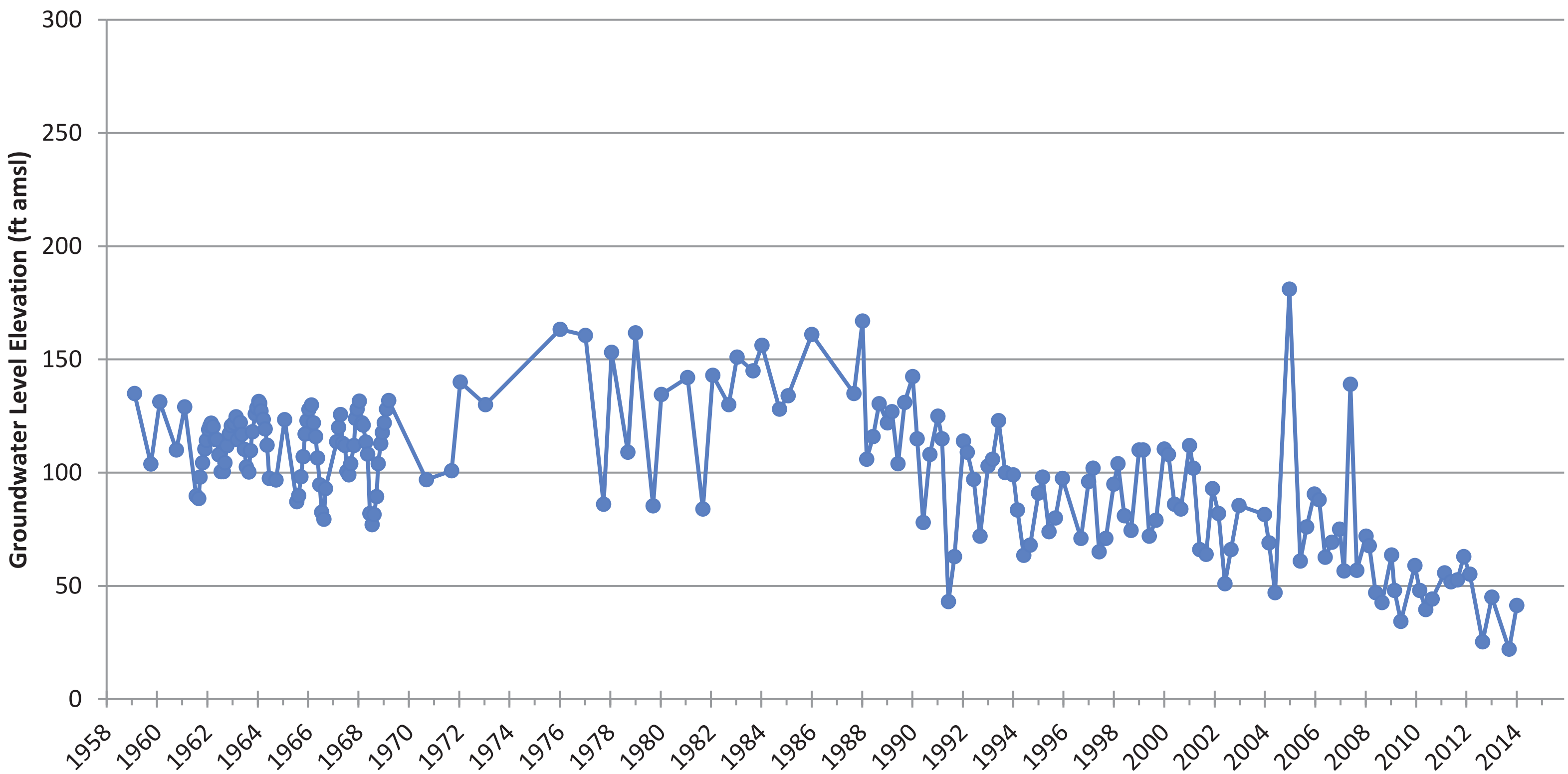
Source of data Anderson | Type drill Cable-Tools | Diam. hole 12"

Depth	Elev.	Thick	Description
0	315	14	(Sandy loam - light brown, fine grained very sandy loam, relatively permeable)
14	301	6	(Sand and gravel - light brown, poorly sorted, subrounded, 0.75 mm to 1.00 mm in diameter, loose quartz sand and subrounded quartz gravel up to 2.5mm)
20	295	36	(Sand, gravel and silt, brown, subrounded, 0.75mm to 1.00 mm in diameter, quartz sand, subrounded gravel up to 3.0 mm, and some silt)
56	259	64	(Same as above)
120	195	14	Sandy clay
134	181	26	(Sandy loam - [illegible] brown hard, sandy loam, relatively impermeable
160	155	70	(Sandy loam, brown, soft, sandy loam, poor permeability)
230	85	15	(Sandy clay, brown, hard, sandy clay, relatively impermeable)
245	70	3	(Silt - brown, very soft, silt, relatively impermeable)
248	67	156	(Sandy loam - brown, compact, very sandy loam, relatively impermeable)
404	-89	4	Sand - [illegible], subrounded, 0.50mm to [illegible] mm, sand, [illegible] [illegible] [illegible] [illegible] [illegible])
408	-93	3	(Sand [illegible], subangular to subrounded, 0.50 mm to [illegible] mm in diameter, quartz sand)
411	-96	26	(Sandy clay - brown, hard, sandy clay, relatively impermeable)
437	-122		([illegible] - [illegible], subangular to subrounded, 0.[illegible]mm to [illegible] mm in diameter, quartz sand) Bottom of well

50	100	200
74	50	100
40	50	200

Groundwater Hydrographs - Shallow

22S/25E-25N01



23/24-16R1

9-060 (December 1949)

PSC

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

USBR TEST WELL
23/24-16R1

No. 23-24-16B

OTHER NOS.

Depth 1400'

WELL LOG

elev 224'

State ______ County TULARE ______ Subarea ______

Owner [redacted]

Location 99-.01

Drilled by USBR ______ Address ______

Date 10/51 ______ Casing diam. ______ Land-surf. alt. 224'

Core data 40-50, 90-98, 140-150, 190-200, 240-250, 290-300, 340-350, 390-400, 450-600,

Source of data 640-700, 790-800, 890-900, 990-994, 1090-1100, 1190-1203, 1270-1280, 1390-1400

(Enter type of well, perforations, yield, and drawdown at end of log)

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	no core		0
	Sand	10	40
	Sandy Clay	35	50
	Sand	10	85
	Sandy Clay	48	95
	Clay	7	143
	Sandy Clay	~~50~~ 70	150
	Sand	20	220
	Sandy Clay	15	240
	Sand	7	255
	Sandy Clay	58	262
	Clay	23	320
	Sand	5	343
	Clay	5	348
	Sandy Clay	22	353
	Clay	10	375
	Sandy Clay	5	385

RECORD BY Goldman DATE 7/20/53 SHEET 1 OF 5

23/24-16R1

9-C(December 1949)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

USBR Test Well

No. 23-29-16R R1

OTHER NOS. ....

WELL LOG

State .... County .... Subarea ....

Owner ....

Location ....

Drilled by .... Address ....

Date .... Casing diam. .... Land-surf. alt. ....

Source of data ....

(Enter type of well, perforations, yield, and drawdown at end of log)

Correlation	Material	Thickness (feet)	Depth (feet)
	Sand	80	390
	Clay	5	470
	Sandy Clay	15	475
'Corcoran Clay'	Clay	70	490
±501'-553'	Sand	7	560
	Sandy Clay	13	567
	Sand	5	580
	Sandy Clay	30	585
	Sand	7	615
	Sandy Clay	33	622
	Sand	5	655
	Sandy Clay	5	660
	Sand	10	665
	Sandy Clay	40	675
	Sand	17	715
	Sandy Clay	7	732
	Sand	6	739

RECORD BY .... DATE .... SHEET 2 OF 5

U. S. GOVERNMENT PRINTING OFFICE 16—61887-1

23/24-16R1

USBR TEST WELL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

No. 23-24-16R R1

WELL LOG

OTHER NOS. ....

State .... County .... Subarea ....

Owner ....

Location ....

Drilled by .... Address ....

Date .... Casing diam. .... Land-surf. alt. ....

Source of data ....

(Enter type of well, perforations, yield, and drawdown at end of log)

Correlation	Material	Thickness (feet)	Depth (feet)
	Sandy Clay	30	745
	Sand	7	775
	Sandy Clay	8	782
	Sand	11	790
	Sandy Clay	6	801
	Sand	5	807
	Sandy Clay	18	812
	Sand	10	830
	Sandy Clay	10	840
	Sand	4	850
	Sandy Clay	6	854
	Sand	10	860
	Sandy Clay	10	870
	Sand	8	880
	Sandy Clay	12	888
	Sand	5	900
	Sandy Clay	20	905

RECORD BY .... DATE .... SHEET 3 OF 5

U. S. GOVERNMENT PRINTING OFFICE 16—41587-1

23/24-16R1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

USBR Test Well

No. 23-24-16 R1

WELL LOG

OTHER NOS.

State ______ County ______ Subarea ______

Owner ______

Location ______

Drilled by ______ Address ______

Date ______ Casing diam. ______ Land-surf. alt. ______

Source of data ______

(Enter type of well, perforations, yield, and drawdown at end of log)

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Sand	5	925
	Sandy Clay	5	930
	Sand	4	935
	Sandy Clay	26	939
	Sand	8	965
	Sandy Clay	42	973
	Sand	40	1015
	Clay	5	1055
	Sandy Clay	30	1060
	Sand	10	1090
	Sandy Clay	10	1100
	Sand	25	1110
	Sandy Clay	15	1135
	Sand	35	1150
	Clay	8	1185
	Sand	87	1193
	Clay	3	1200

RECORD BY ______ DATE ______ SHEET 4 OF 5

U. S. GOVERNMENT PRINTING OFFICE 16—61837-1

23/24-16R1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

USBR TEST WELL

No. 23-24-16R1

OTHER NOS.

WELL LOG

State ______ County ______ Subarea ______

Owner ______

Location ______

Drilled by ______ Address ______

Date ______ Casing diam. ______ Land-surf. alt. ______

Source of data ______

(Enter type of well, perforations, yield, and drawdown at end of log)

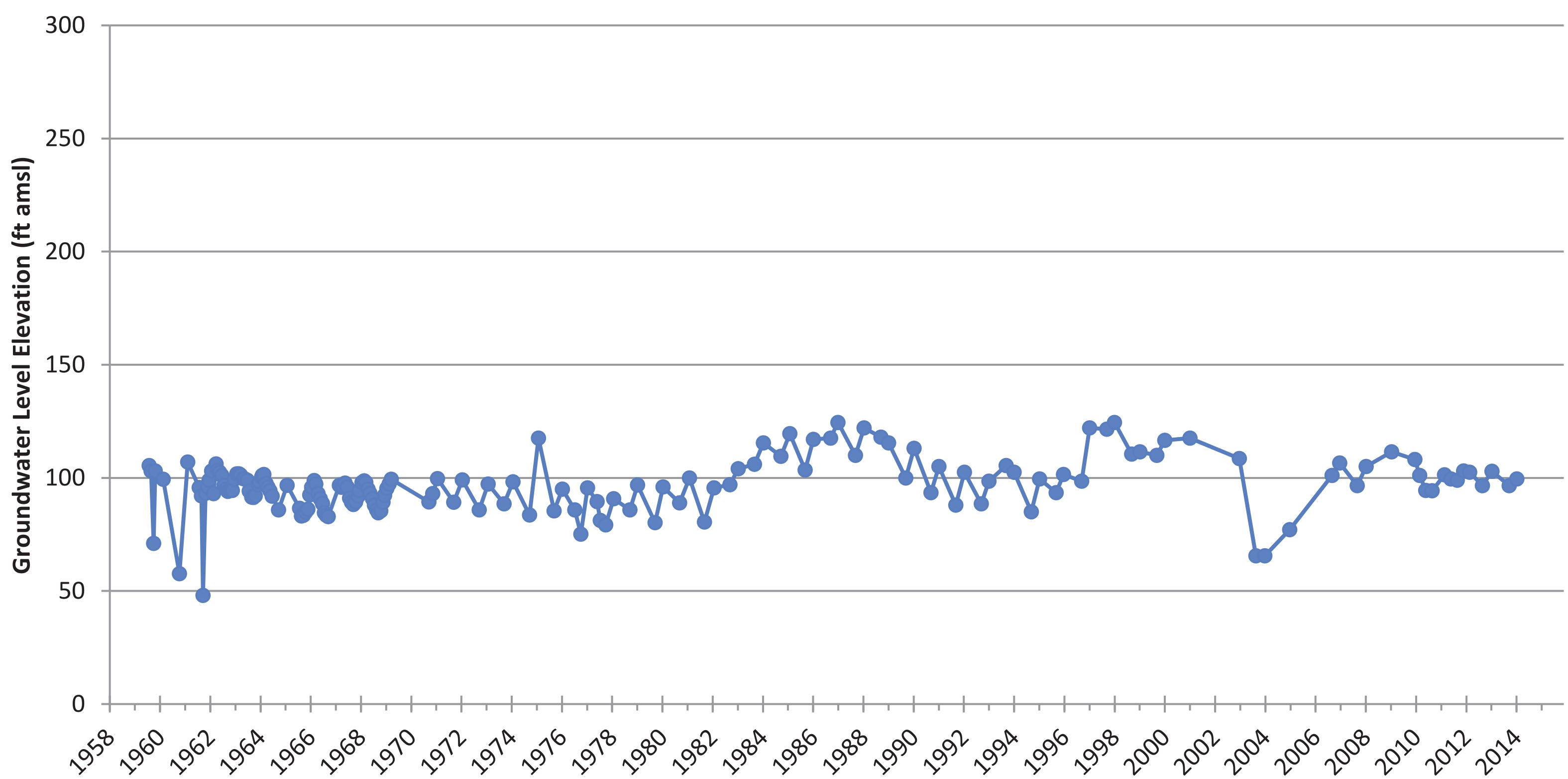
CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Sandy Clay	17	1203
	Sand	10	1220
	Sandy Clay	12	1230
	Sand	6	1242
	Sandy Clay	7	1248
	Sand	3	1255
	Sandy Clay	7	1258
	Sand	25	1265
	Sandy Clay	3	1290
	Sand	7	1293
	Sandy Clay	7	1300
	Sand	11	1307
	Sandy Clay	3	1318
	Sand	41	1321
	Sandy Clay	15	1362 ~~1400~~
	Sand	23	1377
	B.H.		1400

RECORD BY ______ DATE ______ SHEET 5 OF 5

U. S. GOVERNMENT PRINTING OFFICE 16—61837-1

Groundwater Hydrographs - Shallow

23S/24E-16R01



TRIPLICATE
Owner's Copy
Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. **EO117919**

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO / STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. MW-6
Date Work Began 9/24/2010 , Ended 9/24/2010
Local Permit Agency ENVIRO HEALTH, TULARE
Permit No. 10-0338 Permit Date 8/30/2010

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID WATER

DEPTH FROM SURFACE Ft	to Ft.	DESCRIPTION (Describe material, grain, size, color, etc.)
0	20	TOP SOIL, MEDIUMFINE/COARSE SANDS
20	40	MEDIUM/FINE/COARSE SANDS
40	80	EDIUM/FINE/COARSE SANDS WITH SOME CLAY
80	120	MEDIUM/FINE/COARSE SANDS WITH MORE CLAY
120	140	MEDIUM/FINE/COARSE SANDS, WITH SOME CLAY
140	160	MEDIUM/FINE/COARSE SANDS WITH SOME CLAY
160	200	MEDIUM/FINE/COARSE SANDS
200	300	MEDIUM/FINE/COARSE SANDS WITH SOME CLAY
300	340	MEDIUM/FINE/COARSE SANDS, SOME CLAY SOME D.G.
340	420	MEDIUM/FINE/COARSE SANDS WITH SOME CLAY
420	560	CLAY WITH SOME SANDS
560	620	CLAY WITH MORE SANDS MEDIUM/FINE
620	680	CLAY WITH SOME MEDIUM/FINE SANDS
680	720	MOSTLEY CLAY
720	740	CLAY WITH SOME MEDIUM/FINE SANDS
740	760	MEDIUM/FINE/COARSE SANDS WITH SOME CLAY AND SHALE
760	810	MEDIUM/FINE/COARSE SANDSWITH CLAY

TOTAL DEPTH OF BORING 810 (Feet)
TOTAL DEPTH OF COMPLETED WELL 805 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 1/2 MI N AVE. 26 & 1/2 MI E. ROAD 16
City DELANO CA 93215
County TULARE
APN Book 3381 Page 003 Parcel 24
Township 24 Range 26 Section 17
Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
#1										
0	200	16"	✓				PVC	4"	SCH 40	
200	350	16"		✓			PVC	4"	SCH 40	.030
#2										
0	705	12 1/4"	✓				PVC	4"	SCH 40	
705	805	12 1/4"		✓			PVC	4"	SCH 40	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	130	✓			
360	370		✓		
464	474		✓		
590	600		✓		
630	640		✓		
660	670		✓		

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

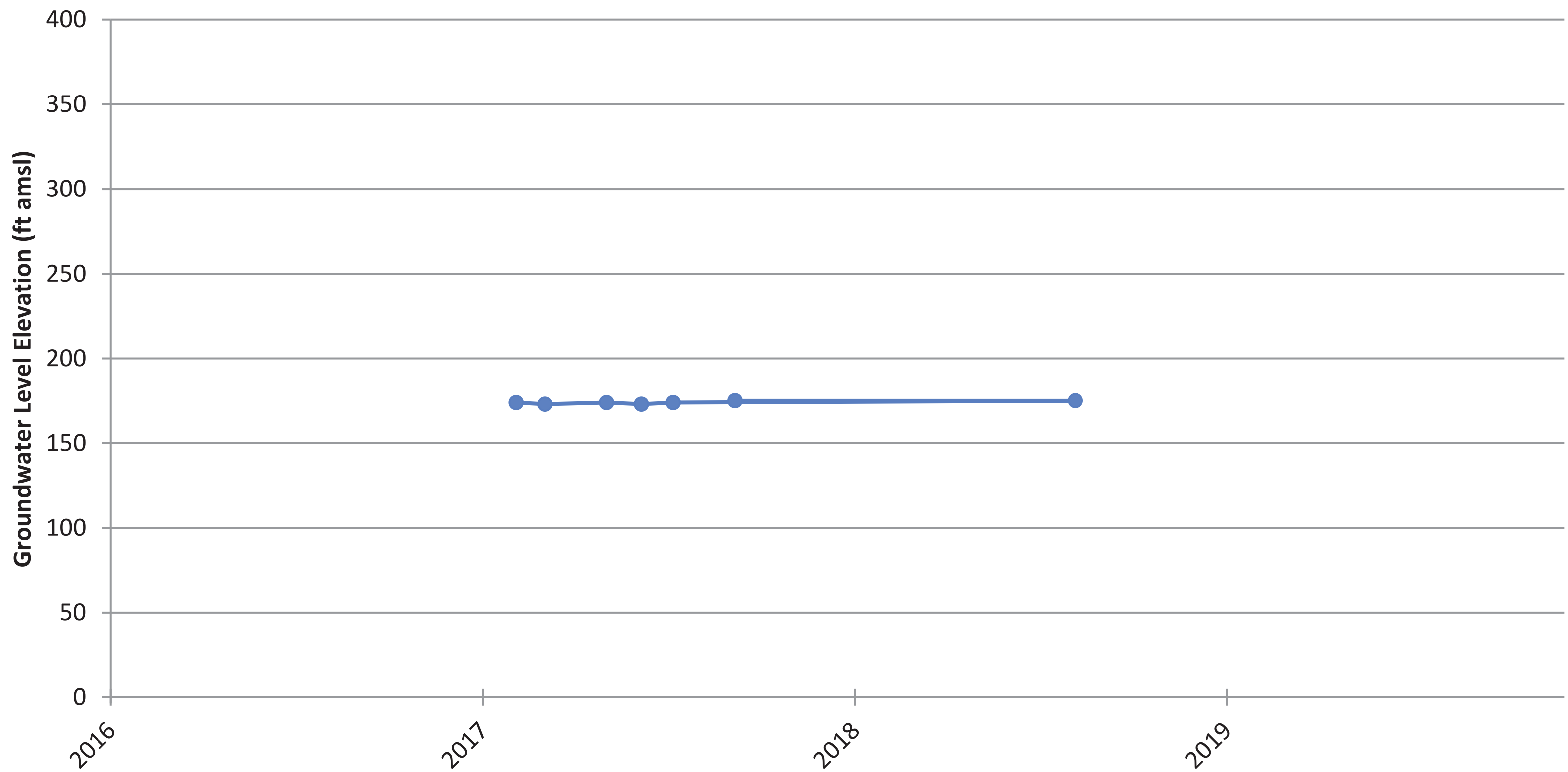
CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME BRADLEY & SONS
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
3625 S. HIGHLAND DEL REY CA 93616
ADDRESS CITY STATE ZIP
Signed [signature] 10/06/10 414178
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Groundwater Hydrographs - Shallow

M-19 (Formerly MW-6)



24/26-32G1

24/26-32G1

UNITED ST TES DEPARTMENT OF THE INTERIOR - BUREAU OF RECLAMATION

County Tulare
Dist. Delano-[illegible]
Quad. Delano
Location Center of NW quarter [illegible] 32.

Owner [redacted] Sierra Vista Ranch
Use
Driller [illegible]

U.S.B.R. No. 24-26-32 E
Local No. [illegible]
Date 4-[illegible]-[illegible]7

Surf. Elev. 893
Depth 470
Yield
Drawdown
Casing

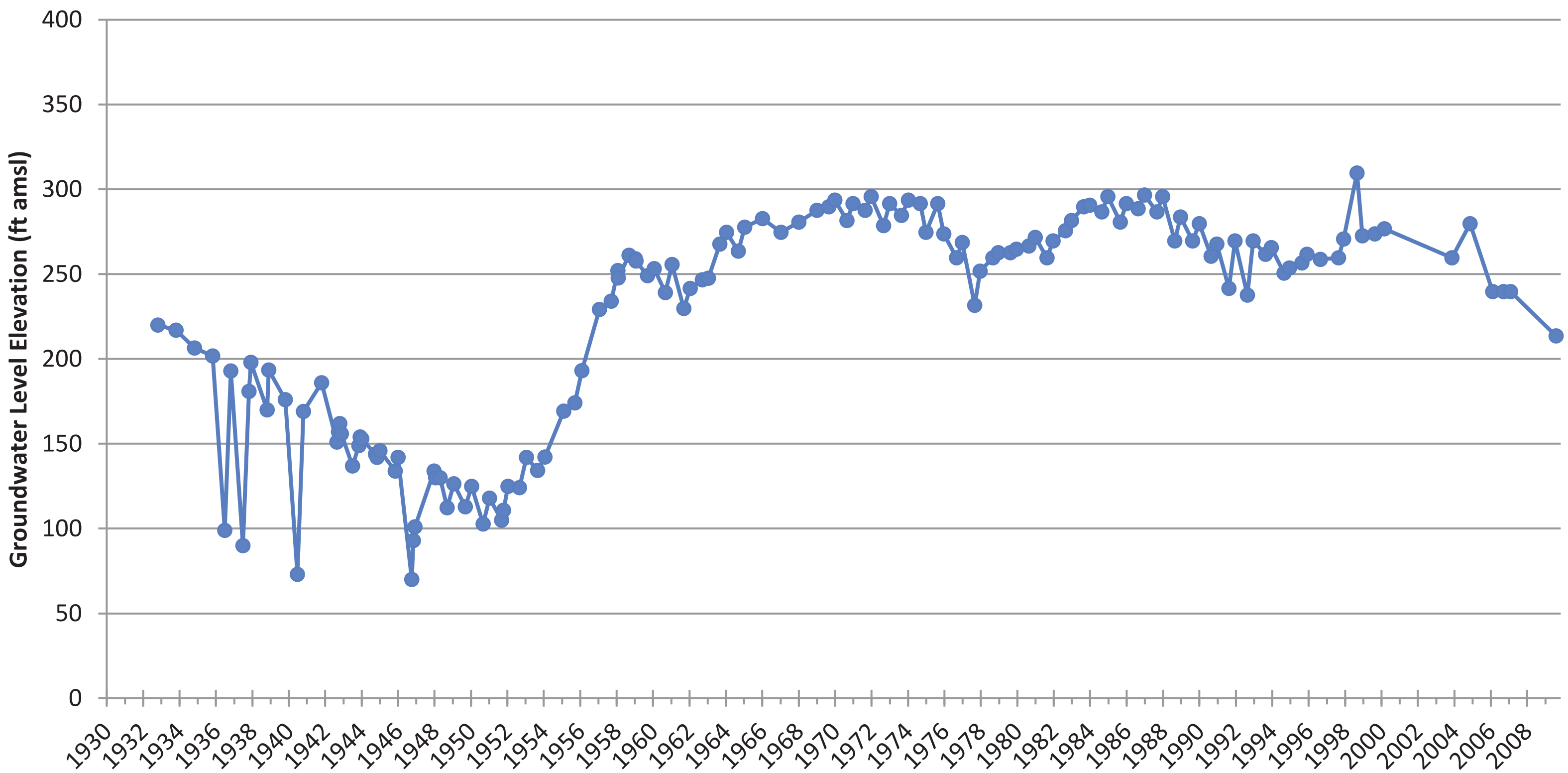
Groundwater elev. Date
Groundwater elev. Date
Aquifers
Artesian head Date
% Sand-gravel

Source of data   Type drill cable tool   Diam. hole 16"

Depth	Elev.	Thick.	Description
0	893	135	top soil and (sand and clay)
135	758	5	water sand
140	753	35	clay
175	718	16	good water gravel
[illegible]91	702	17	clay
[illegible]08	685	9	water sand
[illegible]17	676	31	clay
[illegible]48	645	12	water sand
[illegible]60	633	49	clay
[illegible]	584	7	water sand
316	577	20	clay and silt
[illegible]36	557	12	lime stone
[illegible]48	545	8	water sand
[illegible]56	537	22	clay
378	515	7	water sand
[illegible]85	508	85	clay and shale
470	423		bottom of hole

Groundwater Hydrographs - Shallow

24S/26E-32G01



ORIGINAL
File with DWR **22/23-30**

Page ____ of ____

Owner's Well No. Angiola #1

Date Work Began 3-25-92, Ended 3-25-92

Local Permit Agency Tulare

Permit No. 63779 Permit Date 3-23-92

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 396637

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ____ HORIZONTAL ____ ANGLE ____ (SPECIFY)

DEPTH TO FIRST WATER ____ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION Describe material, grain size, color, etc.
0 - 5	Top Soil
5 - 24	clay
24 - 26	sand
26 - 44	clay
44 - 49	sand
49 - 86	clay
86 - 104	sand
104 - 140	clay
140 - 144	sand
144 - 186	clay
186 - 192	sand
192 - 200	clay
200 - 208	sand
208 - 218	clay
218 - 224	sand
224 - 280	clay
280 - 284	sand
284 - 288	clay
288 - 309	sand
309 - 315	clay
315 - 330	sand
330 - 334	clay
334 - 339	sand
339 - 344	clay
344 - 351	sand
351 - 354	clay
354 - 373	sand
373 - 377	clay
377 - 419	sand
419 - 433	clay
433-437	sand
437-439	clay
439-444	sand
444-450	clay

UNCONFINED

TOTAL DEPTH OF BORING 460 (Feet)

TOTAL DEPTH OF COMPLETED WELL 450 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address ½ mi S. of Ave. 112 & 50 ft. W. of Rd 24

City Corcoran

County Tulare

APN Book Echoe Page 78 Parcel 291-130-01

Township 22S Range 23E Section 30

Latitude ____ NORTH Longitude ____ WEST
DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
- ____ Deepen
- ____ Other (Specify)

____ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

____ MONITORING

WATER SUPPLY
- ____ Domestic
- ____ Public
- X Irrigation
- ____ Industrial

____ "TEST WELL"

____ CATHODIC PROTECTION

____ OTHER (Specify)

DRILLING METHOD Reverse FLUID Natural

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ____ (Ft.) & DATE MEASURED ____

ESTIMATED YIELD* ____ (GPM) & TEST TYPE ____

TEST LENGTH ____ (Hrs.) TOTAL DRAWDOWN ____ (Ft.)

** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 - 240	30	X				steel	15.5	1/4	
240 - 450	30		X			louver	15.5	1/4	.070

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 - 20	X			
20 - 450				5/16x4

ATTACHMENTS (✓)

- ____ Geologic Log
- ____ Well Construction Diagram
- ____ Geophysical Log(s)
- ____ Soil/Water Chemical Analyses
- ____ Other ____

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Grabow Well Drilling, Inc.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 12522 9th Ave. Hanford, CA 93230
CITY STATE ZIP

Signed Dean E. Grabow
WELL DRILLER/AUTHORIZED REPRESENTATIVE

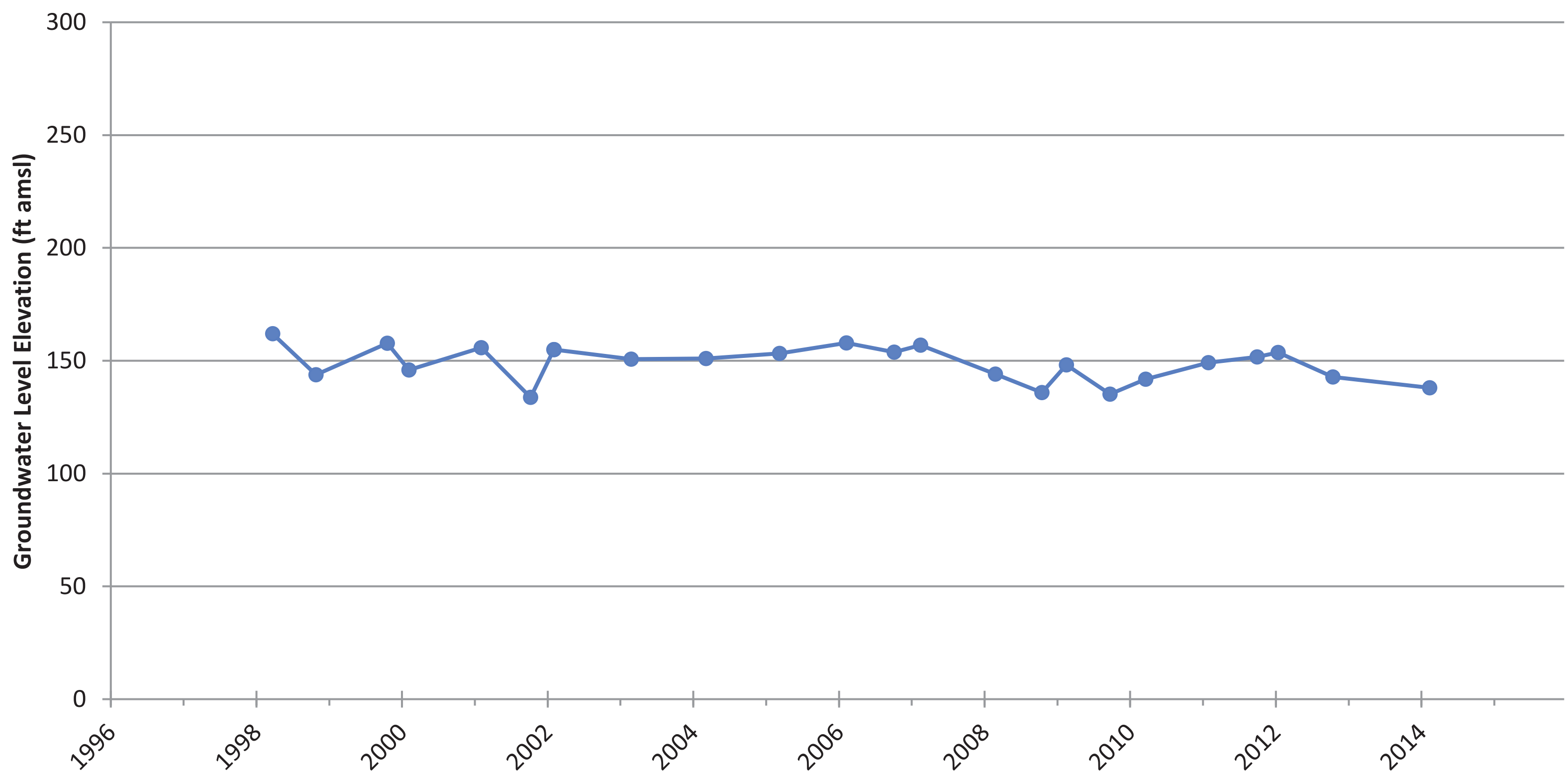
DATE SIGNED 3-29-92 C-57 LICENSE NUMBER 288489

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Groundwater Hydrographs - Shallow

22S/23E-30J01



TRIPLICATE
Owner's Copy
Page 1 of 2
Owner's Well No. 20-E
Date Work Began 6/20/2007, Ended 6/27/2007
Local Permit Agency TULARE COUNTY
Permit No. 07-0221 Permit Date 5/16/2007

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. E054449

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain, size, color, etc.)
0	4	TOP SOIL
4	7	MEDIUM SAND
7	45	SANDY BROWN CLAY
45	50	COARSE SAND & BROWN CLAY
50	53	SAND (MEDIUM COARSE)
53	54	BROWN CLAY
54	58	SAND (MEDIUM COARSE)
58	61	SAND & CLAY
61	70	SAND (MEDIUM COARSE)
70	93	CLAY BROWN
93	104	SAND (MEDIUM COARSE)
104	116	SAND & CLAY
116	121	BROWN CLAY
121	124	SAND & CLAY
124	130	BROWN CLAY
130	141	SAND (MEDIUM COARSE)
1471	150	BROWN CLAY
150	152	SAND (MEDIUM)
152	159	BROWN CLAY
159	160	SAND & CLAY
160	163	BROWN CLAY
163	169	SAND & CLAY
169	178	SAND
178	181	BROWN CLAY
181	183	SAND & CLAY
183	200	BROWN CLAY
200	202	SAND
202	214	BROWN CLAY
214	217	SAND (MEDIUM COARSE)
217	219	BROWN CLAY

TOTAL DEPTH OF BORING 500 (Feet)
TOTAL DEPTH OF COMPLETED WELL 490 (Feet)

WELL OWNER

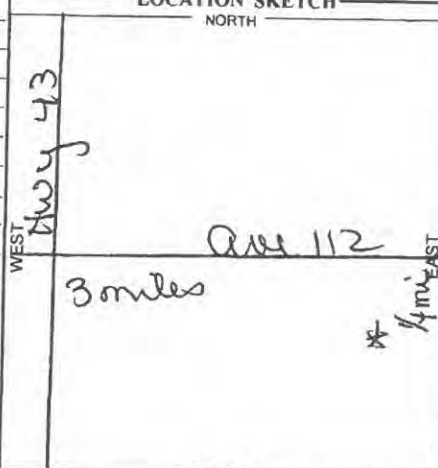
[redacted]

WELL LOCATION

Address AVE 112
City ANGIOLA CA
County TULARE
APN Book 293 Page 230 Parcel 01
Township 22 S Range 23 E Section 28
Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH



WEST EAST SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	36"	5/16"	
0	240	30"	✓				STEEL	18" OD	5/16"	
240	480	30"		✓			STEEL	18" OD	5/16"	.050 SLO
480	490	30"	✓				STEEL	18" OD	5/16"	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			6 SACK
0	500				MIX 6 X 16 & 1/4

ATTACHMENTS (✓)

— Geologic Log
✓ Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP
Signed [signature] 06/28/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

AWD01807

TRIPLICATE
Owner's Copy

Owner's Well No. 20-E

Date Work Began 6/20/2007, Ended 6/27/2007

Local Permit Agency TULARE COUNTY

Permit No. 07-0221 Permit Date 5/16/2007

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. E054449

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD REVERSE FLUID ______

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
219	222	SAND (MEDIUM COARSE)
222	245	BROWN CLAY
245	261	SAND & CLAY
261	282	BROWN CLAY
282	318	SAND (COARSE MEDIUM)
318	326	SANDY BROWN CLAY
326	331	COARSE SAND
331	345	SANDY BROWN CLAY
345	348	COARSE SAND
348	362	SANDY BROWN CLAY
362	367	SANDY BLUE CLAY
367	376	COARSE SAND
376	382	SANDY BLUE CLAY
382	385	COARSE SAND
385	387	SANDY BLUE CLAY
387	389	COARSE SAND
389	393	COARSE SAND & GRAVEL
393	398	COARSE SAND
398	406	SANDY BLUE CLAY
406	408	BLUE CLAY & COARSE SAND
408	410	COARSE SAND
410	413	BLUE SANDY CLAY
413	417	COARSE SAND
417	442	SANDY BLUE CLAY
442	453	COARSE SAND
453	459	MEDIUM & COARSE SAND
459	480	SANDY BLUE CLAY
480	500	BLUE CLAY

TOTAL DEPTH OF BORING 500 (Feet)

TOTAL DEPTH OF COMPLETED WELL 490 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address AVE 112

City ANGIOLA CA

County TULARE

APN Book 293 Page 230 Parcel 01

Township 22 S Range 23 E Section 28

Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ______ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ______ (Ft.) & DATE MEASURED ______

ESTIMATED YIELD * ______ (GPM) & TEST TYPE ______

TEST LENGTH ______ (Hrs.) TOTAL DRAWDOWN ______ (Ft.)

** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	36"	5/16"	
0	240	30"	✓				STEEL	18" OD	5/16"	
240	480	30"		✓			STEEL	18" OD	5/16"	.050 SLO
480	490	30"	✓				STEEL	18" OD	5/16"	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			6 SACK
0	500				MIX 6 X 16 & 1/4

ATTACHMENTS (✓)

— Geologic Log
✓ Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ______

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP

Signed ______ 06/28/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

9-185—July 1935
Revised

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

WELL SCHEDULE

Date CCT. 10, 19 50 Field No. 22/23-21L1
Record by MEC Office No.
Source of data PI

1. *Location:* State California County Tulare
Map ~~Lake View~~ TAYLOR WEIR 5-429C
¼ ¼ sec. T N/S R E/W
2. *Owner:* And Tenant [redacted]
~~Driller~~ Goldring Packing Co. Address
3. *Topography* Plain
4. *Elevation* 205 ft. above/below
5. *Type:* Dug, drilled, driven, bored, jetted 1950
6. *Depth:* Rept. 521 ft. Meas. ft.
7. *Casing:* Diam. 14 in., to in., Type
Depth ft., Finish
8. *Chief Aquifer* From ft. to ft.
Others perfs – 321' – 521'
9. *Water level* ft. rept./meas. 19 above/below
NO ACCESS which is ft. above/below surface
10. *Pump:* Type ~~Turb.~~ Capacity G. M.
Power: Kind Elec. Horsepower 50
11. *Yield:* Flow G. M., Pump G. M., Meas., Rept. Est.
Drawdown ft. after hours pumping G. M.
12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs.
Adequacy, permanence
13. *Quality* Temp °F.
Taste, odor, color Sample Yes/No
Unfit for
14. *Remarks:* (Log, Analyses, etc.) D-log

U. S. GOVERNMENT PRINTING OFFICE 6—7478

Well G1

22/23-21L1

PLOTTED FEB 1970

100 FT W of DITCH ON HALF SECTION LINE

~~45 FT S of ... LINE~~

0.51 miles South of ℄ Ave. 120

.52 mi. W/o Rd 40 (sec. line)
.485 mi. N/o Ave. 112 (sec. line) on W. side of canal.

Meter No. ~~564 989~~ 322 502

Trans. No. — 3661

Disc. Diam. 10 ~~8"~~ Length 11 ft into ditch ~~15 FT E into DITCH~~ 161 ft. into ditch East of canal

Remarks

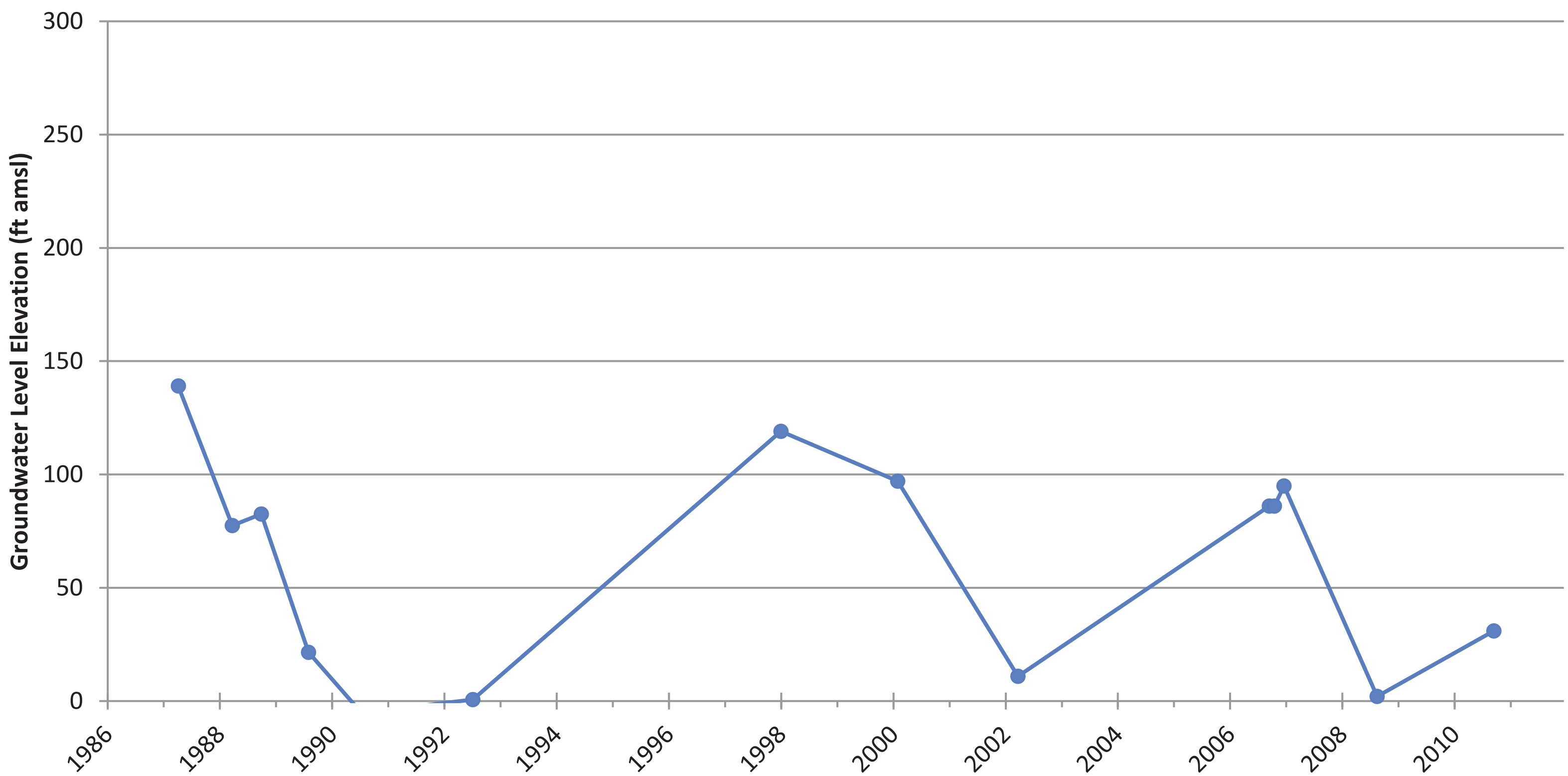
Nov. 6, 1958
Byron-Jackson turb
U.S. Elec. 75 H.P.
S.W.L. = 65.78 ft.
M.P. = T.C. W. Side which is 1.5 ft. above LSD

WL = 67.4' (12-51)

AWD02010

Groundwater Hydrographs - Shallow

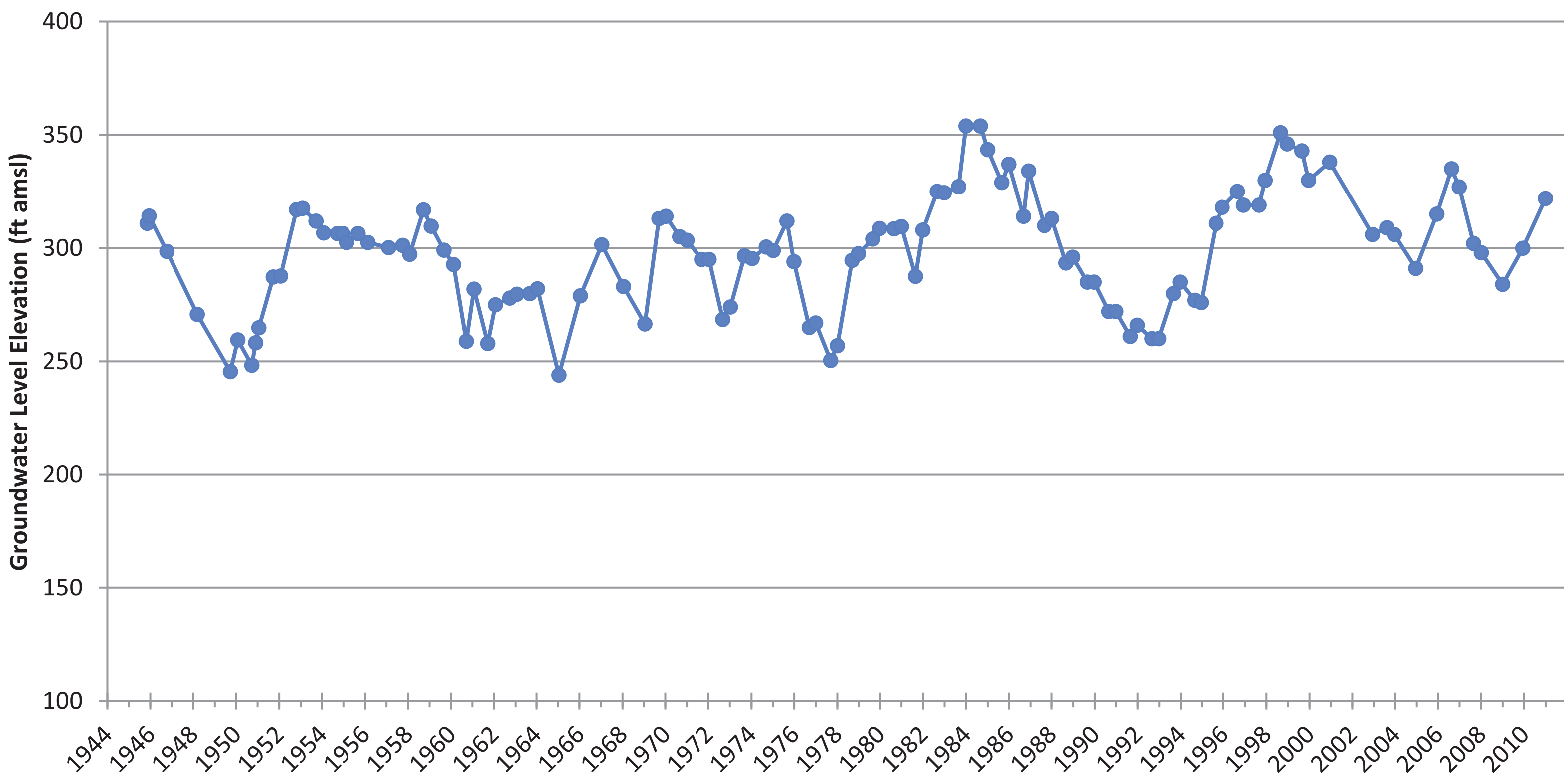
G-1



Thomas Harder & Co.
Groundwater Consulting

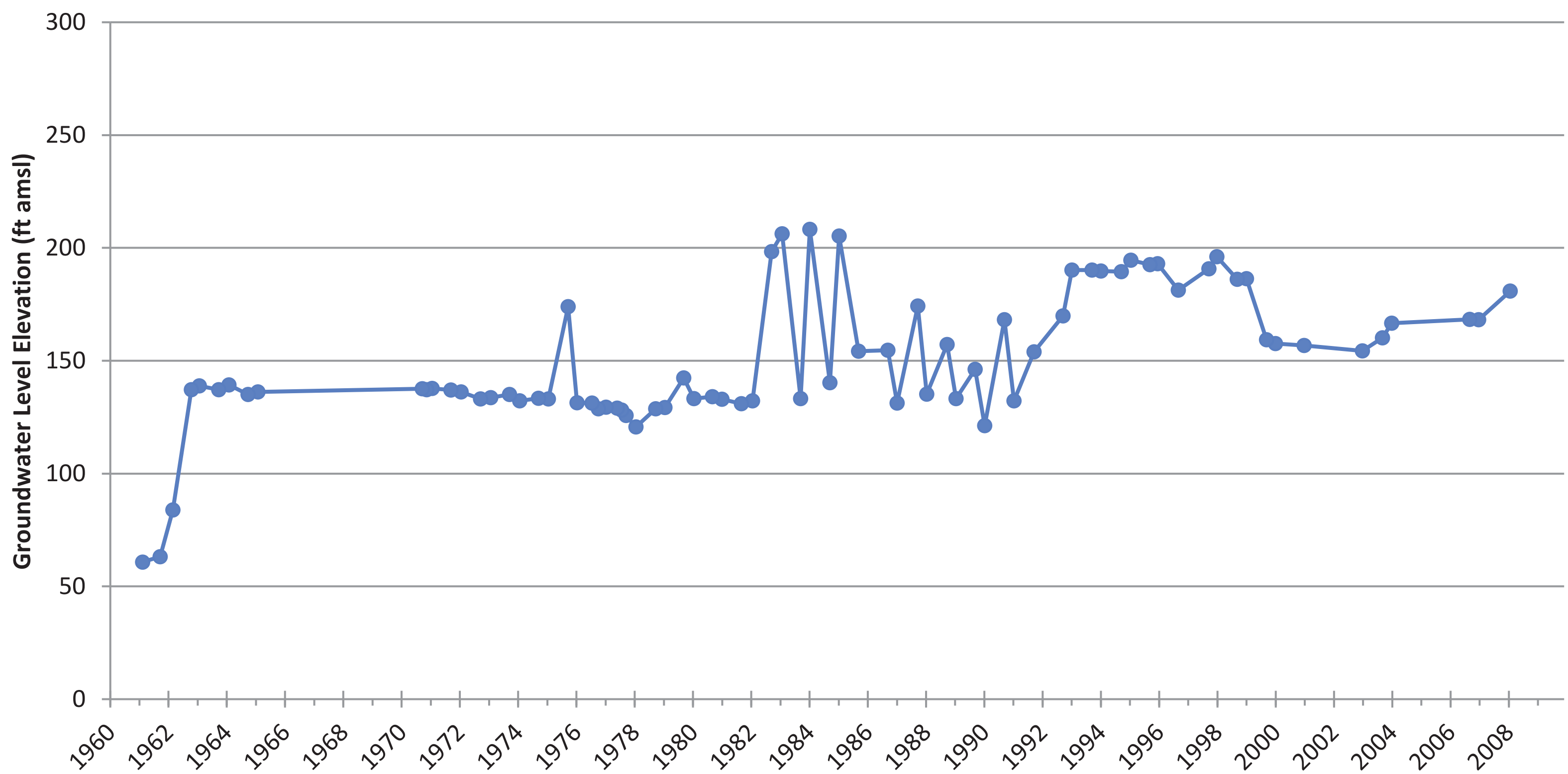
Groundwater Hydrographs - Shallow

22S/26E-25J01



Groundwater Hydrographs - Shallow

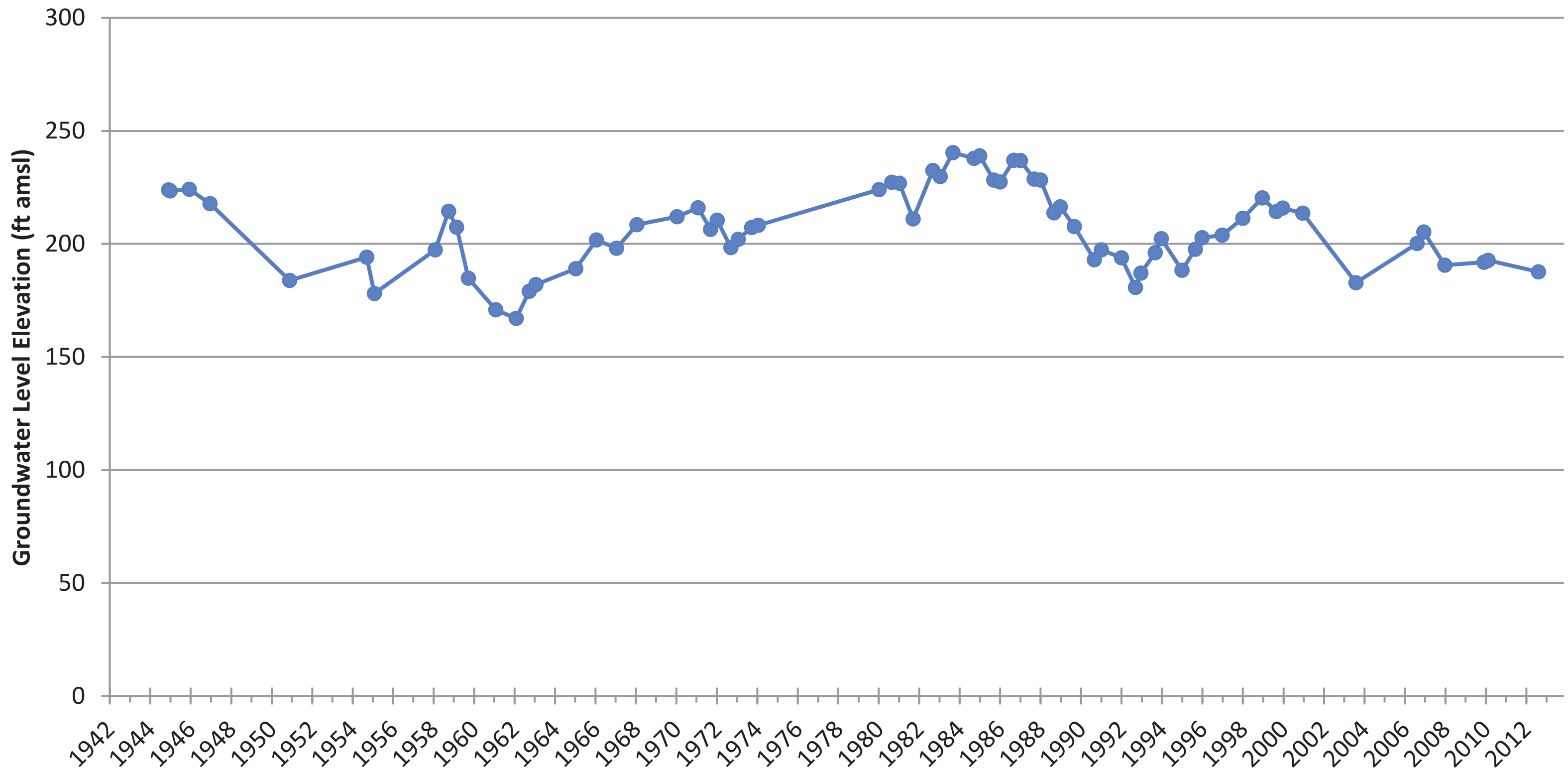
23S/23E-33A02



Thomas Harder & Co.
Groundwater Consulting

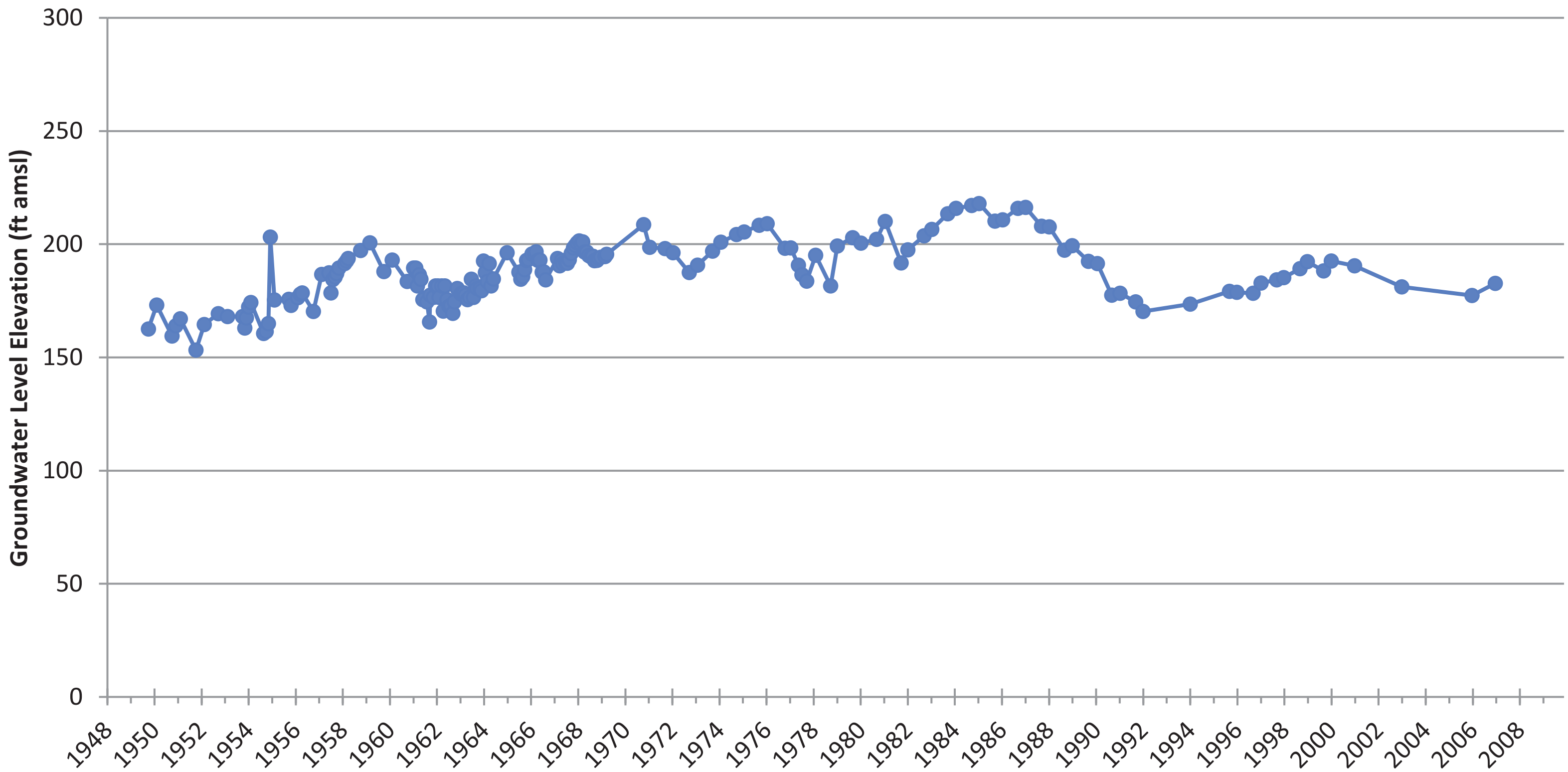
Groundwater Hydrographs - Shallow

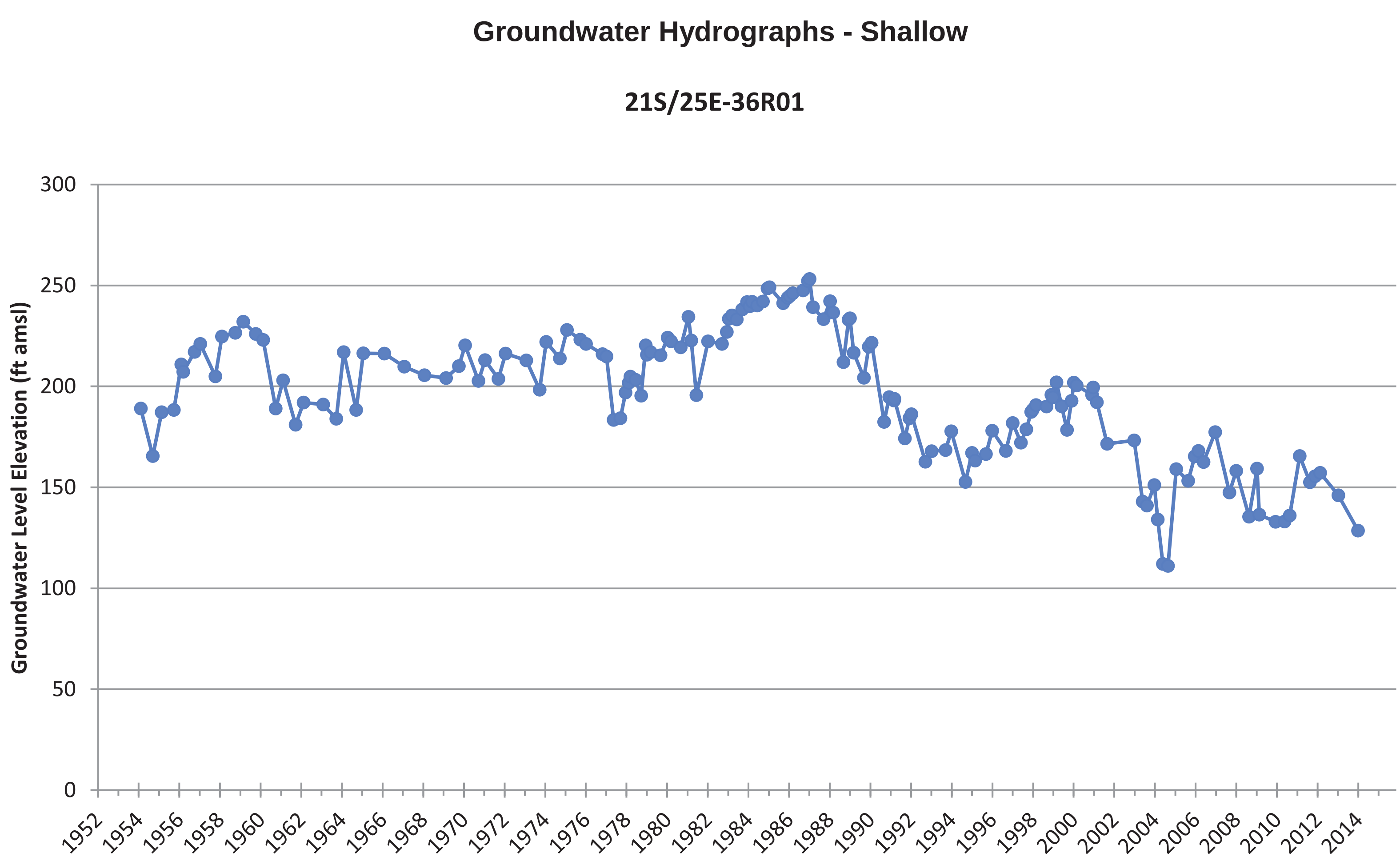
21S/24E-15H01



Groundwater Hydrographs - Shallow

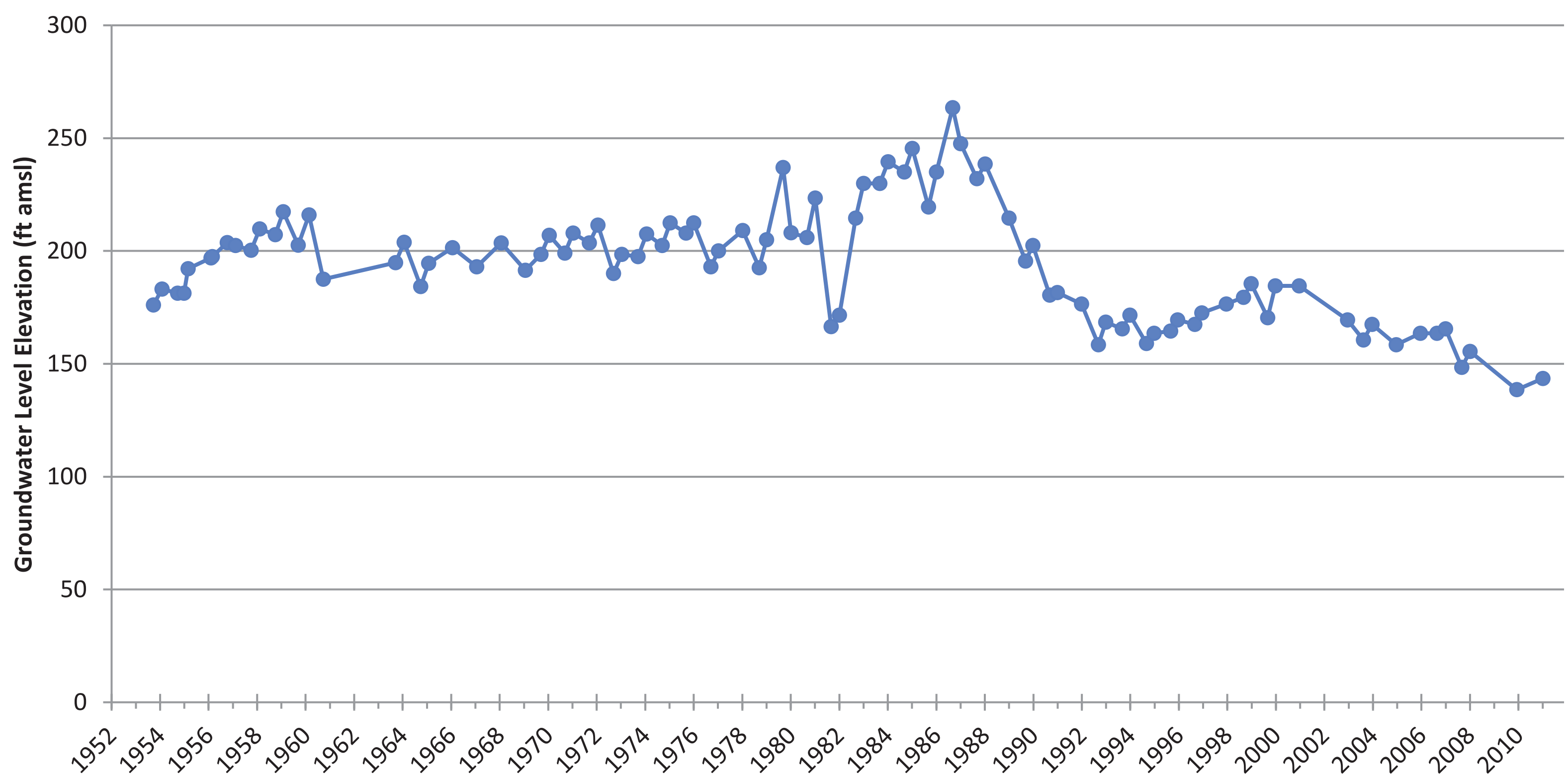
22S/25E-10E01




Groundwater Hydrographs - Shallow
21S/25E-36R01
Groundwater Level Elevation (ft amsl)
300
250
200
150
100
50
0
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

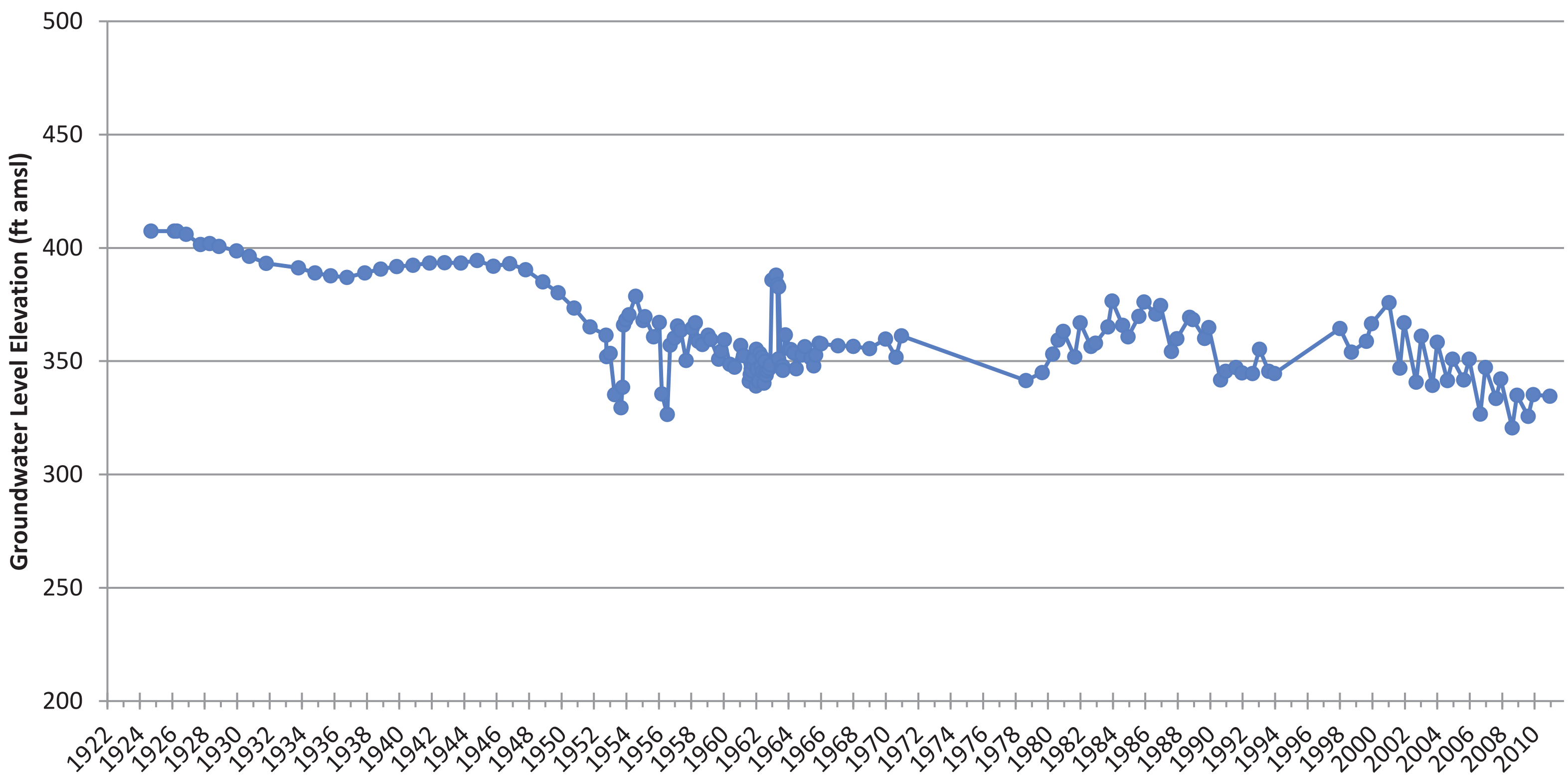
Groundwater Hydrographs - Shallow

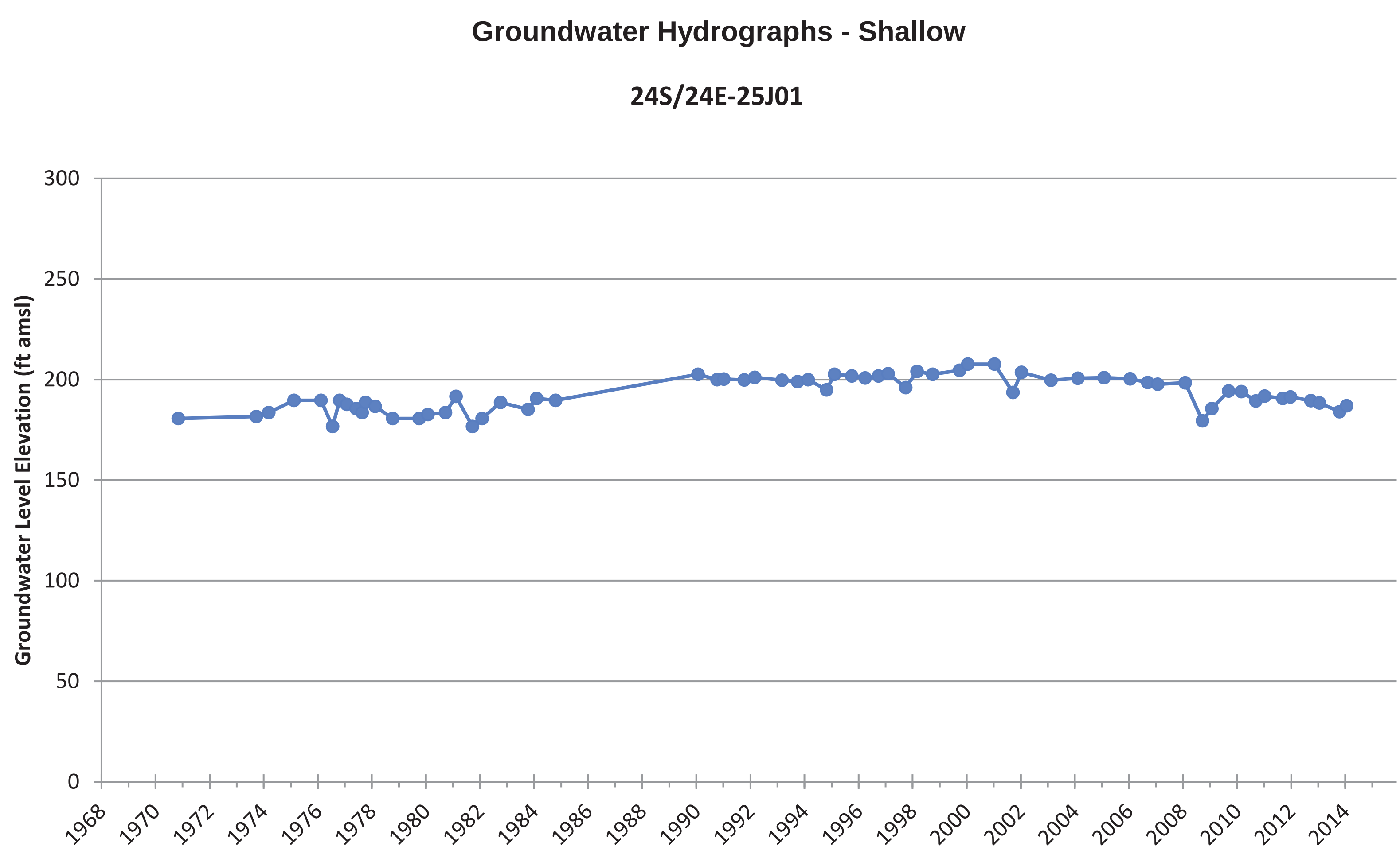
22S/26E-07J01



Groundwater Hydrographs - Shallow

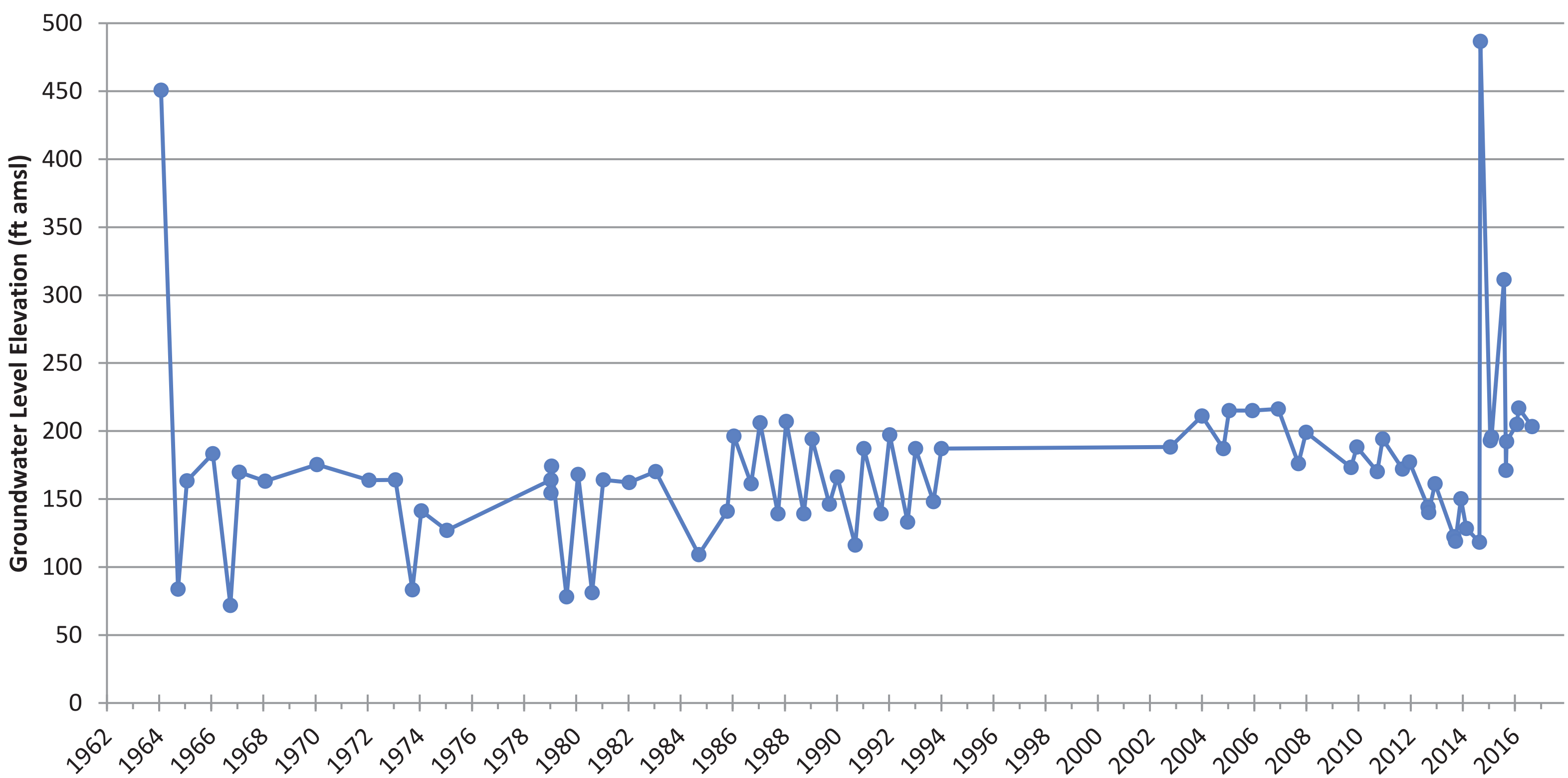
22S/27E-10R01




Groundwater Hydrographs - Shallow
24S/24E-25J01
Groundwater Level Elevation (ft amsl)
300
250
200
150
100
50
0
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

Groundwater Hydrographs - Shallow

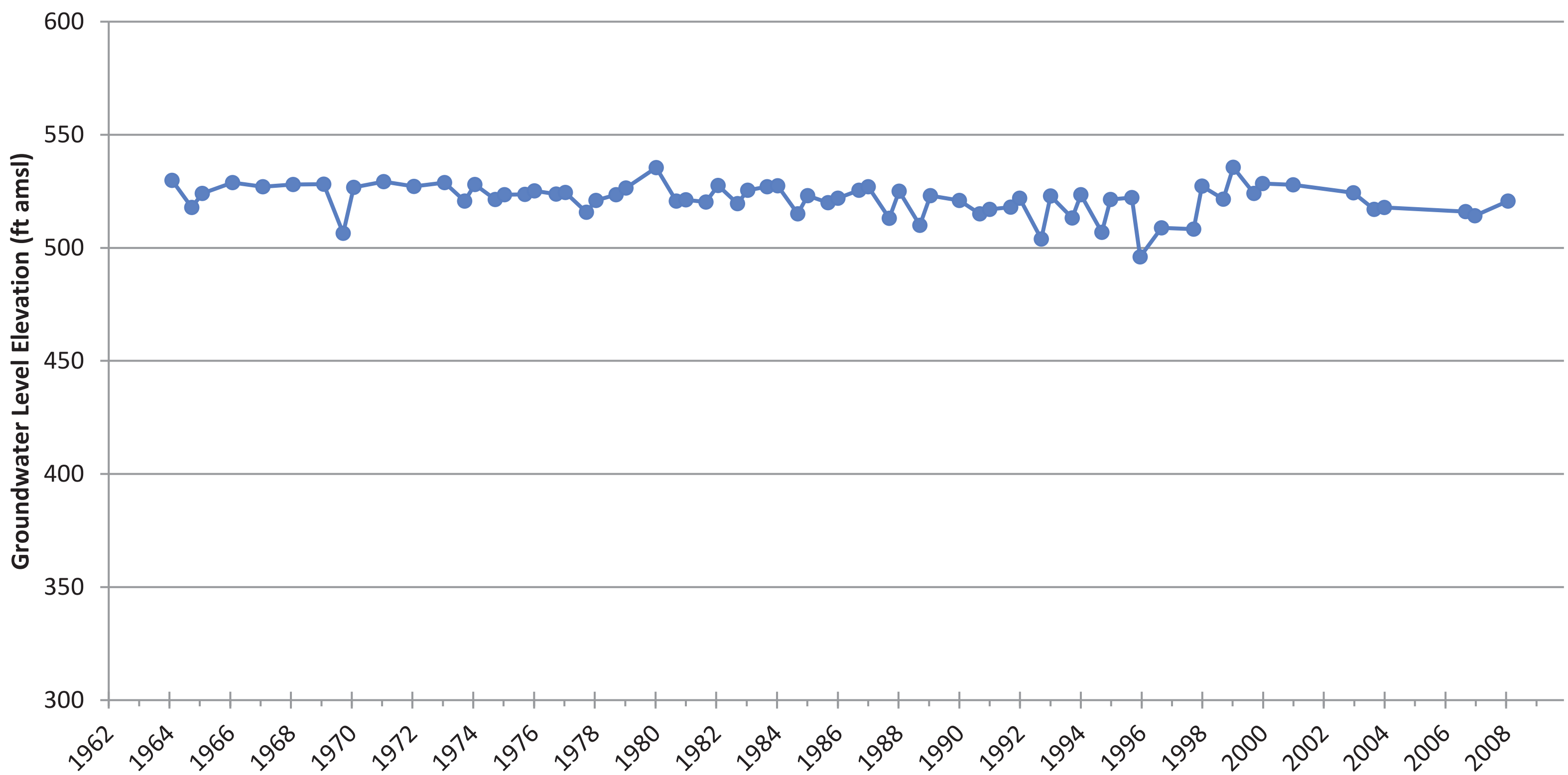
24S/26E-01R01



Thomas Harder & Co.
Groundwater Consulting

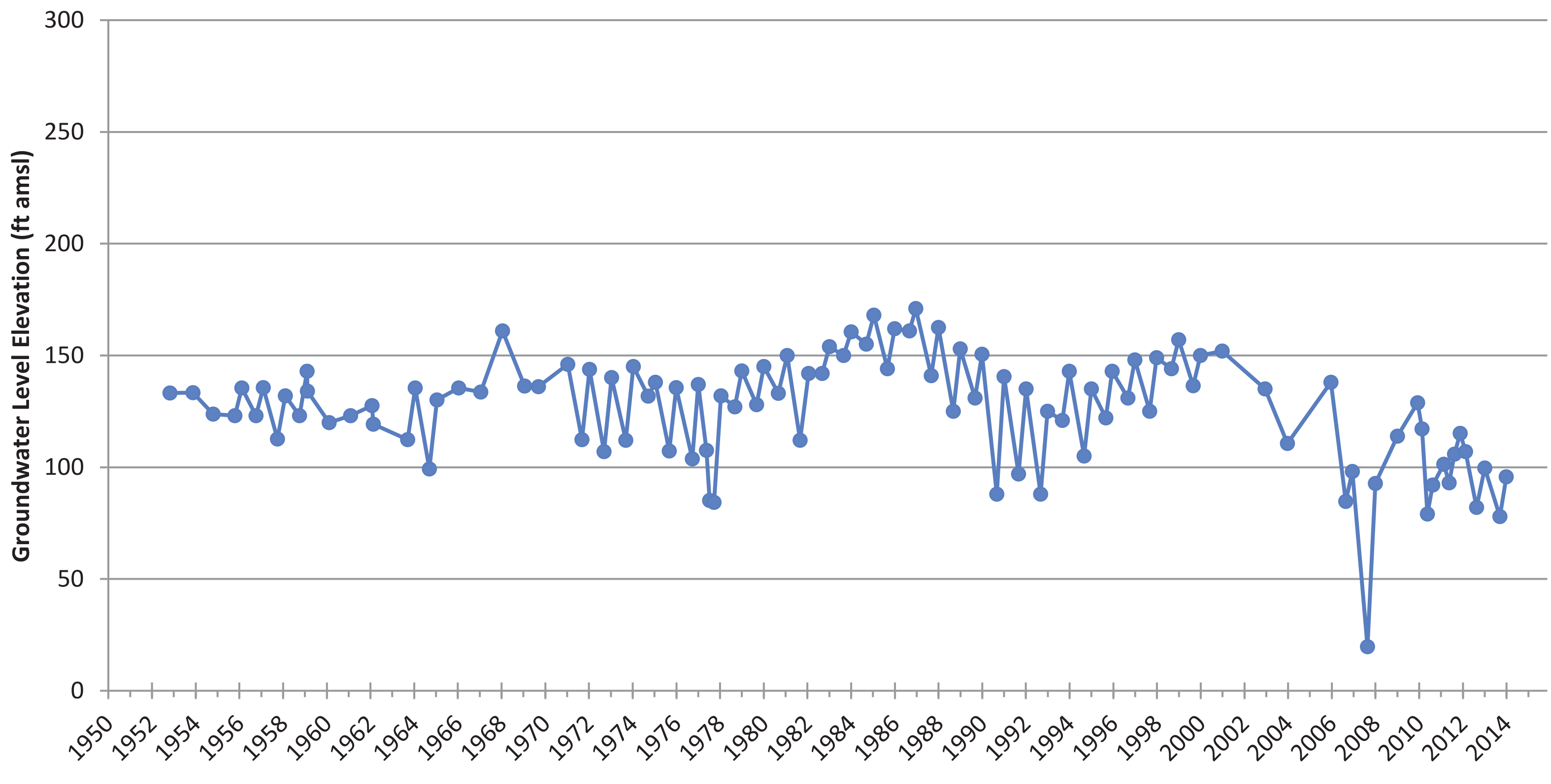
Groundwater Hydrographs - Shallow

22S/28E-03H01



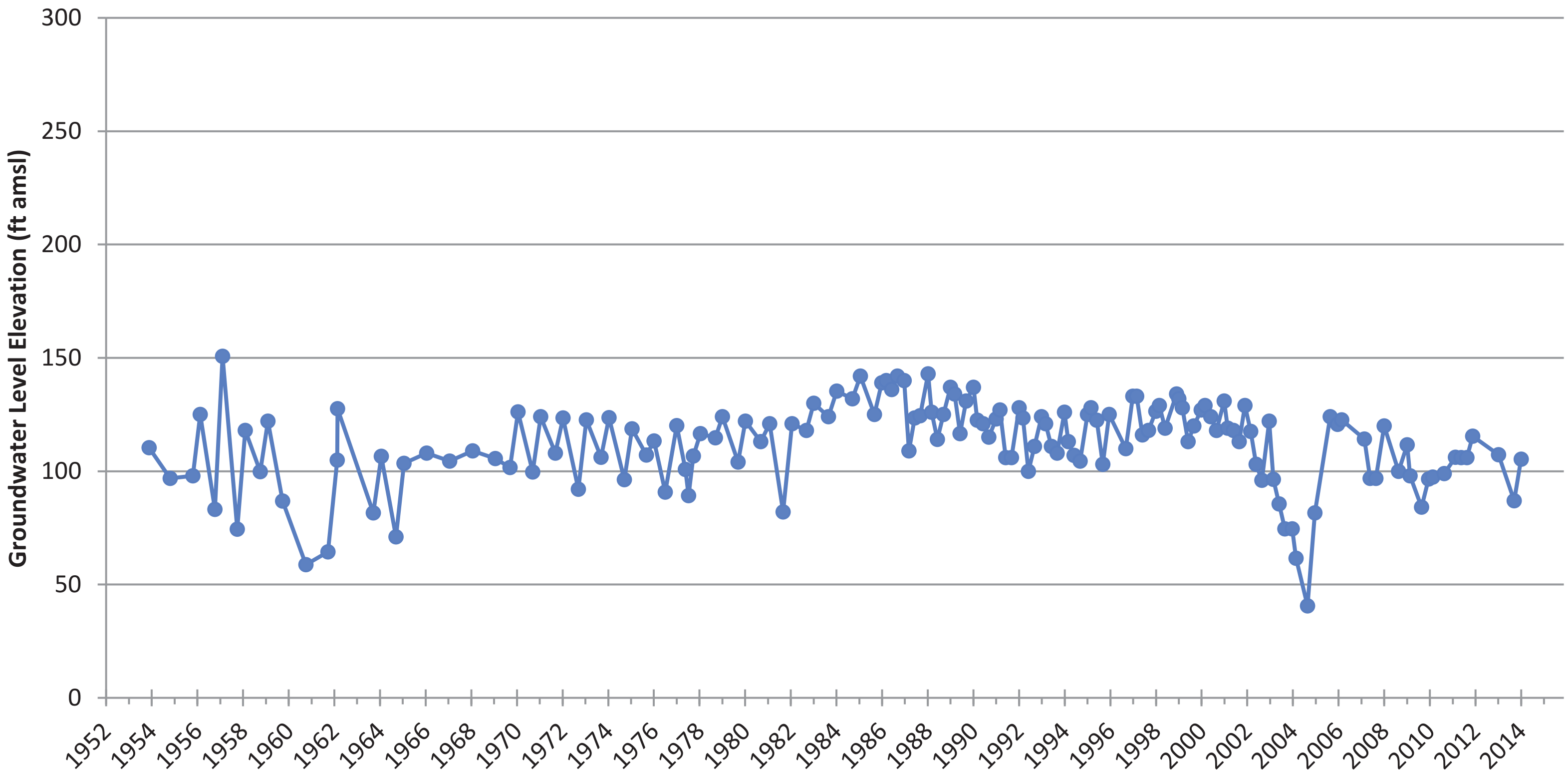
Groundwater Hydrographs - Shallow

23S/25E-19D01



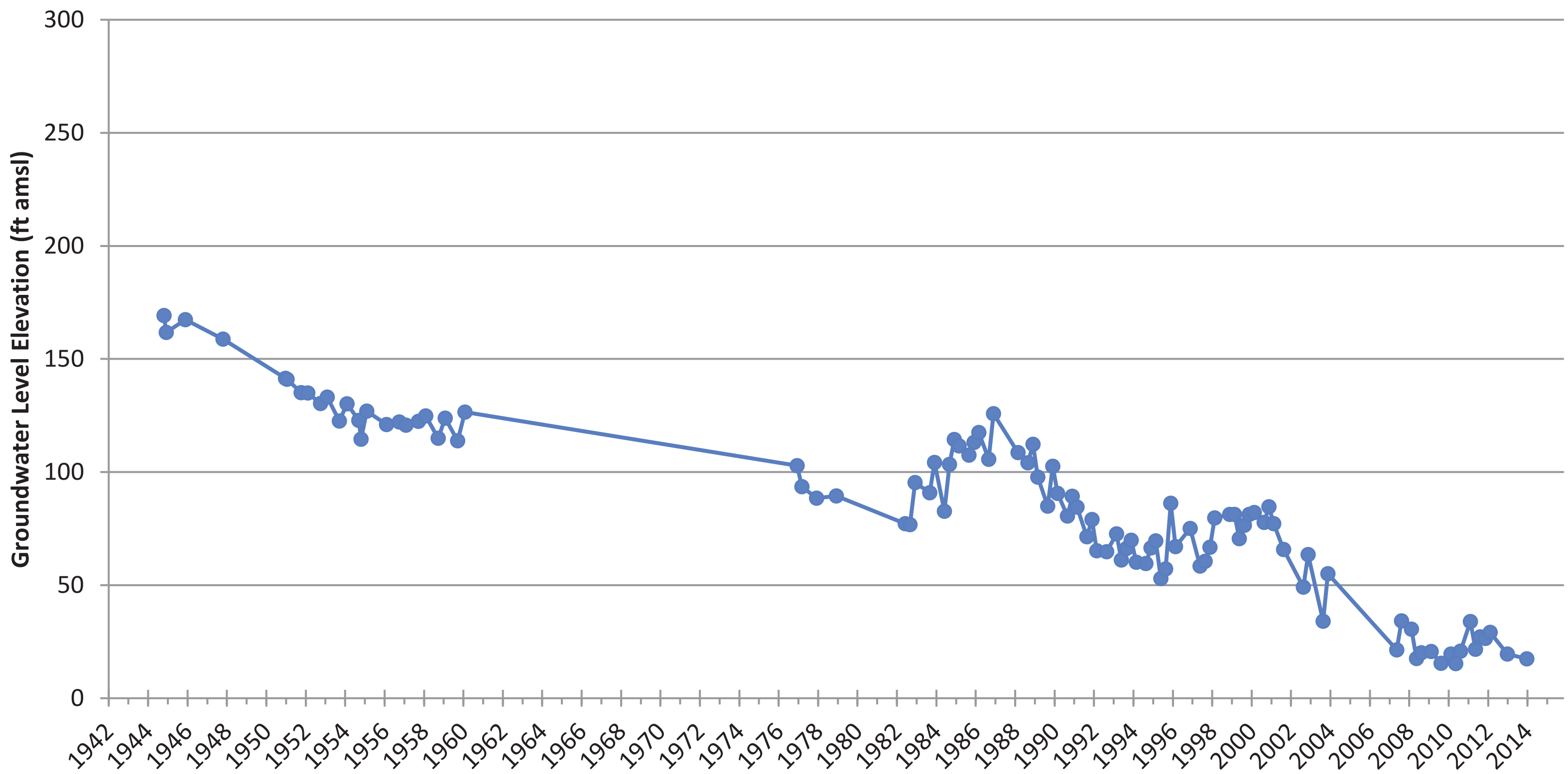
Groundwater Hydrographs - Shallow

23S/24E-28J02



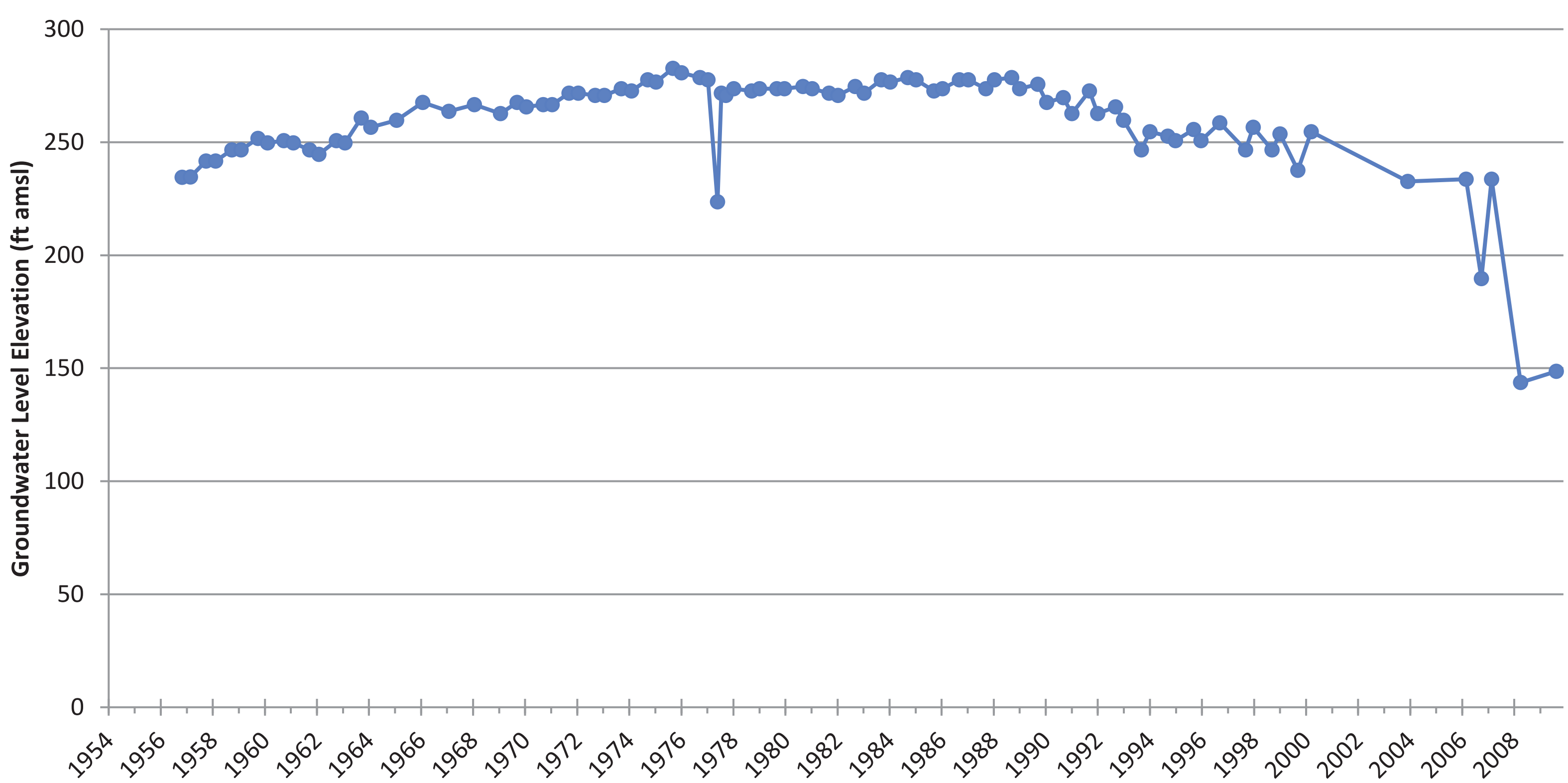
Groundwater Hydrographs - Shallow

22S/24E-20A01



Groundwater Hydrographs - Shallow

24S/25E-35P01



22/23-2121

BOLSEY PORTABLE

ORIGINAL

LOG OF WELL

WHITTEN BROS. DRILLING COMPANY

"The Oldest ..."

PHONE 2321

Well Location: 7/21

Name: Colorine Packing Company

Address: Angola, California

Well Started: 7/20/50 Well finished: 7/31/50 Diameter:

Gauge: 5/16 Total Depth: Depth to Water:

Well G1

Strata Formation	From Feet	To Feet	Perforated
Top Soil	0	6	ft. 16" 5/16 O.D. perforated
Sand	6	15	ft. 5/16 16" O.D. plain
Clay	15	52	
Sandy Clay	52	105	
Sand	105	113	
Sandy Clay	113	202	
Hard Sand	202	262	
Sand	262	265	
Sandy Clay	265	420	
Sand	420	432	
Sandy Clay	432	460	
Tough Clay	460	480	
Sandy Clay	480	510	
Hard Blue Slate	510	521	

BOLSEY PORTABLE

AWD02011

TRIPLICATE
Owner's Copy
Page 1 of 3

STATE OF CALIFORNIA WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. E054456

DWR USE ONLY — DO NOT FILL IN: STATE WELL NO./STATION NO.; LATITUDE; LONGITUDE; APN/TRS/OTHER

Owner's Well No. #2-13W ~~[illegible]~~ W-14
Date Work Began 6/19/2007, Ended 7/12/2007
Local Permit Agency TULARE COUNTY
Permit No. 07-0220 Permit Date 5/15/2007

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain, size, color, etc.)
0	25	SANDY BROWN CLAY
25	38	SANDY BLUE CLAY
38	50	SANDY BROWN CLAY
50	54	SAND
54	61	CLAY
61	66	SANDY CLAY
66	74	CLAY
74	79	SANDY CLAY
79	86	CLAY BROWN
86	91	BLUE CLAY
91	95	SAND
95	98	SANDY CLAY
98	111	CLAY
111	118	FINE SAND
118	126	SANDY CLAY
126	133	BLUE CLAY
133	142	SAND
142	158	BLUE CLAY
158	161	SAND
161	170	BLUE CLAY
170	177	SAND
177	196	BLUE CLAY
196	202	SANDY CLAY
202	205	BLUE CLAY
205	216	SANDY CLAY
216	228	BLUE CLAY
228	234	BLUE CLAY & SAND
234	243	CLAY
243	248	SAND
248	253	SANDY CLAY

TOTAL DEPTH OF BORING 490 (Feet)
TOTAL DEPTH OF COMPLETED WELL 490 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address RD 40 & AVE 112
City ANGIOLA CA
County TULARE
APN Book 291 Page 110 Parcel 05
Township 22 S Range 23 E Section 33
Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	36"	5/16"	
0	240	30"	✓				STEEL	18"	5/16"	
240	480	30"		✓			STEEL	18"	5/16"	.050 SLO
480	490	30"	✓				STEEL	18"	5/16"	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			SIX SACK
0	490			✓	1/4 X 10

ATTACHMENTS (✓)
— Geologic Log
✓ Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP
Signed [signature] 07/16/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

AWD02863

TRIPLICATE
Owner's Copy

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. E054456

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. #2-13W
Date Work Began 6/19/2007, Ended 7/12/2007
Local Permit Agency TULARE COUNTY
Permit No. 07-0220 Permit Date 5/15/2007

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain, size, color, etc.
253	265	SAND
265	269	CLAY
269	276	SAND
276	278	CLAY W/SAND
278	296	CLAY
296	303	SAND
303	309	CLAY
309	316	SAND
316	322	SANDY CLAY
322	325	SAND
325	337	CLAY
337	346	SAND
346	354	SANDY CLAY
354	367	CLAY
367	374	SAND
374	381	SANDY CLAY
381	384	CLAY
384	385	SANDY CLAY
385	391	SAND
391	404	CLAY
404	410	SAND
410	423	CLAY
423	434	CLAY W/LITTLE SAND
434	439	SAND
439	443	SANDY CLAY
443	454	SAND
454	456	CLAY
456	463	SAND
463	472	CLAY
472	480	SAND

TOTAL DEPTH OF BORING 490 (Feet)
TOTAL DEPTH OF COMPLETED WELL 490 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address RD 40 & AVE 112
City ANGIOLA CA
County TULARE
APN Book 291 Page 110 Parcel 05
Township 22 S Range 23 E Section 33
Latitude ___ DEG. MIN. SEC. ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH
WEST EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial
MONITORING —
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	36"	5/16"	
0	240	30"	✓				STEEL	18"	5/16"	
240	480	30"		✓			STEEL	18"	5/16"	.050 SLO
480	490	30"	✓				STEEL	18"	5/16"	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			SIX SACK
0	490			✓	1/4 X 10

ATTACHMENTS (✓)

— Geologic Log
✓ Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 8650 E. LACEY BLVD. CITY HANFORD STATE CA ZIP 93230-4844
Signed ___ WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 07/16/07
C-57 LICENSE NUMBER 548214

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

TRIPLICATE
Owner's Copy

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. E054456

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. #2-13W
Date Work Began 6/19/2007, Ended 7/12/2007
Local Permit Agency TULARE COUNTY
Permit No. 07-0220 Permit Date 5/15/2007

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID ____

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain, size, color, etc.)
480	490	CLAY

TOTAL DEPTH OF BORING 490 (Feet)
TOTAL DEPTH OF COMPLETED WELL 490 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address RD 40 & AVE 112
City ANGIOLA CA
County TULARE
APN Book 291 Page 110 Parcel 05
Township 22 S Range 23 E Section 33
Latitude ____ DEG. MIN. SEC. Longitude ____ DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ____ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ____ (Ft.) & DATE MEASURED ____
ESTIMATED YIELD * ____ (GPM) & TEST TYPE ____
TEST LENGTH ____ (Hrs.) TOTAL DRAWDOWN ____ (Ft.)
*May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	36"	5/16"	
0	240	30"	✓				STEEL	18"	5/16"	
240	480	30"		✓			STEEL	18"	5/16"	.050 SLO
480	490	30"	✓				STEEL	18"	5/16"	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			SIX SACK
0	490			✓	1/4 X 10

ATTACHMENTS (✓)

— Geologic Log
✓ Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ____
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

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8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP
Signed ____ 07/16/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR 21/25-13

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 488425

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Page ___ of ___
Owner's Well No. ___
Date Work Began 2/8/92, Ended 3/12/92
Local Permit Agency Tulare County Health Dept.
Permit No. ___ Permit Date 1/9/92

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	12	Sandy clay,
12	15	sand
15	88	Sandy Clay,
88	112	Sand
112	124	Sandy Clay
124	154	Sand
154	178	grey clay,
178	190	red grey clay,
190	210	red clay
210	222	Sand + joint Clay,
222	252	red Clay,
252	260	Sand

OUTSIDE CORC. CLAY AREA

TOTAL DEPTH OF BORING 256 (Feet)
TOTAL DEPTH OF COMPLETED WELL 257 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 15754 Ave 168
City Tulare
County Tulare
APN Book 232 Page 090 Parcel 16
Township 21S Range 25E Section 13
Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH

NORTH

WEST

o well

EAST

Ave 168

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
___ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)
___ MONITORING
WATER SUPPLY
___ Domestic
___ Public
✓ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Cable tool FLUID None

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 112 (Ft.) & DATE MEASURED 3/12/92
ESTIMATED YIELD* 250 (GPM) & TEST TYPE air lift
TEST LENGTH 12 (Hrs.) TOTAL DRAWDOWN 116 (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	20	20"	✓		✓		Steel	19½	.250	None
0	243	12"	✓				Steel	12	10ga.	
175	225	mills					perforations from 175-225			

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20	✓			

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Lott Drilling Co.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 1593 Joyce Circle CITY Tulare STATE Ca. ZIP 93274

Signed Marland Lott (WELL DRILLER/AUTHORIZED REPRESENTATIVE) DATE SIGNED 3/12/92 C-57 LICENSE NUMBER 398407

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 1 of 1

Owner's Well No. 2

Date Work Began 2-5-99, Ended 2-13-99

Local Permit Agency TCEH

Permit No. 79084 Permit Date 2-2-99

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 519706

DWR USE ONLY — DO NOT FILL IN

21S/26E-10

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain size, color, etc.
0	3	Top Soil
3	15	(Fine) sand
15	19	(Coarse) sand
19	30	Green clay
30	35	(Coarse) sand (H20)
35	41	(Fine) sand
41	57	Sand + Gravel (H2O)
57	105	Brown sandy clay
105	107	(Coarse) sand (H2O)
107	132	Brown Clay + sand
132	140	Sandstone (Hard)
140	162	Red clay + sand
162	167	(Coarse) sand (H2O)
167	172	Sandstone (Hard)
172	176	(Coarse) sand (H2O)
176	205	Brown clay + sand

TOTAL DEPTH OF BORING 205 (Feet)

TOTAL DEPTH OF COMPLETED WELL 200 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address ___

City SAME

County ___

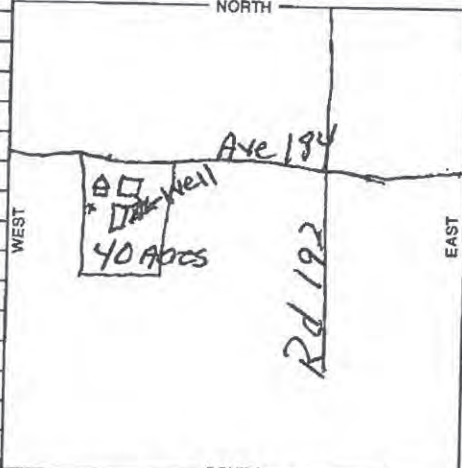
APN Book 236 Page 030 Parcel 008

Township 21S Range 26E Section 10

Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH

NORTH



WEST EAST SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

✓ Domestic

___ Public

___ Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD Rotary FLUID H2O

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 24 (Ft.) & DATE MEASURED 2-13-99

ESTIMATED YIELD * 100 (GPM) & TEST TYPE Airlift

TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN NA (Ft.)

* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE: BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	80	12½	✓				PVC	6"	Sch 40	[illegible]
80	200	12½		✓			PVC	6"	Sch 40	90SX3

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	23	✓			
23	205			✓	3/8 minus

ATTACHMENTS (✓)

___ Geologic Log

___ Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Disgo Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

1410 Jomah, Porterville, Ca. 93257 (ADDRESS, CITY, STATE, ZIP)

Signed Lenny R Corden (WELL DRILLER/AUTHORIZED REPRESENTATIVE) 2-15-99 (DATE SIGNED) 662109 (C-57 LICENSE NUMBER)

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

9-063
(December 1949)

21/26-22A1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

WELL LOG

No. 21/26-22A1
domestic well

OTHER Nos. ....

State Calif County Tulare Subarea ....

Owner [redacted]

Location ....

Drilled by Weels Bros Address Porterville

Date August 1949 Casing diam. 12 Land-surf. alt. ....

Source of data Owners log

(Enter type of well, perforations, yield, and drawdown at end of log)

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
0-75	Soil		
75-83	Muddy sand		
83-96	Sand, Rock & gravel		
96-110	Sandy clay		
110-125	Brown clay		
125-144	Mushy sand		
144-149	Sand		
149-160	Brown clay		
160-164	Muddy sand		
164-174	clay		
	0-170 12" pipe, 2 gauge		
	perf. 118' to 162'		

RECORD BY R. L. Klausing DATE 5/27/59 SHEET 1 OF 1

U. S. GOVERNMENT PRINTING OFFICE 16—61587-1

ORIGINAL
File with DWR 21/26-34

Page ___ of ___

Owner's Well No. ___

Date Work Began 4-29-92, Ended 4-30-92

Local Permit Agency Tulare co.

Permit No. 64027 Permit Date 4-27-92

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 489973

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	5	Top Soil
5	10	Clay
10	20	Sandy Clay
20	40	Gravely sand
40	60	Sandy Clay Gray
60	80	Sandy Clay Coarse
80	100	Cobbles
100	120	Gravely Clay
120	140	Sandy Clay(some cobbles)
140	160	Coarse sand
160	180	" "
180	200	" "

OUTSIDE CORC. CLAY AREA

TOTAL DEPTH OF BORING 220 (Feet)

TOTAL DEPTH OF COMPLETED WELL 200 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 18975 Ave 152

City Porterville Ca.

County Tulare

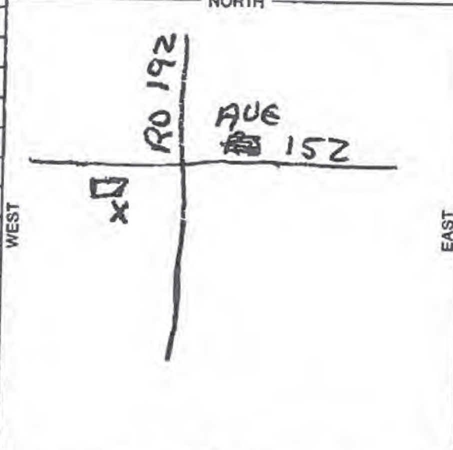
APN Book 237 Page 010 Parcel 14

Township 21S Range 26E Section 34

Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH

NORTH



WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

X Domestic

___ Public

___ Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD Rotary FLUID Mud

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 89 (Ft.) & DATE MEASURED 4-30-92

ESTIMATED YIELD* 175 (GPM) & TEST TYPE Air Lift

TEST LENGTH 5 (Hrs.) TOTAL DRAWDOWN 97 (Ft.)

* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	200	14								
0	80		X				P V C	6	Scd 40	
80	200			X			"	"	"	3/32

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	X			
50	200				3/8 Grav

ATTACHMENTS (✓)

___ Geologic Log

___ Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME L & L Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 2459 N. Oaks Sp. # 47 CITY Tulare STATE Ca. ZIP 93274

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 4-30-92 C-57 LICENSE NUMBER 620671

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 2 of 2

Owner's Well No. [redacted]

Date Work Began 5/21/2007, Ended 5/22/2007

Local Permit Agency Tulare Co

Permit No. 07-0116 Permit Date 3/28/2007

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 47663

DWR USE ONLY – DO NOT FILL IN

21S/23E-30

STATE WELL NO./STATION NO.

LATITUDE | LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD CABLE FLUID WATER/POL

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
332	342	CLAY
342	356	SAND
356	362	CLAY
362	370	SAND
370	375	CLAY
375	395	SAND
395	406	CLAY
406	411	SAND
411	440	CLAY

TOTAL DEPTH OF BORING 440 (Feet)

TOTAL DEPTH OF COMPLETED WELL 420 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 1/4 mile s. ave 160 1/2 mile w. rd 24

City Corcoran,Ca CA

County tulare

APN Book 200 Page 230 Parcel 02

Township 21 S Range 23 E Section 30

Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
- ___ Deepen
- ___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
- ___ Domestic ___ Public
- ✓ Irrigation ___ Industrial

MONITORING ___

TEST WELL ___

CATHODIC PROTECTION ___

HEAT EXCHANGE ___

DIRECT PUSH ___

INJECTION ___

VAPOR EXTRACTION ___

SPARGING ___

REMEDIATION ___

OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	260	28	✓				STEEL	15.5	1/4	
260	420	28		✓			STEEL	15.5	5/16	.125

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20	✓			
20	440				GRAVEL

ATTACHMENTS (✓)

- ___ Geologic Log
- ___ Well Construction Diagram
- ___ Geophysical Log(s)
- ___ Soil/Water Chemical Analysis
- ___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Myers Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

12522 9th ave Hanford CA 93230
ADDRESS CITY STATE ZIP

Signed [signature] 05/23/07 865822
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No.________
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA

Do Not Fill In
Nº 105172
State Well No. 22/23-6
Other Well No.________

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare   Owner's number, if any—
R. F. D. or Street No. 1/4 mi. No. E. of Ave. 4th. So. side of Tule river , section 6. corcoran, ca.

22/23/6

(3) TYPE OF WORK (check):

New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary air ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:

SINGLE ☒ DOUBLE ☐

From ft.	to ft.	Diam.	Gage or Wall
0	450	16x1/4	

If gravel packed

Diameter of Bore	from ft.	to ft.
	0	450

Type and size of shoe or well ring
Size of gravel:
Describe joint

(7) PERFORATIONS:

Type of perforator used: shand. louver
Size of perforations ____ in., length, by ____ in.

From ft.	to ft.	Perf. per row	Rows per ft.
240	450		

(8) CONSTRUCTION:

Was a surface sanitary seal provided? ☐ Yes ☐ No To what depth ____ ft.
Were any strata sealed against pollution? ☐ Yes ☐ No If yes, note depth of strata

(11) WELL LOG:

Total depth 462 ft. Depth of completed well 450 ft.
Formation: Describe by color, character, size of material, and structure.

ft.	to ft.	
0	6	top soil
6	13	sand fine & clay gray
13	27	sand med.
27	32	clay gray
32	45	sand med.
45	48	sand & blue clay
48	61	sand med.
61	96	clay blue
96	121	sand med.
121	128	clay blue
128	142	sand stone & fine & med. sand
142	179	clay blue
179	184	sand med.
184	189	clay blue
189	209	sand med.
209	225	clay blue
225	236	sand fine
236	238	clay blue
238	240	sand fine
240	252	sand med. & fine
252	260	blue clay & med. sand
260	269	sand med.
269	275	clay blue
275	279	sand med & coarse
279	289	clay blue
289	291	sand stone & med sand
291	297	clay blue
297	302	sand med. & fine
302	310	clay blue
310	324	sand med. & coarse
324	332	clay blue
332	345	sand med.
345	348	green clay
348	351	clay blue
351	359	clay blue
359	371	sand coarse & med.
371	379	clay blue
379	398	sand fine & med.
398	410	clay blue
410	419	fine & med. sand
419	432	clay green
432	434	sand fine

continued

UNCONFINED

ILLERS REPORT
7078, Water Code)
Nº 105157
NCY OF CALIFORNIA
State Well No.________
Other Well No.________

(11) WELL LOG: Andy Wheat

Total depth 462 ft. Depth of completed well 450 ft.
Formation: Describe by color, character, size of material, and structure.

ft.	to ft.	
434	437	sand med.
437	440	clay
440	445	sand & clay
445	462	clay blue. Bottom

Was electric log made of well? ☐ Yes ☐ No

Work started 6/24 1977. Completed 6/30 1977

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Dail Rhoads Well drilling
(Person, firm, or corporation) (Typed or printed)
Address 570 E. Gail ave. Tulare, Calif. 93274
[SIGNED] Dail Rhoads
Well Driller
License No. 303612 Dated 7/7, 1977

ORIGINAL
File with DWR

WATER WELL DRILLERS REPORT

(Sections 7079, 7080, 7081, 7082, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Do Not Fill In

Nº 30889

State Well No.

Other Well No. 22S-23E-18

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare Owner's number, if any Mitchell-1

Township, Range, and Section Sec. 18 - R23E - T22S

Distance from cities, roads, railroads, etc. 60' W - Rd 24 and ¼ mi N - Ave. 120 Tulare Co -

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐

If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: SINGLE ☐ DOUBLE ☐ OTHER:

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	If gravel packed From ft.	To ft.
0	440	14 OD	1/4	26	0	440

Size of shoe or well ring: Size of gravel:

Describe joint

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
0	200	3	14	1/8

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☒ No ☒ To what depth ft.

Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata

From 0 ft. to 70 ft.

From ft. to ft.

Method of sealing Cemente

(9) WATER LEVELS:

Depth at which water was first found, if known ft.

Standing level before perforating, if known ft.

Standing level after perforating and developing ft. 54'

(10) WELL TESTS:

Was pump test made? Yes ☐ No ☐ If yes, by whom?

Yield: 2000 gal./min. with 80 ft. drawdown after 4 hrs.

Temperature of water Was a chemical analysis made? Yes ☐ No ☐

Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth ft. Depth of completed well ft.

Formation: *Describe by color, character, size of material, and structure*

ft. to ft.

100 - 114 Sand
114 - 130 Clay
130 - 148 Sand
148 - 154 Clay
154 - 170 Sand
170 - 180 Clay
180 - 195 Sand
195 - 200 Clay
200 - 205 Sand
205 - 215 Clay
215 - 230 Sand
230 - 255 Clay
255 - 260 Sand
260 - 270 Clay
270 - 277 Sand UNCONFINED
277 - 295 Clay
295 - 305 Sand
305 - 315 Clay
315 - 335 Sand
335 - 340 Clay
340 - 376 Sand
376 - 390 Clay
390 - 402 Sand
402 - 420 Clay
420 - 424 Sand
424 - 430 Clay
430 - 434 Sand
434 - 456 Clay
456 -

CONFIDENTIAL
Water Code Sec. 13752

Work started 19 , Completed 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Terry's Well Drilling
(Person, firm, or corporation) (Typed or printed)

Address PO Box 787 Corcoran Cal

[SIGNED] [signature]
(Well Driller)

License No. 144440 Dated Oct 20, 1970

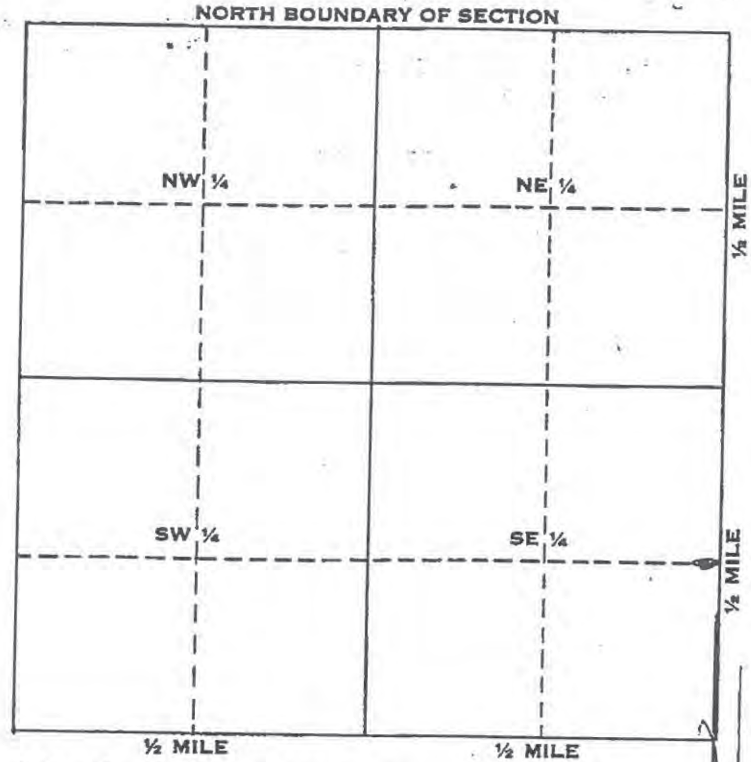
SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-65)

No. N.I.

58391-950 10-65 SDM TRIP ① △ OSP

WELL LOCATI… …ETCH



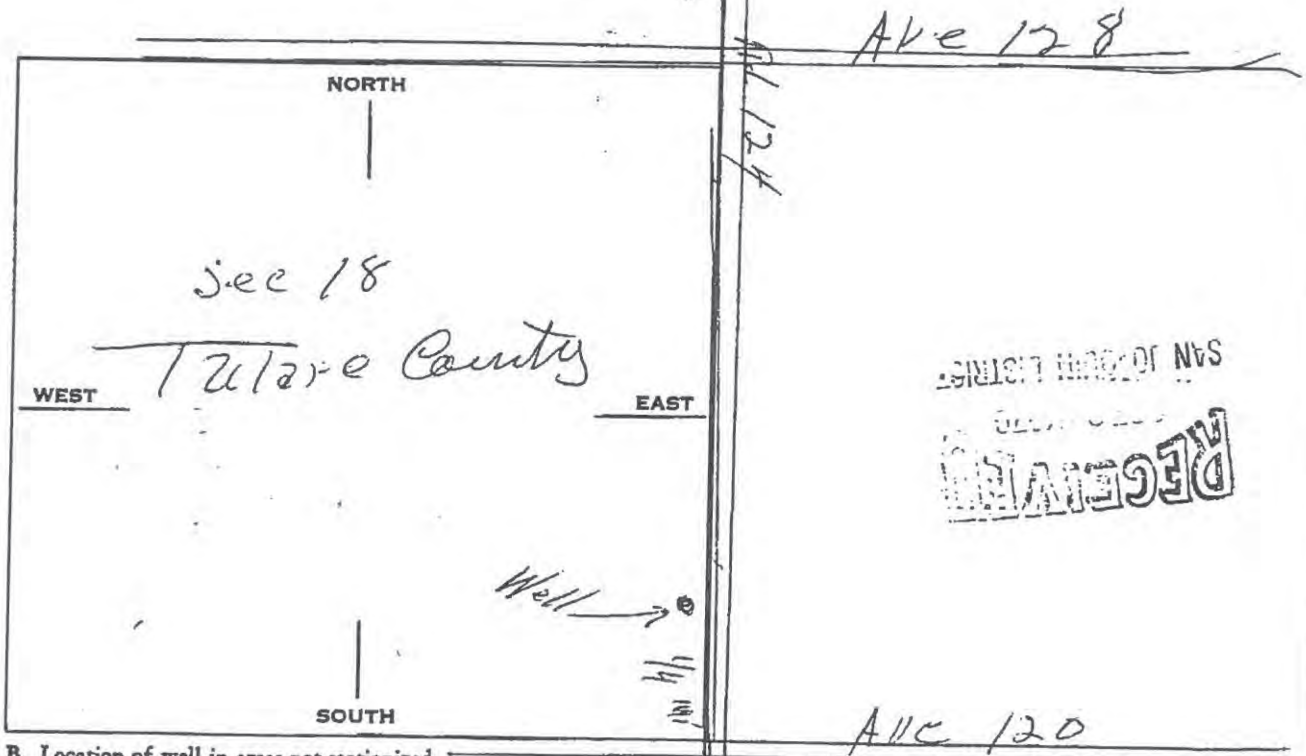
A. Location of well in sectionized areas.
Sketch roads, railroads, streams, or other features as necessary.

Township 22 S N/S

Range 23 E E/W

Section No. 18

Tulare Co



B. Location of well in areas not sectionized.
Sketch roads, railroads, streams, or other features as necessary.
Indicate distances.

ORIGINAL
File with DWR

Page ___ of ___

Owner's Well No. ___

Date Work Began ___, Ended ___

Local Permit Agency ___

Permit No. ___ Permit Date ___

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 458715

DWR USE ONLY — DO NOT FILL IN

2 1 S 2 4 E 1 9 — STATE WELL NO./STATION NO.

LATITUDE ___ LONGITUDE ___

APN/TRS/OTHER ___

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER 88 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain size, color, etc.
0	11	L.B.Clay
11	15	Fine Sand
15	25	L.B.Clay
25	31	Coarse Sand
31	68	L.B.Clay
68	72	Med Sand
72	88	L.B.Clay
88	96	Fine Sand(water)
96	102	Med Coarse Sand
102	108	L.B.CLAY
108	114	Med Sand
114	116	L.CLAY
116	124	Coarse Sand
124	142	L.B.Clay
142	145	Coarse Sand
145	165	Brown Clay
165	168	Coarse Sand
168	173	Brown Clay
173	185	Med Coarse Sand
185	190	Brown Clay
190	206	Med Coarse Sand
206	230	L.B.Clay
230	235	Blue Clay

TOTAL DEPTH OF BORING 235 (Feet)

TOTAL DEPTH OF COMPLETED WELL 235 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address ½ mi. north of ave 160 on Rd.64,

City West side of rd.,south side of tule

County Tulare, Tipton

APN Book 200 Page 160 Parcel 016

Township 21s Range 24e Section 19

Latitude ___ NORTH Longitude ___ WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
- ___ Deepen
- ___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY
- ___ Domestic
- ___ Public
- XX Irrigation
- ___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD CABLE FLUID ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 86 (Ft.) & DATE MEASURED 12/29/95

ESTIMATED YIELD* 250 (GPM) & TEST TYPE Air

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN 6 (Ft.)

* May not be representative of a well's long-term yield.

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	228	14	X				Cal.Weld	14	10	
							½"x4"x14" Steel Shoe			
163	208					£	Mills Perf.			¼"x3"

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20	x			

ATTACHMENTS (✓)

- ___ Geologic Log
- ___ Well Construction Diagram
- ___ Geophysical Log(s)
- ___ Soil/Water Chemical Analyses
- ___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Roger L. Nation (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

26521 South Mooney Blvd. Visalia,Ca. 93277 (ADDRESS, CITY, STATE, ZIP)

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE 12/30/95 DATE SIGNED 259884 C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL

File with DWR

Notice of Intent No.

Local Permit No. or Date

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 165525

State Well No. 21/29-29

Other Well No.

(1) [redacted]

(2) **LOCATION OF WELL** (See instructions):

County TULARE Owner's Well Number

Well address if different from above

Township Range Section

Distance from cities, roads, railroads, fences, etc. ½ mi. south of Ave 160 on Rd. 80,75' west side of road north side of ditch blank.

WELL LOCATION SKETCH

(3) **TYPE OF WORK:**

New Well ☒ Deepening ☐

Reconstruction ☐

Reconditioning ☐

Horizontal Well ☐

Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) **PROPOSED USE:**

Domestic ☐

Irrigation ☒

Industrial ☐

Test Well ☐

Stock ☐

Municipal ☐

Other ☐

(5) **EQUIPMENT:**

Rotary ☐ Reverse ☐

Cable ☒ Air ☐

Other ☐ Bucket ☐

(6) **GRAVEL PACK:**

Yes ☐ No ☒ Size

Diameter of bore

Packed from to ft.

(7) **CASING INSTALLED:**

Steel ☒ Plastic ☐ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall
0	184	14	10

½x4x14" Steel Shoe

(8) **PERFORATIONS:** Mills

Type of perforation or size of screen

From ft.	To ft.	Slot size
132	175	½x3

(9) **WELL SEAL:**

Was surface sanitary seal provided? Yes ☐ No ☒ If yes, to depth ft.

Were strata sealed against pollution? Yes ☐ No ☒ Interval ft.

Method of sealing

(10) **WATER LEVELS:**

Depth of first water, if known 50 ft.

Standing level after well completion 44 ft.

(11) **WELL TESTS:**

Was well test made? Yes ☒ No ☐ If yes, by whom? Nation

Type of test Pump ☐ Bailer ☐ Air lift ☒

Depth to water at start of test 44 ft. At end of test 50 ft

Discharge 250 gal/min after hours Water temperature

Chemical analysis made? Yes ☐ No ☒ If yes, by whom?

Was electric log made? Yes ☐ No ☒ If yes, attach copy to this report

(12) **WELL LOG:** Total depth 220 ft. Depth of completed well 220 ft.

from ft. to ft.	Formation (Describe by color, character, size or material)
0-25	L.B.Clay
25-32	Coarse Sand
32-46	L.B.Clay
46-53	Med Sand (Water)
53-54	Soft Clay
54-62	Coarse Sand
62-95	L.B.Clay
95-98	Coarse Sand
98-100	Soft Clay
100-102	Coarse Sand
102-104	Soft Sandy Clay
104-107	Coarse Sand
107-133	L.B.Clay
133-157	Coarse Sand
157-161	L.B.Sandy Clay
161-173	Coarse Sand & Sandstones
173-190	L.B.Clay
190-194	Med Sand
194-220	L.B.Clay

DO NOT FOR PUBLIC WATER CODE SEC.

UNCONFINED

Work started 10/19 19 87 Completed 11/6 19 87

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED Roger L. Nation (Well Driller)

NAME ROGER L. NATION (Person, firm, or corporation) (Typed or printed)

Address P.O. BOX 216

City IVANHOE, CA. Zip 93235

License No. 259884 Date of this report 11/6/87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

WATER WELL DRILLERS REPORT
(Sections 7079, 7080, 7081, 7082, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Do Not Fill In
Nº 30891
State Well No.
Other Well No. 22S/23E-15

(1) OWNER:
[redacted]

(2) LOCATION OF WELL:
County Tulare Owner's number, if any
Township, Range, and Section Sec. 15 - T22S - R23E
Distance from cities, roads, railroads, etc. 80 ft N of Ave 120 and 1 1/4 miles E of Hiway 43

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:
STEEL: SINGLE ☐ DOUBLE ☐ OTHER:

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	420	14 1D	1/4	26	0	420

Size of shoe or well ring:
Size of gravel:
Describe joint

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
240	420	4	12	1/8 Lou.

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☐ No ☐ To what depth ft.
Were any strata sealed against pollution? Yes ☒ No ☐ If yes, note depth of strata
From 0 ft. to 50 ft.
From ft. to ft.
Method of sealing Cemete

(9) WATER LEVELS:
Depth at which water was first found, if known ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:
Was pump test made? Yes ☒ No ☐ If yes, by whom? Wilson
Yield: 1500 gal./min. with 38 ft. drawdown after 4 hrs.
Temperature of water Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:
Total depth ft. Depth of completed well ft.
Formation: Describe by color, character, size of material, and structure ft. to ft.

ft. to ft.	Formation
160 - 171	Clay
171 - 179	Sand
179 - 184	Clay
184 - 200	Sand
200 - 212	Clay
212 - 217	Sand
217 - 226	Clay
226 - 234	Sand
234 - 239	Clay
239 - 245	Sand
245 - 261	Clay
261 - 266	Sand
266 - 277	Clay
277 - 298	Sand
298 - 314	Clay
314 - 324	Sand
324 - 328	Clay
328 - 340	Sand
340 - 348	Clay
348 - 352	Sand
352 - 355	Clay
355 - 388	Sand
388 - 398	Clay
398 - 407	Sand
407 - 412	Clay
412 - 424	Sand

UNCONFINED

CONFIDENTIAL
Water Code Sec. 13752

Work started 19 , Completed 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Terry's Well Drilling
(Person, firm, or corporation) (Typed or printed)

Address Box 787 Corcoran Cal

[SIGNED] (signature)
(Well Driller)

License No. 144990 Dated 10-20, 1970

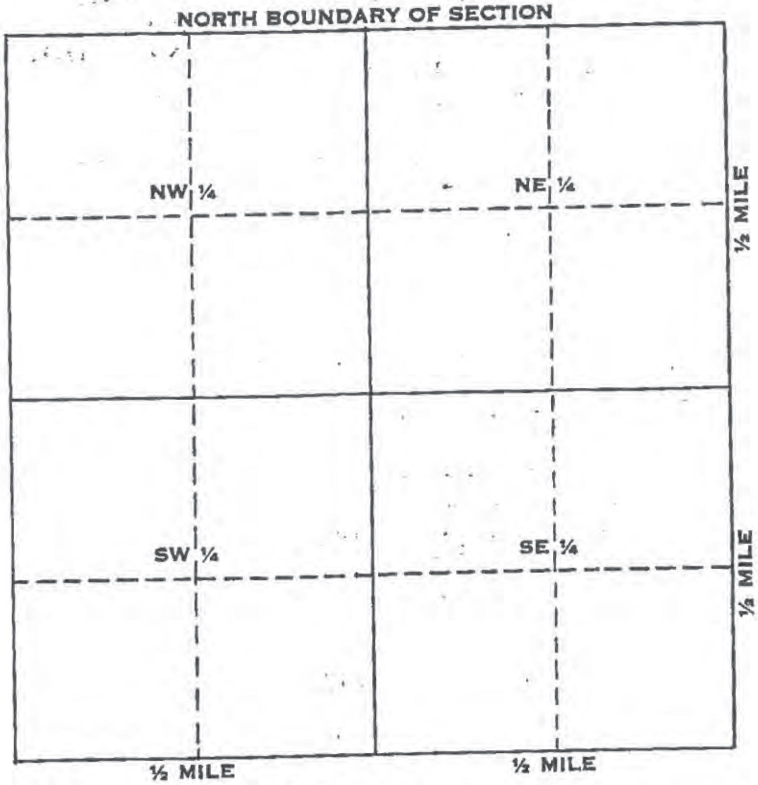
SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-65)

No N.I.

56391-950 10-65 50M TRIP ① △ OSP

WELL LOCATION SKETCH

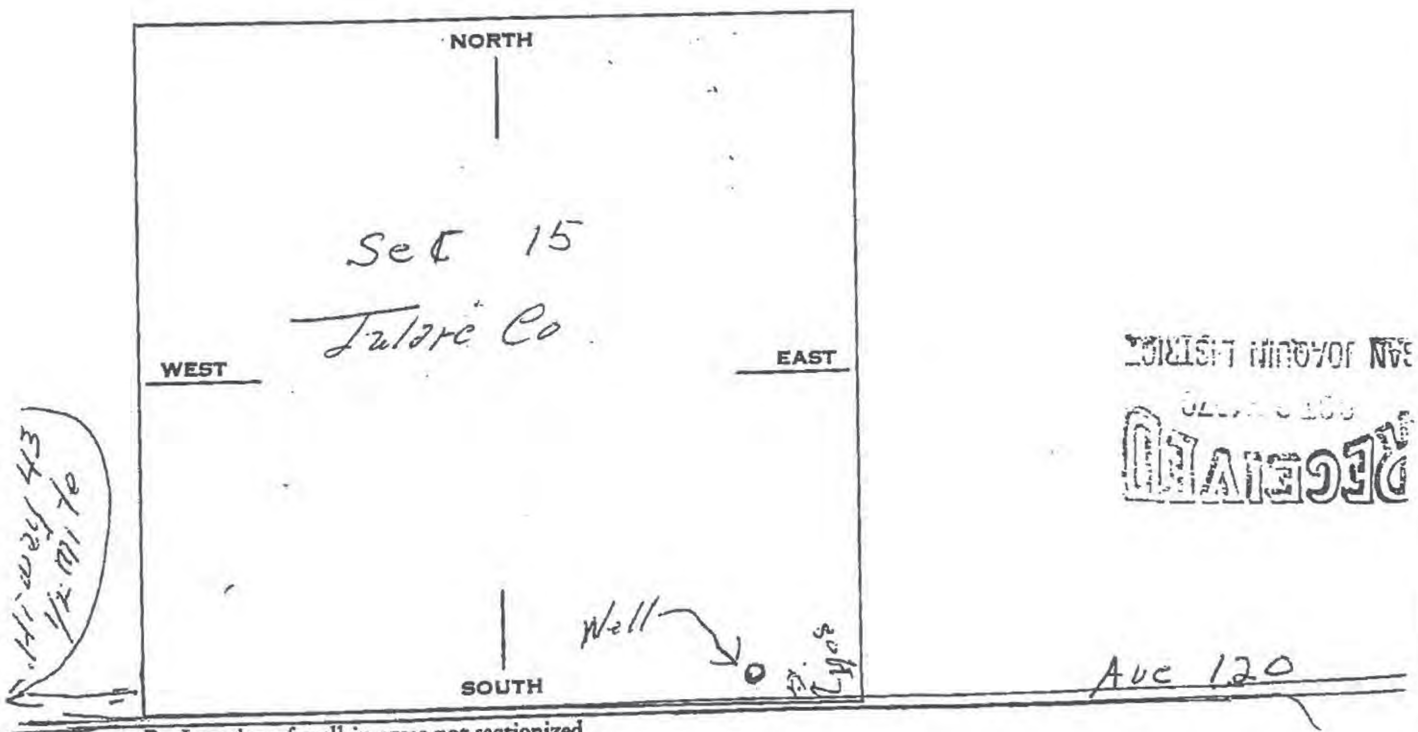


A. Location of well in sectionized areas.
Sketch roads, railroads, streams, or other features as necessary.

Township 22 S N/S

Range 23 E E/W

Section No. 15



B. Location of well in areas not sectionized.
Sketch roads, railroads, streams, or other features as necessary.
Indicate distances.

22/24-6L

ORIGINAL
File with DWR

WATER WELL DRILLERS REPORT

(Sections 7079, 7080, 7081, 7082, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Do Not Fill In

№ 23071

State Well No. ______
Other Well No. 22S/24E-6

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare Owner's number, if any #6 I

Township, Range, and Section S 6 - R24E - T22S

Distance from cities, roads, railroads, etc. 1/2 mile SW of AVE 144 & RD 72 INTERSECTION

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐

If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	466	16	1/4	27	0	460

Size of shoe or well ring: Size of gravel:

Describe joint

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
160	360	24	2	1/8

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☐ No ☐ To what depth ft.

Were any strata sealed against pollution? Yes ☐ No ☒ If yes, note depth of strata

From ft. to ft.

From ft. to ft.

Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known ft.

Standing level before perforating, if known ft.

Standing level after perforating and developing ft. 110

(10) WELL TESTS:

Was pump test made? Yes ☐ No ☒ If yes, by whom?

Yield: 1600 gal./min. with 50 ft. drawdown after hrs.

Temperature of water Was a chemical analysis made? Yes ☐ No ☐

Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth ft. Depth of completed well ft.

Formation: *Describe by color, character, size of material, and structure*

ft. to ft.	Formation
100 - 111	Clay
111 - 123	Sand
123 - 135	Clay
135 - 141	Sand
141 - 144	Clay
144 - 148	Sand
148 - 170	Clay
170 - 177	Sand C.
177 - 188	Clay
188 - 194	Sand C.
194 - 219	Clay
219 - 228	Sand C.
228 - 233	Clay
233 - 238	Sand C.
238 - 251	Clay
251 - 254	Sand C.
254 - 256	Clay
256 - 258	Sand C.
258 - 267	Clay
267 - 275	Sand C.
275 - 284	Clay
284 - 293	Sand C.
293 - 304	Clay
304 - 308	Sand C.
308 - 310	Clay
310 - 316	Sand M. + F.
316 - 324	Clay
324 - 330	Sand M.
330 - 334	Clay
334 - 340	Sand F.
340 - 345	Clay
345 - 360	Sand C.

CONFIDENTIAL
Water Code Sec. 7080

Work started 19 , Completed 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Terrys Well Drilling (Person, firm, or corporation) (Typed or printed)

Address 2125 Van Dorsten Corcoran

[SIGNED] [signature] (Well Driller)

License No. 140990 Dated Aug 31, 1966

SKETCH LOCATION OF WELL ON REVERSE SIDE

EP-5

EP-5

PROPERTY LOCATED I MILE EAST OF PORTERVILLE

Date drilling completed Oct. I7th. I934

Depth of well I54 ft.

Depth of caseing I54 ft.

Water level 60 ft.

I45 ft. Of I4 gage I2 inch single collar hard red steel caseing

I/2 X 8 shoe

Depth perforated 60 to I44 ft.

Penetration record

From	To	Type of formation
68	II9	Coarse
II9	I35	Clay Rocky
I35	I52	Sand and Bolders
I52	I54	Black Rock

Driller; Hickman

9765-C

Well 21

MYERS BROTHERS, Inc.

Reverse Circulation Rotary Gravel Pack Well Log
8650 E. Lacey Blvd. — Hanford, California — Phone 582-9031

Dates:
Started: 11-16-87
Completed: 11-23-87
Driller Simmers
Well No. TH 21

Industrial ☐
Domestic ☐
Irrigation ☐
Other ☐

CUSTOMER [redacted]

WELL LOCATION CORNER OF HARRISON & HOCKETT STS. PORTERVILLE. TULARE CO.

TYPE OF WORK

1. Hole Size 5 5/8"
2. Casing Dia.
3. Casing Thickness
4. Blank Casing
5. Perforation
6. Type of Perforation
7. Depth 280'
8. Gravel Tons
9. Gravel size

EXTRAS

1. Hole Size
2. Conductor Pipe Size
3. Depth
4. Cement Yds.

Remarks:
GOT WATER SAMPLES WITH SUBMERSIBLE PUMP. 138-143 & 179-184'
FILLED HOLE WITH CUTTINGS 280'-100'
PUT IN 15 BAGS BENTONITE HOLE PLUG 100'-20'
PUMPED IN CEMENT & BENTONITE 20'-

STRATA INFORMATION

Strata	Ft.	to Ft.
BROWN CLAY	0	7
SAND	7	16
ROCKS & GRAVEL	16	31
SAND, STRINGERS BROWN CLAY	31	44
BROWN CLAY	44	72
RED CLAY	72	101
BROWN CLAY	101	130
COARSE SAND	130	137
BROWN CLAY	137	143
SAND	143	150
BROWN CLAY	150	152
SAND	152	161
ROCKS	161	165
SAND	165	166
ROCKS & SAND	166	174
SAND, SMALL STRINGERS BR. CLAY	174	187
BROWN CLAY	187	215
BR. CLAY & SAND STRINGERS	215	217
SAND	217	221
BROWN CLAY	221	225
HARD BR. CLAY, ROCK STRINGERS	225	257
HARD BLUE ROCK	257	258
MED. HARD BROWN ROCK	258	263
HARD GREEN ROCK	263	280

LSD Elev 471 23/27-3D1 [illegible] ①

U.S. DEPARTMENT OF THE INTERIOR - BUREAU OF RECLAMATION - REGION II

WELL LOG

23/27-3D1

County Tulare
Dist.
Quad. Ducor
Owner [redacted]
Use [illegible]
Driller [illegible]
U.S.B.R. No. 23-27-3
Local No. Saucelito 5
Date 11-10-47
Location 23-27-3 (0.01-0.9[illegible]) [illegible] of Sec. 3, T.23, R.27

Surf. Elev. 471.0
Depth 172.5
Yield
Drawdown
Casing 3" x 172.5' Perf. alternate [illegible] Sand-Gravel
10' Lengths from 26' to 172.5
Groundwater Elev. Date
Groundwater Elev. Date
Aquifers 280
Artesian head Date
Source of data Logan Type drill [illegible] Core Drill Diam. hole [illegible]

Depth	Elev.	Thick	Description
0	471	20	Chocolate brown slightly calcareous silty loam with 15% scattered angular sand grains to 3mm, relatively impermeable.
2	469	4.5	Brown ill-sorted calcareous sandy clay loam; sand angular arkosic ranging to 1mm, streaks of white calcareous material Low permeability.
6.5	464.5	3.5	Reddish-brown ill-sorted subangular friable arkosic sandy loam; sand av. 0.1mm, max. 3mm; 20% red silt and clay matrix, low perm.
10	461	7.3	Reddish-brown loose to friable ill-sorted subangular arkosic coarse sand, av. 0.5mm, max. 5mm, with much silty material, grains slightly coated with red clay, perm.
17.3	453.5	1.7	Tan firm fairly well sorted, silty clay loam, areas of white calcareous material, manganese stains, rel. imperm.
19	452.	6.8	Tan firm, ill-sorted, subangular arkosic coarse sand, av. 0.5mm, max. 4mm, 20% silt and clay matrix, rel. perm.
25.8	445.2	2.2	Tan friable fairly well sorted, silty loam with 5% sand, manganese stains. Top 6" red plastic impermeable clay, low permeability.
28	443	8.5	Tan friable to loose well sorted arkosic sandy silt; sand, av. 0.1 mm, max. 0.5mm, mafics 5%, prominent biotite flakes to 0.5mm, rel. perm.
36.5	434.5	15.0	Loose subangular poorly sorted arkosic coarse gravel; av. 3mm, max. 15mm, occasionally 50 mm; grading down to fine sand, some scattered lenses with micaceous silt and fine sand as matrix, predominently granitic materials also fine-grained basics, very perm.
51.5	419.5	3.	Loose subangular - subround cobbles; min 20mm, max. 40mm, composition as above, matrix of coarse sand largely lost in drilling, very perm.
54.5	416.5	3.5	Coarse gravel as 36.5 - 51.5
58	413	10	Tan firm fairly well sorted, silty loam, 10% sand ranging to max. of 0.1mm, clay filled tubular openings, mafics 5% biotite prominent, low permeability.
68	403	6.2	Tan loose angular well sorted fine sand, av. 0.2 mm, max. 1mm, 10% silt, mafics 5%, perm.
74.2	396.8	8.3	Reddish-brown clay with many fractues fine tubular openeings and manganese stains, rel. imperm.

23/27-3D1 ②

U.S. DEPARTMENT OF THE INTERIOR - BUREAU OF RECLAMATION - REGION II
WELL LOG

Page 2

County Tulare
Dist.
Quad. Ducor
Location 23-27-3 (0.01-0.095)

Owner
Use
Driller

U.S.B.R. No. 23-27-3
Local No. Saucelito 5
Date 11-10-47

Surf. Elev. | Groundwater Elev. | Date
Depth | Groundwater Elev. | Date
Yield | Aquifers
Drawdown | Artesian head | Date
Casing | % Sand-Gravel

Source of data | Type drill | Diam. hole

Depth	Elev.	Thick	Description
82.5	388.5	5.	Tan firm fairly well sorted micaceous sandy silt; sand 20% ranging to 1mm, low permeability.
87.5	383.5	8.5	Tan firm fairly well sorted silty loam; 10% sand chiefly quartz ranging to 0.5mm, many fine tubular openings; manganese stains, rel. imperm.
96	375	3	Tan firm clay with 30% scattered sand & pebbles arkosic ranging to 7mm, tubular openings and manganese stains, rel. imperm.
99	372	3	Tan firm poorly sorted sandy silt; sand angular arkosic, ranging to max. of 2mm, tubular openings, manganese stains, low perm.
102	369	8.5	Tan firm silty loam, as 85.7 - 96.
110.5	360.5	8	Tan loose fairly well sorted, subangular arkosic coarse sand, av. 0.5mm, max. 3mm, pebble 15 mm, 15% silt & clay decomposition product matrix, relatively permeable.
118.5	352.5	4.0	Reddish-brown firm clay with 10% angular arosic sand grains to 1mm, slickensides, manganese stains, rel. imperm.
122.5	348.5	9.5	Tan firm sitly loam, as 87.5 - 96 with thin streaks, of white clay, rel. imperm.
132	339	7.5	Tan firm clay loam; 30% sand subangular arkosic, to max. of 2mm. Tubular openings, manganese stains, rel. imperm.
139.5	331.55	1.5	Brown friable ill-sorted arkosic sandy loam; sand ave. 0.2mm, max. 3mm, many tubular openings, low perm.
141	330	4	Reddish-brown clay as 118.5 - 122.5
145	326	3	Tan silty loam as 87.5 - 96
148	323	5	Tan firm clay with many fractures abundant manganese stains, many thin seams of white clay, 10% scattered angular sand grains to 0.5mm, relatively impermeable.
[illegible]	[illegible]	[illegible]	[illegible]
153	318	3.3	Tan silty loam as 87.5 - 96
156.3	314.7	1.7	Tan friable angular poorly sorted arkosic medium sandy loam; 30% silt and clay matrix relatively permeable.
158	313	3	Tan firm silty loam; 5% sand grains, chiefly quartz to 0.2 mm, small openings, manganese stains, low perm.

23/27-3D1

U.S. DEPARTMENT OF THE INTERIOR - BUREAU OF RECLAMATION - REGION II

WELL LOG

County Tulare | Owner | U.S.B.R. No. 23-27-3
Dist. | Use | Local No. Saucelito 5
Quad. Ducor | Driller | Date 11-10-47

Location 23-27-3 (0.01-0.995) 53' E & 22.5' S of NW Cor. S 3, T 23 R 27

Surf. Elev. | Groundwater Elev. | Date
Depth | Groundwater Elev. | Date
Yield | Aquifers
Drawdown | Artesian head | Date
Casing | % Sand-Gravel

Source of data | Type drill | Diam. hole

Depth	Elev.	Thick	Description
161	310	4.2	Reddish-brown firm clay with many fractures & manganese stains. 10% angular sand grains to 1mm; white feldspars very prominent, relatively impermeable.
165.2	305.8	2.7	Tan silty loam as 87.5 - 96 but with 20% sand
167.9	303.1	4.6	Tan loose subang. fairly well sorted arkosic coarse sand, av. 0.6mm, max. 3mm; 15% white silty clay, decomposition product matrix, permeable.
172.5	298.5		Bottom

Note; Above core examined while very dry. As materials were found in place, indurations were much different than here noted.

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 258421

State Well No. 22/27-4

Other Well No. ______

Notice of Intent No. ______

Local Permit No. or Date ______

[redacted]

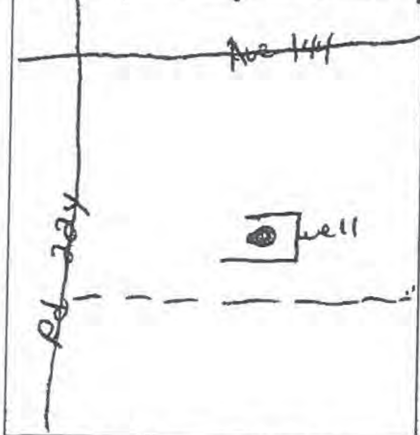
(2) LOCATION OF WELL (See instructions):

County Tulare Owner's Well Number ______

Well address if different from above 22511 Ave 144

Township 22 S Range 27E Section 4

Distance from cities, roads, railroads, fences, etc. approximately 2 miles southwest of Porterville to intersection of Ave 144 + Rd 224 in southeast corner of intersection approx 250 feet S.E. of inter



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☒
Irrigation ☐
Industrial ☐
Test Well ☐
Municipal ☐
Other ☐
(Describe)

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☒ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☐ No ☒ Size ______
Diameter of bore ______
Packed from ______ to ______ ft.

(7) CASING INSTALLED:
Steel ☒ Plastic ☐ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen ______

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	148	8	12	104	148	1/8x4

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☐ No ☒ If yes, to depth ______ ft
Were strata sealed against pollution? Yes ☐ No ☒ Interval ______ ft
Method of sealing ______

(10) WATER LEVELS:
Depth of first water, if known 32 ft.
Standing level after well completion 32 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom? Lott Drilling.
Type of test Pump ☐ Bailer ☐ Air lift ☒
Depth to water at start of test 32 ft At end of test 60 ft
Discharge 100 gal/min after ______ hours Water temperature ______
Chemical analysis made? Yes ☐ No ☒ If yes, by whom? ______
Was electric log made Yes ☐ No ☒ If yes, attach copy to this report

(12) WELL LOG: Total depth 156 ft. Completed depth 156 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	2	hard clay.
2	3	hardpan
3	32	sandy clay.
32	44	sand
44	84	rock, gravel, cobbles.
84	104	sandy clay.
104	140	joint clay.
140	150	hard clay.
150	156	gravel + joint clay.

CONFIDENTIAL

NOT FOR PUBLIC USE
WATER CODE SEC. 13752

OUTSIDE CORC. CLAY AREA

Work started 3-24 1988 Completed 3-31 1988

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed [signature] (Well Driller)

NAME Lott Drilling Co. (Person, firm, or corporation) (Typed or printed)

Address 1593 Joyce Circle

City Tulare Ca. ZIP 93274

License No. 398407 Date of this report 4-8-88

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

86 96355

22/26-17A1

22/26-17A1

Popeline well @
245 [illegible]

90 ft. 16" Caseing
155 ft. 12" "
245

[illegible] 13-50 (190')

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e064534

Page 1 of 3

Owner's Well Number 1

Date Work Began 11/05/2007 Date Work Ended 11/7/2007

Local Permit Agency TULARE COUNTY EHD

Permit Number 07-0532 Permit Date 11/1/07

DWR Use Only – Do Not Fill In

21S/27E-36

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method MUD ROTARY Drilling Fluid BENTONITE

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	20	SAND, FINE TO COARSE GRAINS
20	50	COBBLE
50	55	SAND, FINE TO COARSE GRAINS
55	70	COBBLE
70	75	SAND, FINE TO COARSE GRAINS
75	80	COBBLE
80	100	SAND, FINE TO COARSE GRAINS
100	115	COBBLE
115	138	BROWN SILTY CLAY, FINE TO COARSE GRAINS

Total Depth of Boring 138 Feet

Total Depth of Completed Well 138 Feet

Well Owner

[redacted]

Well Location

Address 474 S. MAIN

City PORTERVILLE County Tulare

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

Datum ___ Decimal Lat. ___ Decimal Long. ___

APN Book 261 Page 070 Parcel 003

Township 21S Range 27E Section 36

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West see attached East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☑ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 55 (Feet below surface)

Depth to Static Water Level 29 (Feet) Date Measured 11/9/07

Estimated Yield * 24.7 (GPM) Test Type Sub. pump

Test Length 24.0 (Hours) Total Drawdown 110 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	58	12.25	BLANK	PVC	SDR17			
58	138	12.25	SCREEN	PVC	SDR17		MILLED SLO	0.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	50	CEMENT	GROUT
50	138	GRAVEL	3/8" ROCK

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other LOCATION MAP

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CONSOLIDATED TESTING LABS., INC.
Person, Firm or Corporation

603 E. WORTH AVENUE PORTERVILLE CA 93257
Address City State Zip

Signed [signature] 11-19-07 544541
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL

File with DWR

Notice of Intent No. ______

Local Permit No. or Date ______

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

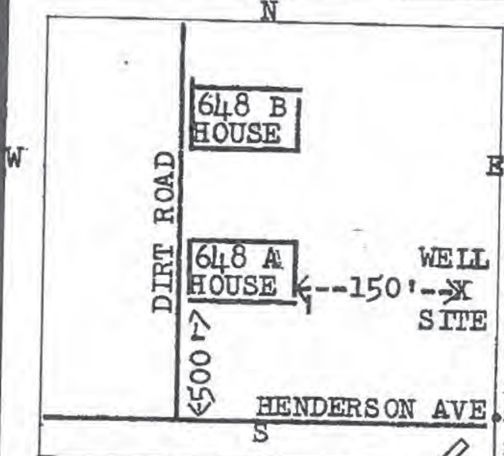
No. 085866

State Well No. 21/27-24

Other Well No. ______

[redacted]

(2) LOCATION OF WELL (See instructions):
County TULARE Owner's Well Number ______
Well address if different from above ______
Township ______ Range ______ Section ______
Distance from cities, roads, railroads, fences, etc. 150 FT. EAST OF 648 A EAST HENDERSON, PORTERVILLE



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic X
Irrigation X
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable [X] Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☐ No [X] Size ______
Diameter of bore ______
Packed from ______ to ______ ft.

(7) CASING INSTALLED:
Steel [X] Plastic ☐ Concrete ☐

(8) PERFORATIONS: FACTORY
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	152	18	10	124	148	1"X1¼"

(9) WELL SEAL: PUMP CO. PROVIDES
Was surface sanitary seal provided? Yes ☐ No [X] If yes, to depth ______ ft.
Were strata sealed against pollution? Yes ☐ No [X] Interval ______ ft.
Method of sealing ______

(10) WATER LEVELS:
Depth of first water, if known 76 ft.
Standing level after well completion 56 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No [X] If yes, by whom? ______
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test ______ ft. At end of test ______ ft.
Discharge ______ gal/min after ______ hours Water temperature ______
Chemical analysis made? Yes ☐ No [X] If yes, by whom? ______
Was electric log made? Yes ☐ No [X] If yes, attach copy to this report

(12) WELL LOG: Total depth 152 ft. Depth of completed well 152 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	3	TOP SOIL
3	74	RED CLAY
74	76	GREY CLAY
76	82	GREY ROCK
82	108	GREY CLAY
108	112	GREY ROCK
112	118	GREY CLAY
118	128	GREY ROCK
128	142	GREY CLAY
142	152	1/8" to ½ ROCK

CONFIDENTIAL

NOT FOR PUBLIC USE WATER CODE SEC. 13752

OUTSIDE CORC. CLAY AREA

Work started 6-8 1979 Completed 6-14 1979

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED Arthur Cuddeback (Well Driller) RIG #1

NAME STAR WELL DRILLING
(Person, firm, or corporation) (Typed or printed)

Address 14583 AVE. 384 RT.#1

City VISALIA, CALIF. Zip 93277

License No. #373338 Date of this report 6-19-79

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

GROUND WATER

23/25-16N4

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No.______
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

1889

LOCATION NOT CHECKED
Do Not Fill In
No. 55087
State Well No. 23S/25E-16N4
Other Well No. 23 ...

[redacted]

(2) LOCATION OF WELL:

County Tulare   Owner's number, if any—
R. F. D. or Street No.
650' West of Southern Pacific R.R.
near 99 Hwy
470' North of Avenue 72

(3) TYPE OF WORK (*check*):

New well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (*check*):

Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [X] Other [ ]

(5) EQUIPMENT:

Rotary [X]
Cable [ ]
Dug Well [ ]

(6) CASING INSTALLED:

SINGLE [X] DOUBLE [ ]

From 0 ft. to 240 ft. 8" Diam. # 12 Gage or Wall

If gravel packed

Diameter of Bore	from ft.	to ft.
14"	0	250

Type and size of shoe or well ring: None
Size of gravel: Rejects
Describe joint: Belled End, Welded

(7) PERFORATIONS:

Type of perforator used: Milled slots
Size of perforations: 2- 1/2 in., length, by 1/8 in.

From ft.	to ft.	Perf. per row	Rows per ft.
200	240	8	2

(8) CONSTRUCTION:

Was a surface sanitary seal provided? [ ] Yes [X] No To what depth ____ ft.
Were any strata sealed against pollution? [ ] Yes [X] No If yes, note depth of strata
From ____ ft. to ____ ft.
Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found: 115 ft.
Standing level before perforating: ____ ft.
Standing level after perforating: 115 ft.

(10) WELL TESTS: (Air lift)

Was a pump test made? [X] Yes [ ] No If yes, by whom? Belknap
Yield: 60 gal./min. with 15 ft. draw down after 1 hrs.
Temperature of water ____ Was a chemical analysis made? [ ] Yes [X] No
Was electric log made of well? [ ] Yes [X] No

(11) WELL LOG: Page 1 of 2

Total depth 250 ft. Depth of completed well Est. 238 ft.

Formation: *Describe by color, character, size of material, and structure.*

From ft.	to ft.	Formation
0	6	Sand
6	16	Sandy Clay
16	33	Coarse Sand
33	40	Brown Sandy Clay
40	43	Brown Hardpan
43	57	Brown Clay
57	58	Medium Coarse Sand
58	59	Clay
59	64	Medium Coarse Sand
64	72	Hard Clay
72	75	Coarse Sand
75	80	Brown Sandy Clay
80	84	Coarse Sand
84	89	Brown Clay
89	90	Coarse Sand
90	95	Brown Clay
95	103	Coarse Sand
103	107	Brown Clay
107	110	Coarse Sand
110	111	Brown Clay
111	115	Coarse Sand
115	122	Sandy Brown Clay
122	125	Coarse Sand
125	126	Brown Clay
126	129	Coarse Sand
129	137	Brown Clay
137	146	Coarse Sand
146	153	Sandy Brown Clay
153	157	Coarse Sand
157	158	Borw Clay
158	164	Coarse Sand
164	168	Brown Clay
168	170	Coarse Sand
170	178	Brown Sandy Clay
178	180	Coarse Sand
180	181	Sandy Brown Clay
181	183	Coarse Sand
183	190	Sandy Brown Clay
190	201	Coarse Sand
201	203	Sandy Brown Clay
203	211	Coarse Sand
211	218	Brown Clay
218	219	Coarse Sand (OVER)

Work started 6-19-59 Completed 6-23-59

Cont

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Bill Belknap BH
(Person, firm, or corporation) (Typed or printed)
Address 9274 So. Buttonwillow Ave.,
Reedley, Calif.

[SIGNED] Bill Belknap
Well Driller
License No. 106833 Dated 6-26-59

37028 6-57 50M QUIN △ SPO   DWR 188 (REV. 3-54)

23/25-16N4

Log No 55087

U.S.G.S.

TEST WELL

219	221	Sandy Brown Clay
221	225	Coarse Sand -
225	230	Sandy Brown Clay
230	237	Coarse Sand
237	244	Sandy Brown Clay
244	250	Coarse Sand

All strata where no color is designated were logged as being yellow-brown

The bottom of the casing is open and the gravel was allowed to flow into the well on top of an anchor to which a plastic covered wire rope is attached.

25/26-9

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No. 5
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

25/26-9N1 (G.S.)
1020

LOCATION NOT CHECKED
Do Not Fill In
No. 36188
State Well No.
Other Well No. 25S/26E-9

(2) LOCATION OF WELL:
County Kern Owner's number, if any—
R. F. D. or Street No.
Sec. 9
Twnshp 25 S
Range 26 E

(3) TYPE OF WORK (check):
New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☐
Cable ☒
Dug Well ☐

(6) CASING INSTALLED:
SINGLE ☒ DOUBLE ☐

From ft.	to ft.	Diam.	Gage or Wall
0	351	8"	12 ga.

If gravel packed

Diameter of Bore	from ft.	to ft.
12½"	0	351

Type and size of shoe or well ring
Size of gravel:
Describe joint

(7) PERFORATIONS:
Type of perforator used Machine
Size of perforations 1" in., length, by 1/8" in.
From ft. to ft. Perf. per row Rows per ft.
276 351

(8) CONSTRUCTION:
Was a surface sanitary seal provided? ☐ Yes ☐ No To what depth ft.
Were any strata sealed against pollution? ☐ Yes ☐ No If yes, note depth of strata
From ft. to ft.
Method of Sealing

(9) WATER LEVELS:
Depth at which water was first found ft.
Standing level before perforating ft.
Standing level after perforating ft.

(10) WELL TESTS:
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. draw down after hrs.
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No
Was electric log made of well? ☐ Yes ☐ No

(11) WELL LOG:
Total depth ft. Depth of completed well ft.
Formation: Describe by color, character, size of material, and structure.

From ft.	to ft.	Formation
0	5	Top Soil
5	150	Hard Sand
150	240	Clay
240	250	Sand
250	310	Sandy Clay
310	320	Sand
320	351	Clay

(1467 feet north, 0.96 mile west of SE corner of section 9 (USGS))

CONFIDENTIAL
Section 4076.1, Water Code

Work started 19 . Completed 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)
Address 1744 High St.
Delano, Calif.
[SIGNED] Donald E. Ryan
Well Driller
License No. 148282 Dated 4/9/56

DWR FORM NO. 240 (REV. 5-54)

24/25-16B1

ORIGINAL

LOG OF WELL

WHITTEN BROS. DRILLING COMPANY

"The Oldest and Still Best"

DELANO, CALIFORNIA

PHONE 2621

Well Drilled For

SINCE 1913

Name [redacted]

Well Started March 6 Well finished March [illegible] Diameter 12"

Gauge 12 Dble Total Depth 300' Depth to Water Water level 104'

Strata Formation	From Feet	To Feet	Perforated	From Feet	To Feet
Clay	0	187	Perforating well from 120' to 285'		
Sand	187	190			
Clay	190	300			

BOLSEY PORTABLE [illegible]

23/26-28H1

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No. 5
(Insert appropriate number)

23/26-28H1 (G.S.)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

1193

LOCATION NOT CHECKED
Do Not Fill In
Nº 32114
State Well No.
Other Well No. 23S/26E-28

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare Owner's number, if any—
R. F. D. or Street No.
Section NW¼ 28
Township 23S
Range 26E

(3) TYPE OF WORK (check):

New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:

SINGLE ☒ DOUBLE ☐

From ft. to ft. Diam. Gage or Wall
300 ft. 8" x # 12

If gravel packed
Diameter of Bore 12½ from 0 ft. to 300 ft.

Type and size of shoe or well ring
Size of gravel:
Describe joint

(7) PERFORATIONS:

Type of perforator used Machine
Size of perforations 1/8" x 1" cc in., length, by in.
From ft. to ft. Perf. per row Rows per ft.
190 ft. to 300 ft.

(8) CONSTRUCTION:

Was a surface sanitary seal provided? ☐ Yes ☐ No To what depth ft.
Were any strata sealed against pollution? ☐ Yes ☐ No If yes, note depth of strata
From 140 ft. to 160 ft.
Method of Sealing Cement plug

(9) WATER LEVELS:

Depth at which water was first found ft.
Standing level before perforating ft.
Standing level after perforating ft.

(10) WELL TESTS:

Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. draw down after hrs.
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No
Was electric log made of well? ☐ Yes ☐ No

(11) WELL LOG:

Total depth 300 ft. Depth of completed well 300 ft.
Formation: Describe by color, character, size of material, and structure.

From (ft.)	To (ft.)	Formation
0	6	Top Soil
6	24	Hard Pan
24	100	Sandy Clay
100	125	Sand
125	200	Yellow Clay
200	215	Sand
215	280	Clay
280	285	Sand
285	300	Hard Clay

CONFIDENTIAL
Section 7076.1, Water Code

Work started 4/55 19 Completed 4/55 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps Inc.
(Person, firm, or corporation) (Typed or printed)
Address 1744 High St.
Delano, California.
[SIGNED] [signature]
Well Driller
License No. 148282 Dated 6/6 1955

DWR FORM NO. 248 (REV. 3-54)

Appendix B

Driller's Logs and Hydrographs for Existing Lower Aquifer Wells

21/23-36R1

ORIGINAL
File with DWR

WATER WELL DRILLERS REPORT

(Sections 7079, 7080, 7081, 7082, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Do Not Fill In

Nº 23051

State Well No.

Other Well No. 21/23E-36R1

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare   Owner's number, if any S116

Township, Range, and Section 21S-23E-36

Distance from cities, roads, railroads, etc.

(3) TYPE OF WORK (check):

New Well [X] Deepening [ ] Reconditioning [ ] Destroying [ ]

If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) EQUIPMENT:

Rotary [ ]
Cable [ ]
Other [ ]

(6) CASING INSTALLED:

STEEL: OTHER:
SINGLE [X] DOUBLE [ ]

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	400	18"	3/8"	28"	0	1000
400	1000	12"				

Size of shoe or well ring: Size of gravel: 1/4"

Describe joint weld

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
400	1000	12	24	1/8

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes [ ] No [ ] To what depth ft.

Were any strata sealed against pollution? Yes [ ] No [X] If yes, note depth of strata

From ft. to ft.

From ft. to ft.

Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known ft.

Standing level before perforating, if known ft.

Standing level after perforating and developing ft. 130

(10) WELL TESTS:

Was pump test made? Yes [X] No [ ] If yes, by whom? Wilson

Yield: 2000 gal./min. from 190 ft. drawdown after hrs.

Temperature of water   Was a chemical analysis made? Yes [ ] No [X]

Was electric log made of well? Yes [X] No [ ] If yes, attach copy

(11) WELL LOG:

Total depth 1000 ft. Depth of completed well ft.

Formation: *Describe by color, character, size of material, and structure*

ft. to ft.

200 - 300 Clay
300 - 330 Sand
330 - 390 Clay
390 - 410 Sand
410 - 460 Clay
460 - 475 Sand
475 - 590 Clay
590 - 600 Sand
600 - 620 Clay
620 - 635 Sand
635 - 650 Clay
650 - 660 Sand
660 - 675 Clay
675 - 770 Sand
770 - 810 Clay
810 - 820 Sand
820 - 845 Clay
845 - 850 Sand
850 - 880 Clay
880 - 900 Sand
900 - 930 Clay
930 - 950 Sand
950 - 1000 Clay

CONFIDENTIAL
Water Code Sec 7080

2 wells
Same
1/8 mile apart

Work started 19 , Completed 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Terrys Well Drilling
(Person, firm, or corporation) (Typed or printed)

Address 2125 Van Dorsten

[SIGNED] [signature]
(Well Driller)

License No. 140990 Dated 4-20, 1966

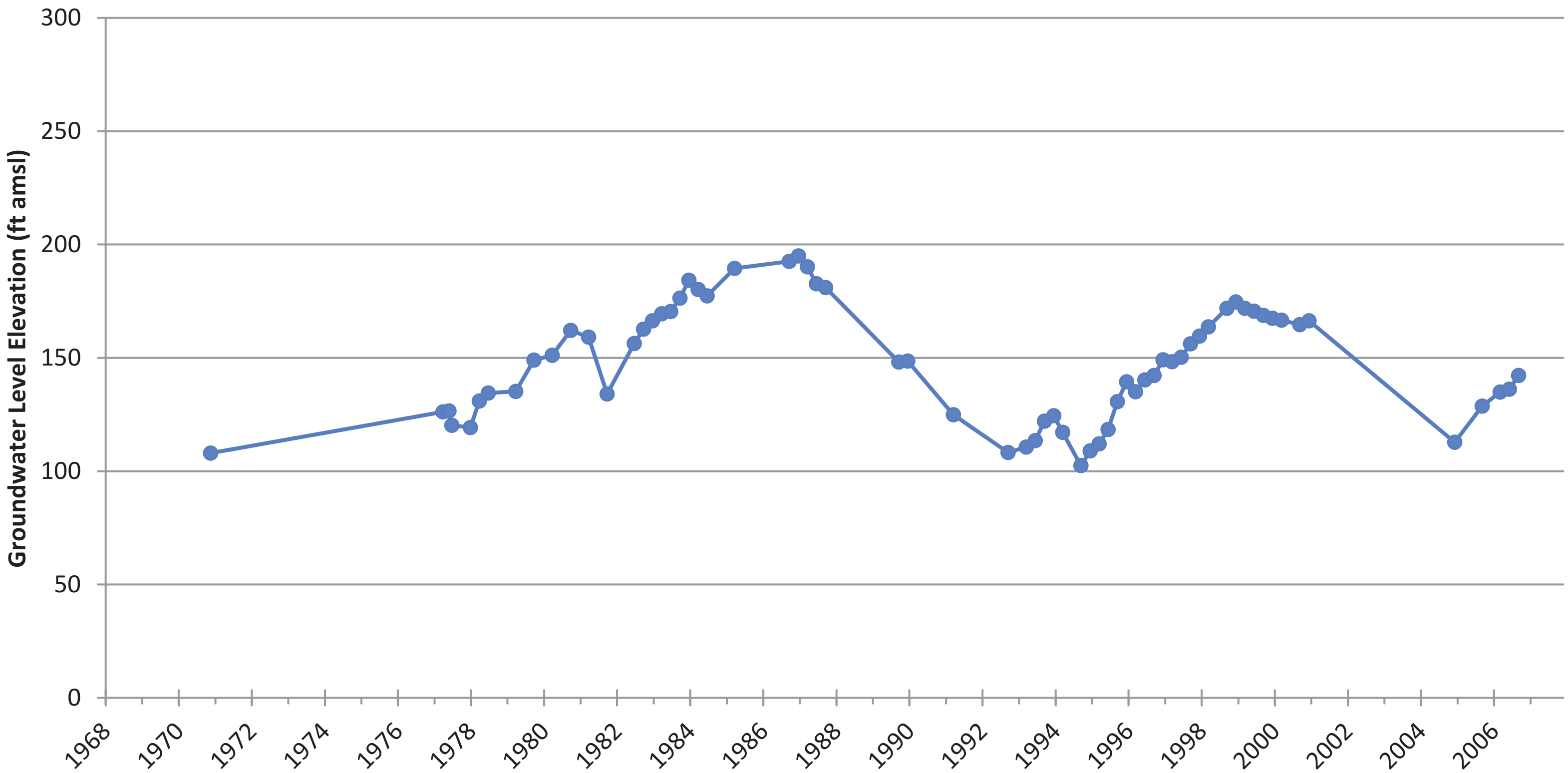
SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-65)

96381-950 10-65 50M TRIP ① △ OSP

Groundwater Hydrographs - Deep

21S/23E-36R01



22/24-1Q1

LOCATION NOT CHECKED

ORIGINAL –
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No.________
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

Do Not Fill In
№ 66984
State Well No.________
Other Well No. 22/24E-1Q1

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare Owner's number, if any—

R. F. D. or Street No.

(3) TYPE OF WORK (*check*):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (*check*):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:

SINGLE ☒ DOUBLE ☐

From ft. to	ft.	Diam.	Gage or Wall
480'		3/16" Wall	

If gravel packed

Diameter of Bore	from ft.	to ft.

Type and size of shoe or well ring

Describe joint

Size of gravel: 6-20
78 ton

(7) PERFORATIONS:

Type of perforator used

Size of perforations in., length, by in.

From 480 ft. to 700 ft. Perf. per row Rows per ft.

220' perforated

(8) CONSTRUCTION:

Was a surface sanitary seal provided? ☐ Yes ☒ No To what depth ft.

Were any strata sealed against pollution? ☐ Yes ☒ No If yes, note depth of strata

From ft. to ft.

Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found 90 ft.

Standing level before perforating ft.

Standing level after perforating ft.

(10) WELL TESTS:

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. draw down after hrs.

Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

Was electric log made of well? ☐ Yes ☒ No

(11) WELL LOG:

Total depth 720 ft. Depth of completed well 700 ft.

Formation: *Describe by color, character, size of material, and structure.*

ft. to	ft.	Formation
0	50	Sandy clay
50	140	Sand, clay strks.
140	152	Clay
152	230	Sand, clay strks.
230	245	Clay
245	320	Sand
320	328	Clay
328	420	Sand, clay strks.
420	440	Clay
440	550	Sand
550	572	Hard sand
572	720	Sand, clay strks.

CONFIDENTIAL
Section 7076.1, Water Code

Work started Jan. 23 1961. Completed Feb. 7 1961

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Knapp & Graham, Inc.
(Person, firm, or corporation) *(Typed or printed)*

Address 1155 W. Inyo St.
Tulare, Calif.

[SIGNED] (signature)
Well Driller

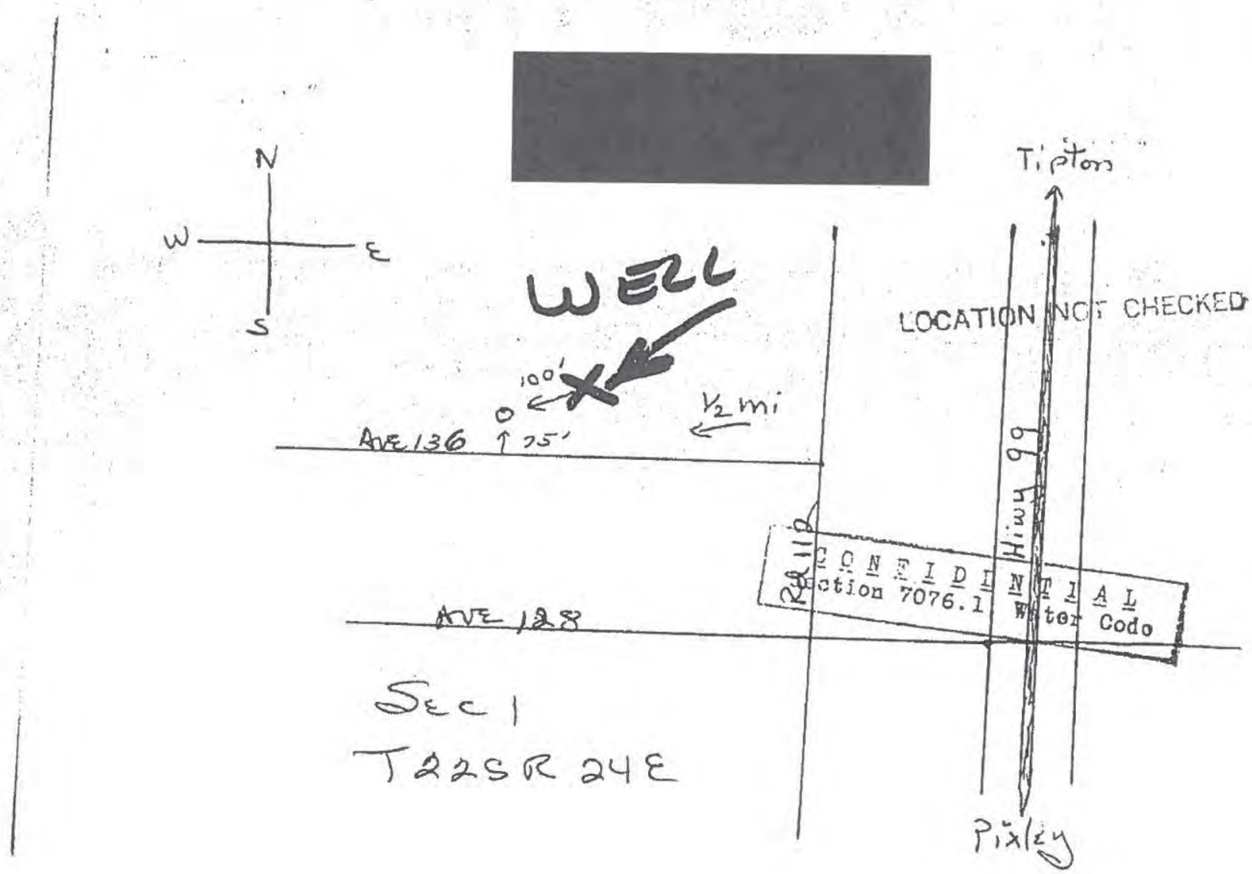
License No. 193493 Dated Feb. 8, 1961

37025 8-57 50M QUIN △ SPO DWR 188 (REV. 3-54)

22/24-1Q1

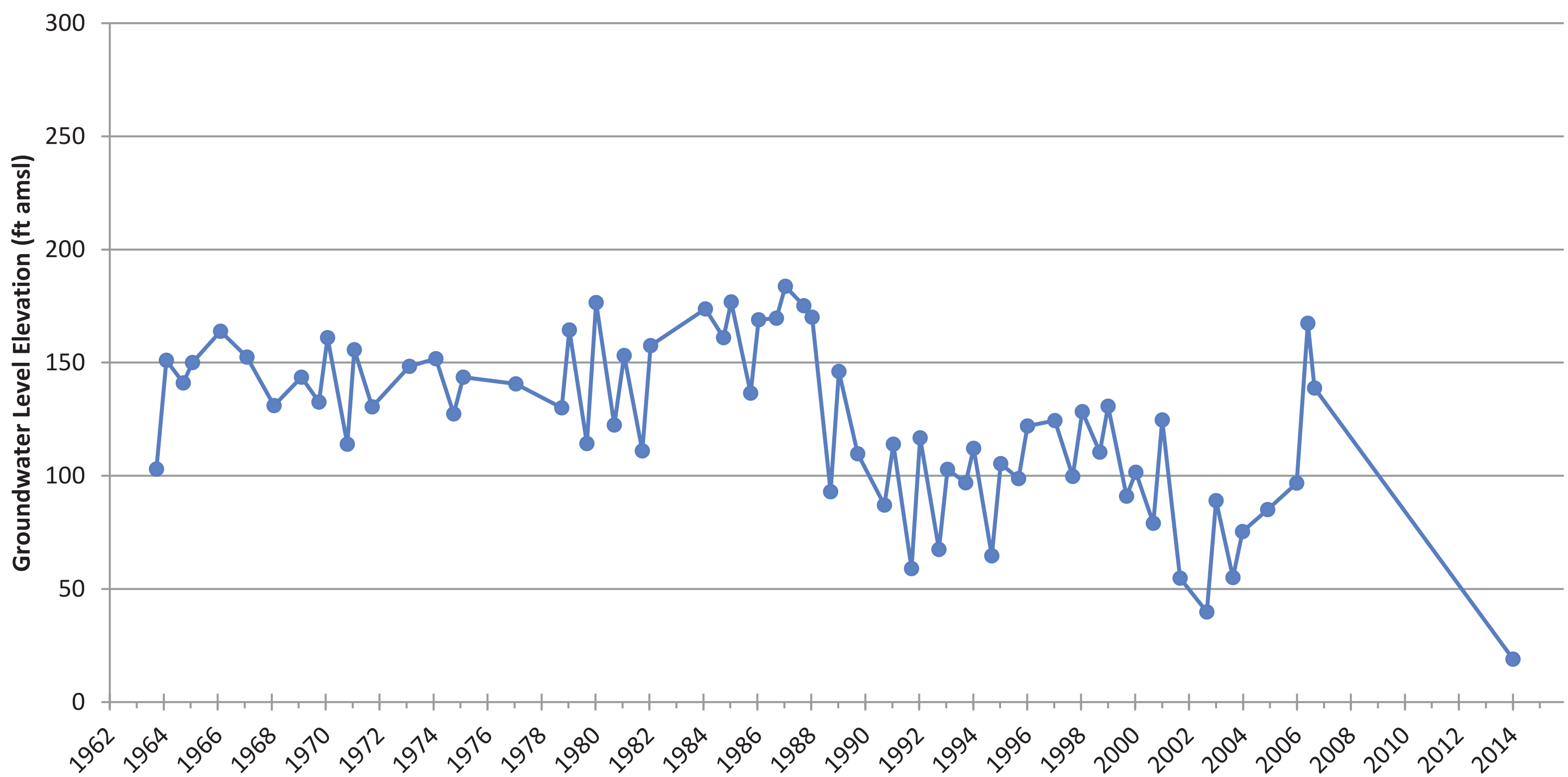
LOCATION OF WELL

Log# 66984



Groundwater Hydrographs - Deep

22S/24E-01Q01



ORIGINAL File with DWR 24/27-8L

WATER WELL DRILLERS REPORT
(Sections 7075, 7080, 7081, 7082, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Do Not Fill In
No 337
State Well No.
Other Well No. 24S/27E-8L

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare   Owner's number, if any

Township, Range, and Section

Distance from cities, roads, railroads, etc. ½ mile North of Ave. 32 and ½ mile East of Rd. 216

(3) TYPE OF WORK (check):

New Well [X] Deepening [ ] Reconditioning [ ] Destroying [ ]

If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [X] Test Well [ ] Other [ ]

(5) EQUIPMENT:

Rotary [X] Cable [ ] Other [ ]

(6) CASING INSTALLED:

STEEL: SINGLE [X] DOUBLE [ ] OTHER:

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	If gravel packed From ft.	To ft.
0	703	16"	¼"	25½	top	bottom
703	1747	14"	¼"			
16" to 14" slip jt.						

Size of shoe or well ring: —   Size of gravel: ¼"

Describe joint collar w/ fillet weld.

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen machine

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
522	703	2	16	.100 x 2
703	1747	2	14	.100 x 2

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes [ ] No [X] To what depth ft.

Were any strata sealed against pollution? Yes [ ] No [X] If yes, note depth of strata

From ft. to ft.

From ft. to ft.

Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known unknown.

Standing level before perforating, if known ft.

Standing level after perforating and developing ft.

(10) WELL TESTS:

Was pump test made? Yes [ ] No [X] If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

Temperature of water   Was a chemical analysis made? Yes [ ] No [X]

Was electric log made of well? Yes [X] No [ ] If yes, attach copy

(11) WELL LOG:

Total depth 1747 ft. Depth of completed well 1747 ft.

Formation: *Describe by color, character, size of material, and structure*

ft. to	ft.	
0 ft. to	9 ft.	top soil
9	60	sandy clay
60	63	sand
63	253	sandy clay
253	257	sand
257	473	sandy clay
473	479	sand
479	695	sandy clay
695	745	blue clay
745	748	sand
748	812	blue clay
812	943	sandy clay
943	1033	sediment
1033	1246	shale & clay
1246	1361	blue clay
1361	1371	hard shale
1371	1455	shale & clay
1455	1488	hard shale
1488	1588	hard shale & clay
1588	1729	hard sand
1729	1747	sand & clay

CONFIDENTIAL
Water Code Sec. 13752

Work started 11/1/67, Completed 11/14/67

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)

Address 1744 Inyo St.
Delano, Calif. 93215

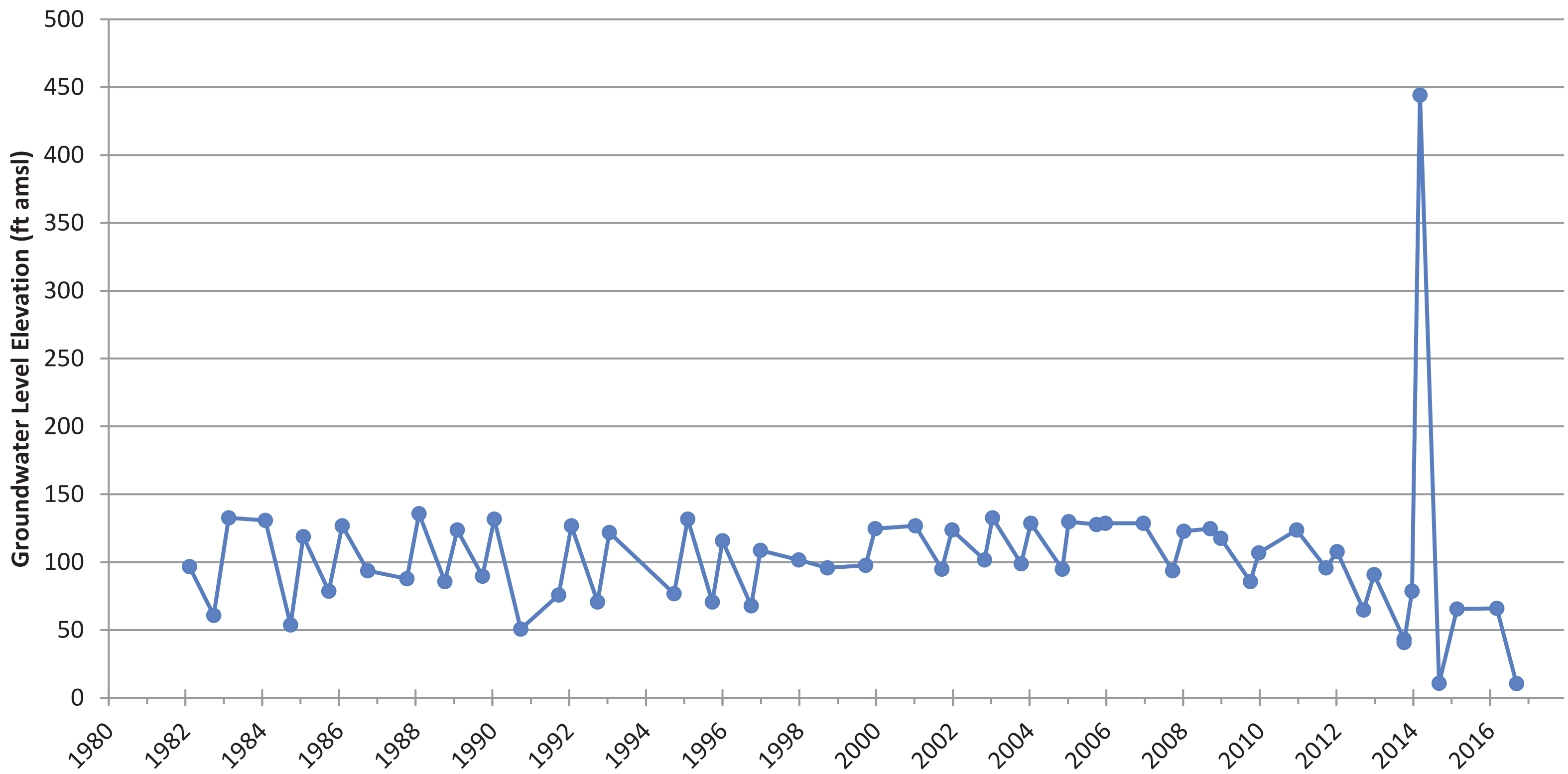
[SIGNED] Donald Ryan
(Well Driller)

License No. 148282   Dated 11/13/68, 19

SKETCH LOCATION OF WELL ON REVERSE SIDE

Groundwater Hydrographs - Deep

24S/27E-08L01



DUPLICATE 24/27-32K1
File Original, Duplicate and Triplicate with the REGIONAL WATER POLLUTION CONTROL BOARD No. 5
(Insert appropriate number)

WATER WELL DRILLERS REPORT
(Sections 7076, 7077, 7078, Water Code)
24/27-32K1 (G.S.)
STATE OF CALIFORNIA
1160

LOCATION NOT CHECKED
Do Not Fill In
Nº 32108
State Well No.
Other Well No. 24S/27E-32

(1) OWNER:
[redacted]

(2) LOCATION OF WELL:
County Tulare Owner's number, if any—
R. F. D. or Street No.
SE ¼ Section 32
Township 24S
Range 27E

(3) TYPE OF WORK (check):
New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:
SINGLE ☒ DOUBLE ☐
From ft. to ft. Diam. Gage or Wall
1800 ft. 14" x ¼" casing

If gravel packed
Diameter of Bore 26" from ft. to ft.
0 to 1800 ft
Size of gravel: 3/8"

Type and size of shoe or well ring:
Describe joint

(7) PERFORATIONS:
Type of perforator used Machine
Size of perforations 1/8/ x 1" cc in., length, by in.
From ft. to ft. Perf. per row Rows per ft.
1002 ft. to 1800 ft.

(8) CONSTRUCTION:
Was a surface sanitary seal provided? ☐ Yes ☐ No To what depth ft.
Were any strata sealed against pollution? ☐ Yes ☐ No If yes, note depth of strata
From ft. to ft.
Method of Sealing

(9) WATER LEVELS:
Depth at which water was first found ft.
Standing level before perforating ft.
Standing level after perforating ft.

(10) WELL TESTS:
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. draw down after hrs.
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No
Was electric log made of well? ☐ Yes ☐ No

(11) WELL LOG:
Total depth 1800 ft. ft. Depth of completed well 1800 ft. ft.
Formation: Describe by color, character, size of material, and structure.

From (ft.)	To (ft.)	Formation
0	3	Top Soil
3	180	Sandy Clay
180	183	Sand
183	240	Hard Sand
240	310	Sandy Clay
310	356	Hard Clay
356	360	Sand
360	395	Hard Clay
395	420	Hard Sand
420	427	Sand
427	465	Sandy Clay
465	500	Blue Clay
500	516	Blue Shale
516	530	Clay
530	544	Sediment
544	569	Hard Sandy Clay
569	633	Sediment
633	650	Shale & Clay
650	679	Sediment
679	709	Blue Clay
709	712	Sand
712	739	Blue Sediment
739	742	Sand
742	767	Hard Clay
767	770	Hard Slate
770	802	Shale
802	812	Blue Clay
812	816	Sand
816	822	Clay
822	850	Sediment
850	865	Sediment Clay
865	944	Sediment
944	948	Sand
948	958	Hard Clay
958	1004	Sediment
1004	1008	Sand
1008	1080	Blue Sediment
1080	1082	Sand
1082	1108	Sediment
1108	1271	Shale & Clay
1271	1301	Hard Slate
1301	1401	Shale

CONFIDENTIAL Section 7076, Water Code

0.47 mi north & 0.49 mi west of SE corner of section 32 (USGS)

Work started 4/2/55 Completed 5/5/55 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
1800'
NAME Whitten Pumps, Inc. (Person, firm, or corporation) (Typed or printed)
Address 1744 High St.
Delano, California
[SIGNED] (signature) Well Driller
License No. 148282 Dated 19

93882 3-54 20M QUIN SPO
DWR FORM No. 246 (REV. 3-54)

24/27-32K1

LOG NO. 32108

Well Log Continued

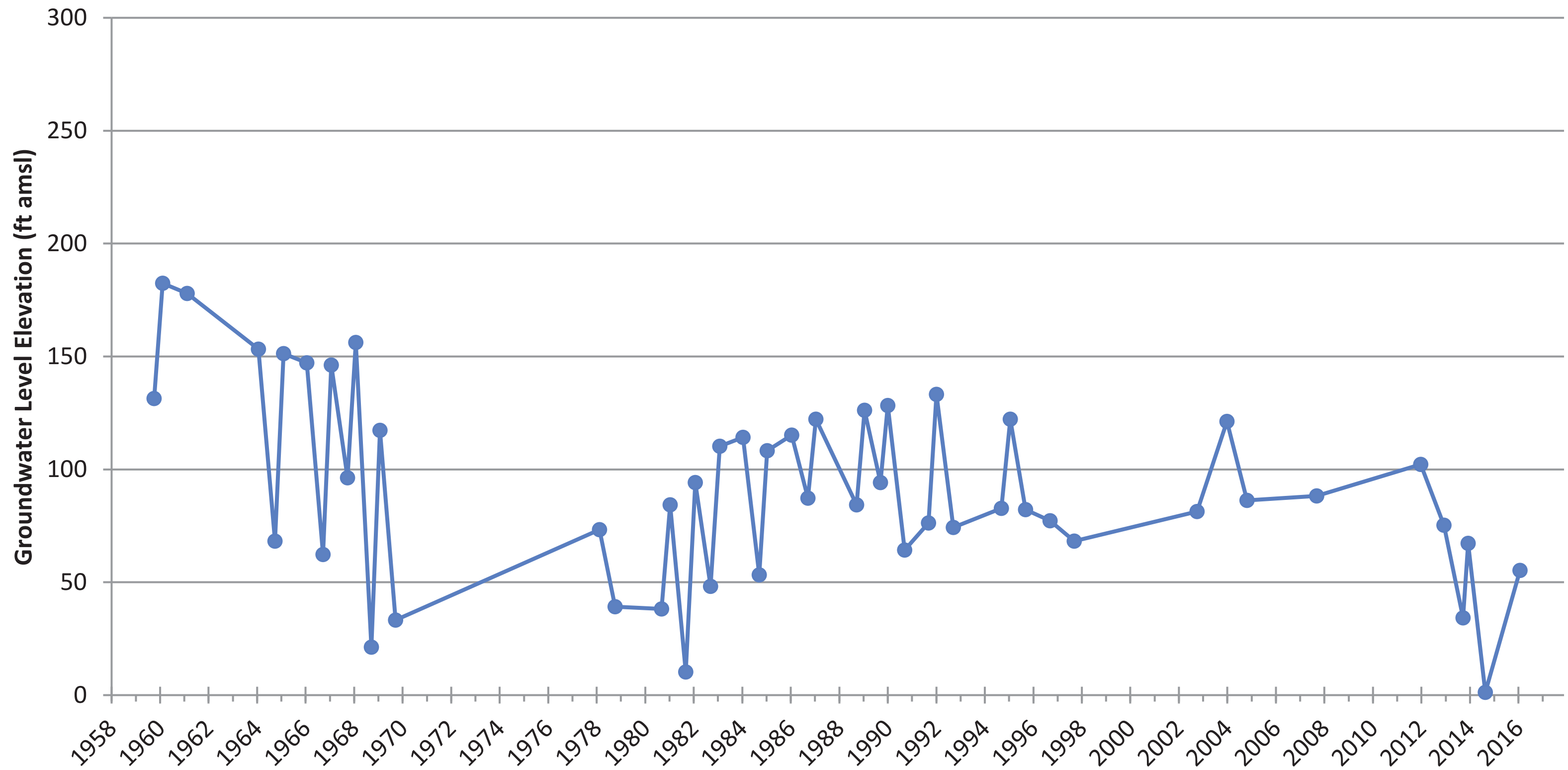
1401	ft.	to	1410	ft.	Hard Clay
1410	"	"	1413		Sand
1413			1423		Clay
1423			1426		Sand
1426			1433		Clay
1433			1435		Hard Shale
1435			1475		Shale
1475			1493		Blue Shale
1493			1500		Clay
1500			1515		Shale
1515			1522		Clay
1522			1526		Shale
1526			1551		Very Hard Slate
1551			1590		Shale
1590			1628		Sandy Shale
1628			1750		Sand & Shale
1750			1765		Sandy Clay
1765			1780		Clay
1780			1800		Blue Shale

0.47 mile north, 0.49 mile west of SE corner of Section 32, (USGS)

24/27-32K1

Groundwater Hydrographs - Deep

24S/27E-32K01



Thomas Harder & Co.
Groundwater Consulting

24/24-3A1

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No. 5
(Insert appropriate number)

WATER WELL DRILLERS REPORT
(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

2406

LOCATION NOT CHECKED
Do Not Fill In
No. 63263
State Well No. 3A1
Other Well No. 24S/24E-3

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare Owner's number, if any—
R. F. D. or Street No.
Southwest corner of intersection of Ave. 48 and Rd. 92.

(3) TYPE OF WORK (check):

New well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) EQUIPMENT:

Rotary [X]
Cable [ ]
Dug Well [ ]

(6) CASING INSTALLED:

SINGLE [X] DOUBLE [ ]

From ft. to ft. Diam. Gage or Wall 1/4
600 ft. 16" 1/4 Single
1002 ft. 14" 1/4 Single

If gravel packed
Diameter of Bore 28" from ft. to ft.
~~Top to both~~ Bottom

Type and size of shoe or well ring
Size of gravel: 3/8
Describe joint Butt Welded

(7) PERFORATIONS:

Type of perforator used Machine
Size of perforations 1/8 in., length, by 1 cc in.
From ft. to ft. 4 Perf. per row 18 Rows per ft.
804 ft. to 1,602 ft.

(8) CONSTRUCTION:

Was a surface sanitary seal provided? [ ] Yes [X] No To what depth ft.
Were any strata sealed against pollution? [ ] Yes [X] No If yes, note depth of strata
From ft. to ft.
Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found Unknown ft.
Standing level before perforating ft.
Standing level after perforating ft.

(10) WELL TESTS:

Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. draw down after hrs.
Temperature of water Was a chemical analysis made? [ ] Yes [X] No
Was electric log made of well? [ ] Yes [X] No

(11) WELL LOG:

Total depth 1,602 ft. Depth of completed well 1,602 ft.
Formation: *Describe by color, character, size of material, and structure.*

From (ft.)	To (ft.)	Formation
0	35	Sandy Clay
35	153	Sandy
153	188	Clay
188	235	Hard Sand
235	270	Clay
270	273	Sand
273	315	Sandy Clay
315	338	Hard Shale
338	430	Sandy Clay
430	436	Sand
436	458	Sandy Clay
458	582	Clay
582	643	Blue Clay
643	710	Sandy Clay
710	730	Sand
730	745	Sandy Clay
745	792	Shale
792	892	Clay
892	906	Sand
906	945	Sandy Clay
945	960	Blue Clay
960	963	Sand
963	1036	Hard Shale
1036	1070	Clay
1070	1096	Shale
1096	1125	Clay
1125	1140	Sand
1140	1170	Shale
1170	1200	Clay
1200	1247	Sandy Clay
1247	1257	Hard Shale
1257	1260	Sand
1260	1390	Shale
1390	1405	Sand
1405	1425	Sandy Clay
1425	1488	Shale
1488	1502	Clay
1502	1575	Shale
1575	1590	Sand
1590	1602	Hard Shale

Work started 6/7/60 19 Completed 6/24/60 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

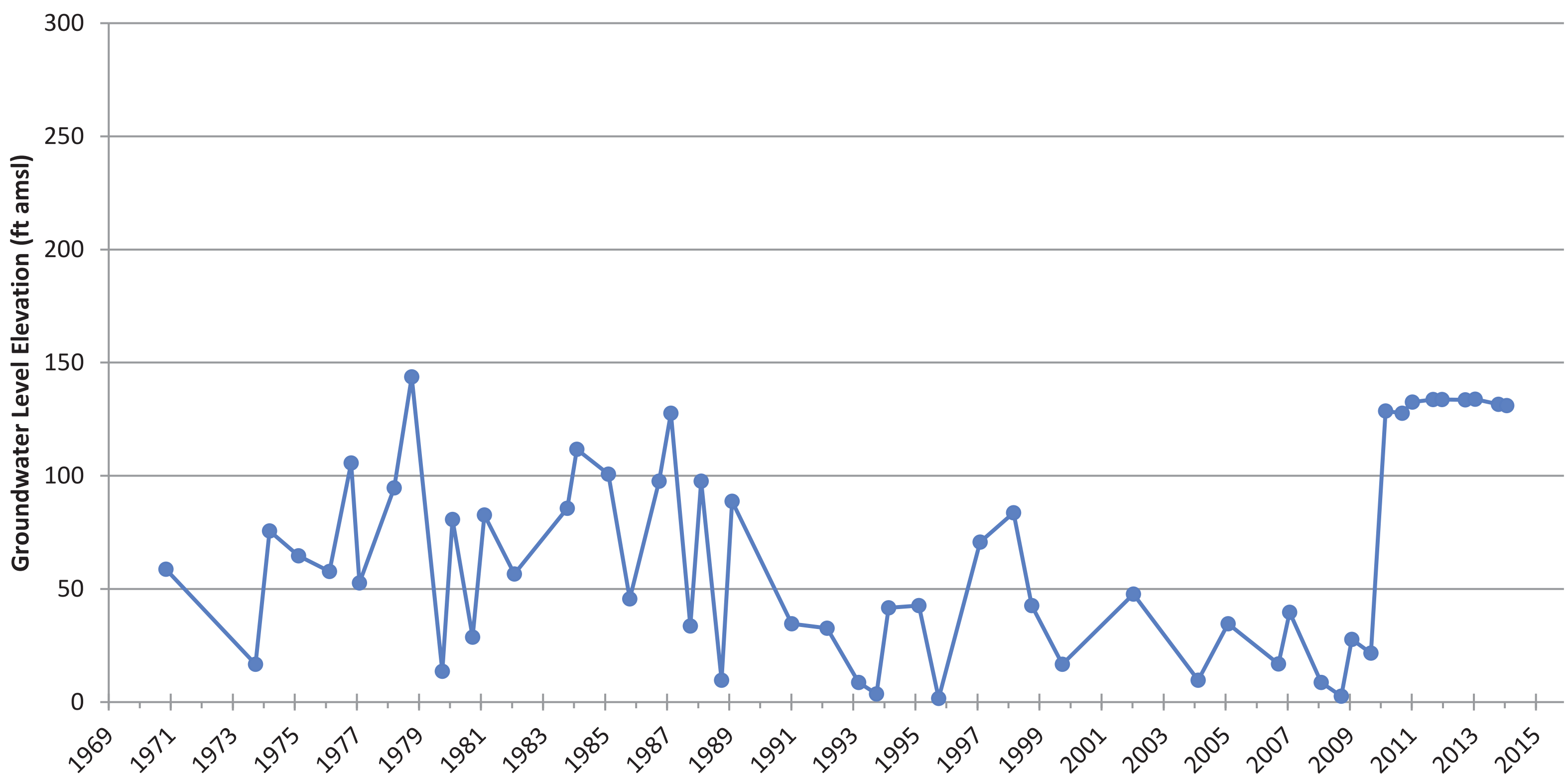
NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)
Address 1744 High St.
Delano, Calif.
[SIGNED] Donald [illegible] (Well Driller)
License No. 148282 Dated 11-1-, 19 60

87025 4-57 20M QUIN OSP

DWR 188 (REV. 3-54)

Groundwater Hydrographs - Deep

24S/24E-03A01



TRIPLICATE
Owner's Copy
Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. EO117919

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. MW-6
Date Work Began 9/24/2010, Ended 9/24/2010
Local Permit Agency ENVIRO HEALTH, TULARE
Permit No. 10-0338 Permit Date 8/30/2010

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain, size, color, etc.
0	20	TOP SOIL, MEDIUMFINE/COARSE SANDS
20	40	MEDIUM/FINE/COARSE SANDS
40	80	EDIUM/FINE/COARSE SANDS WITH SOME CLAY
80	120	MEDIUM/FINE/COARSE SANDS WITH MORE CLAY
120	140	MEDIUM/FINE/COARSE SANDS, WITH SOME CLAY
140	160	MEDIUM/FINE/COARSE SANDS WITH SOME CLAY
160	200	MEDIUM/FINE/COARSE SANDS
200	300	MEDIUM/FINE/COARSE SANDS WITH SOME CLAY
300	340	MEDIUM/FINE/COARSE SANDS, SOME CLAY SOME D.G.
340	420	MEDIUM/FINE/COARSE SANDS WITH SOME CLAY
420	560	CLAY WITH SOME SANDS
560	620	CLAY WITH MORE SANDS MEDIUM/FINE
620	680	CLAY WITH SOME MEDIUM/FINE SANDS
680	720	MOSTLEY CLAY
720	740	CLAY WITH SOME MEDIUM/FINE SANDS
740	760	MEDIUM/FINE/COARSE SANDS WITH SOME CLAY AND SHALE
760	810	MEDIUM/FINE/COARSE SANDSWITH CLAY

TOTAL DEPTH OF BORING 810 (Feet)
TOTAL DEPTH OF COMPLETED WELL 805 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 1/2 MI N AVE. 26 & 1/2 MI E. ROAD 16
City DELANO CA 93215
County TULARE
APN Book 3381 Page 003 Parcel 24
Township 24 Range 26 Section 17
Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH
NORTH
WEST EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
— Domestic — Public
— Irrigation — Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
#1										
0	200	16"	✓				PVC	4"	SCH 40	
200	350	16"		✓			PVC	4"	SCH 40	.030
#2										
0	705	12 1/4"	✓				PVC	4"	SCH 40	
705	805	12 1/4"		✓			PVC	4"	SCH 40	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	130	✓			
360	370		✓		
464	474		✓		
590	600		✓		
630	640		✓		
660	670		✓		

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

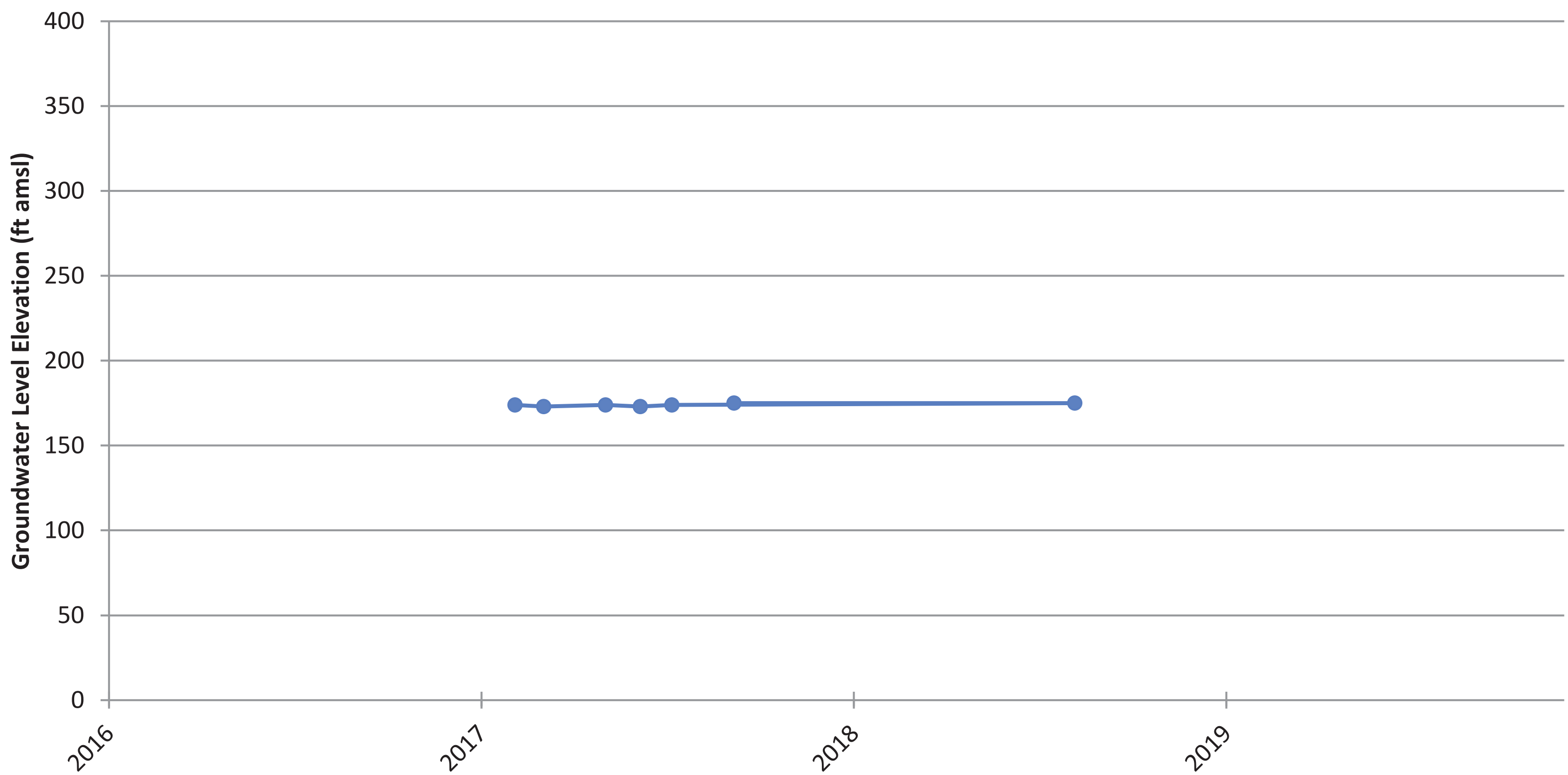
CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME BRADLEY & SONS
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
3625 S. HIGHLAND DEL REY CA 93616
ADDRESS CITY STATE ZIP
Signed [signature] 10/06/10 414178
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

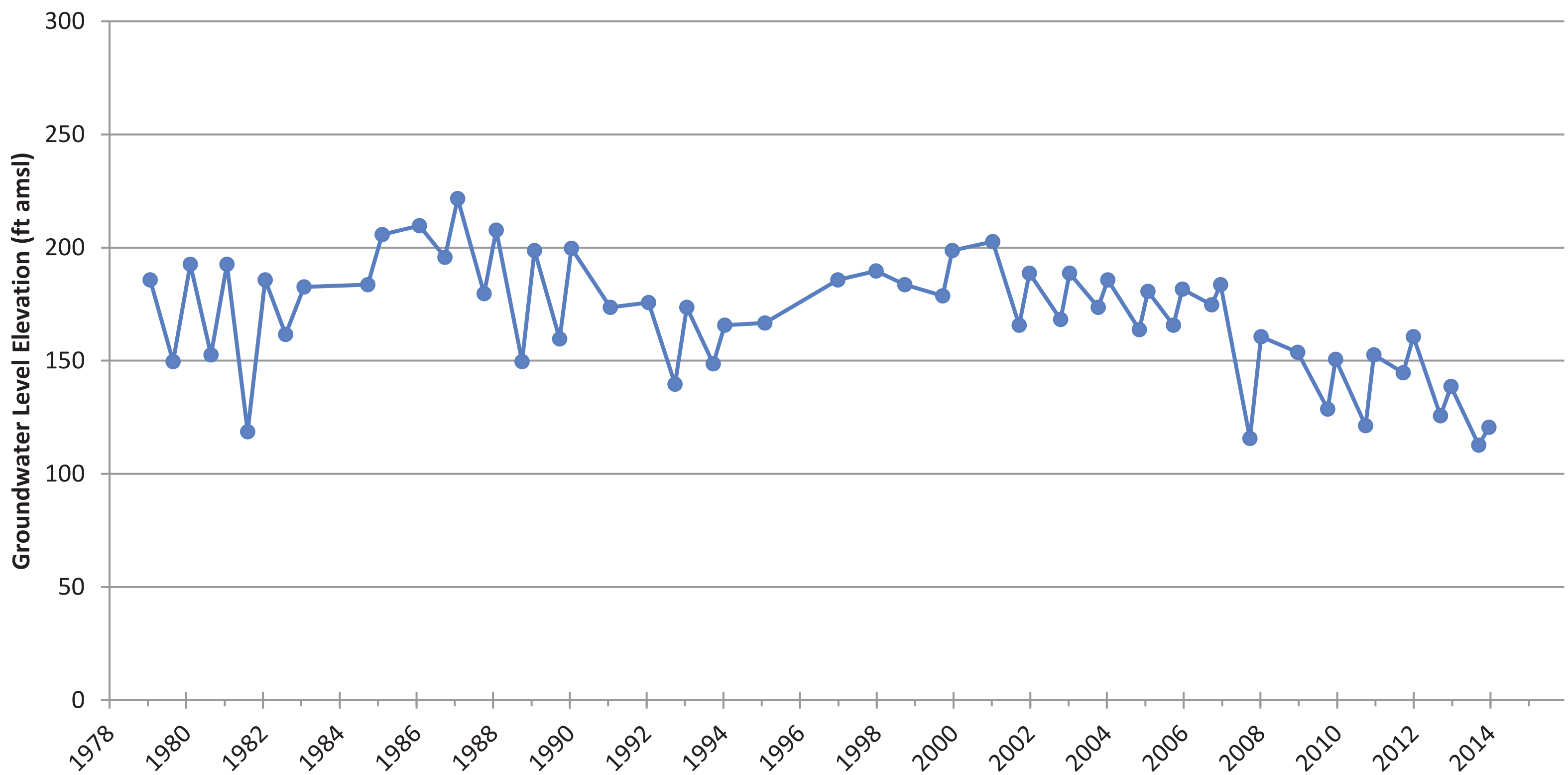
Groundwater Hydrographs - Deep

M-19



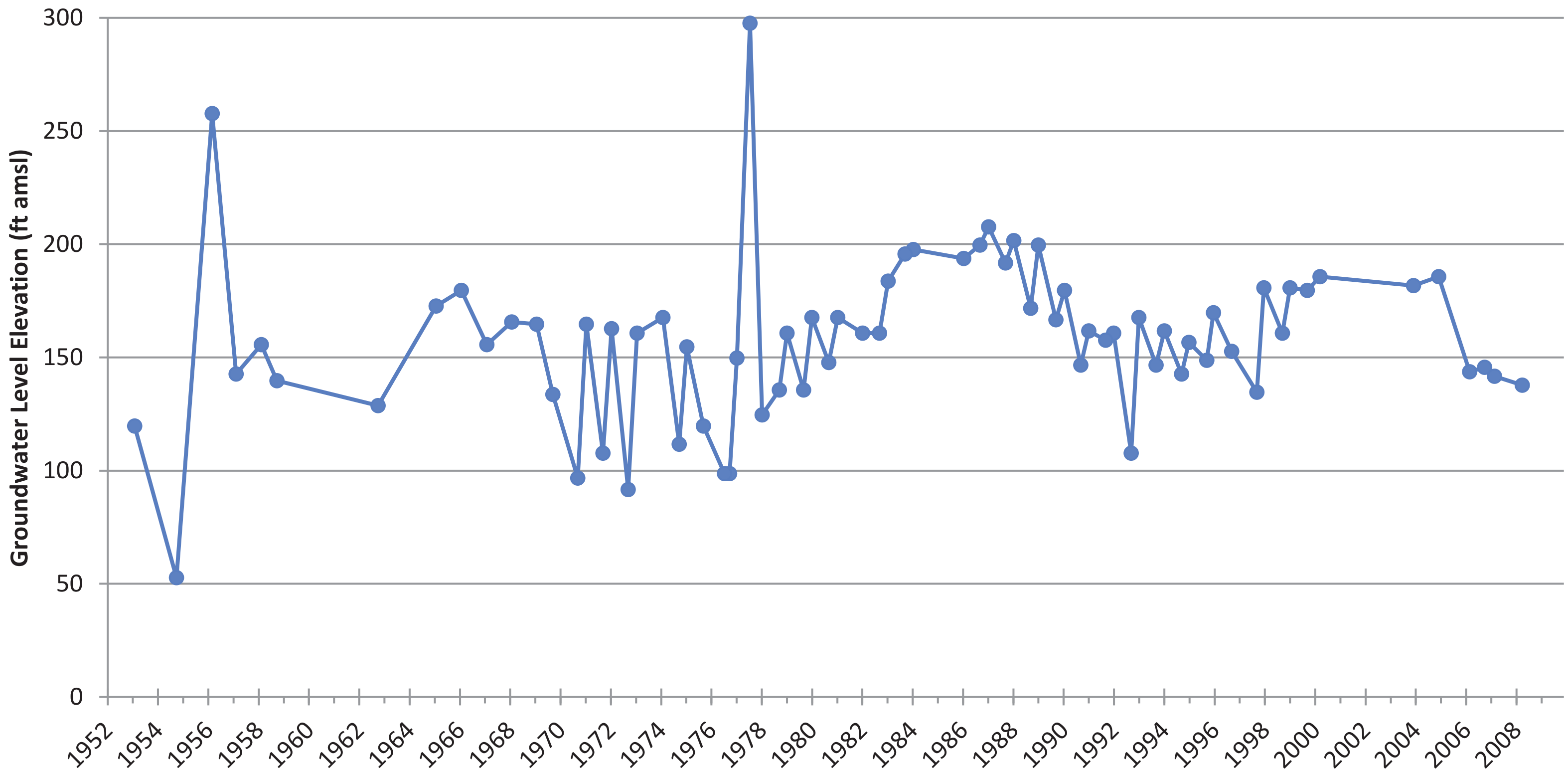
Groundwater Hydrographs - Deep

24S/25E-13F01



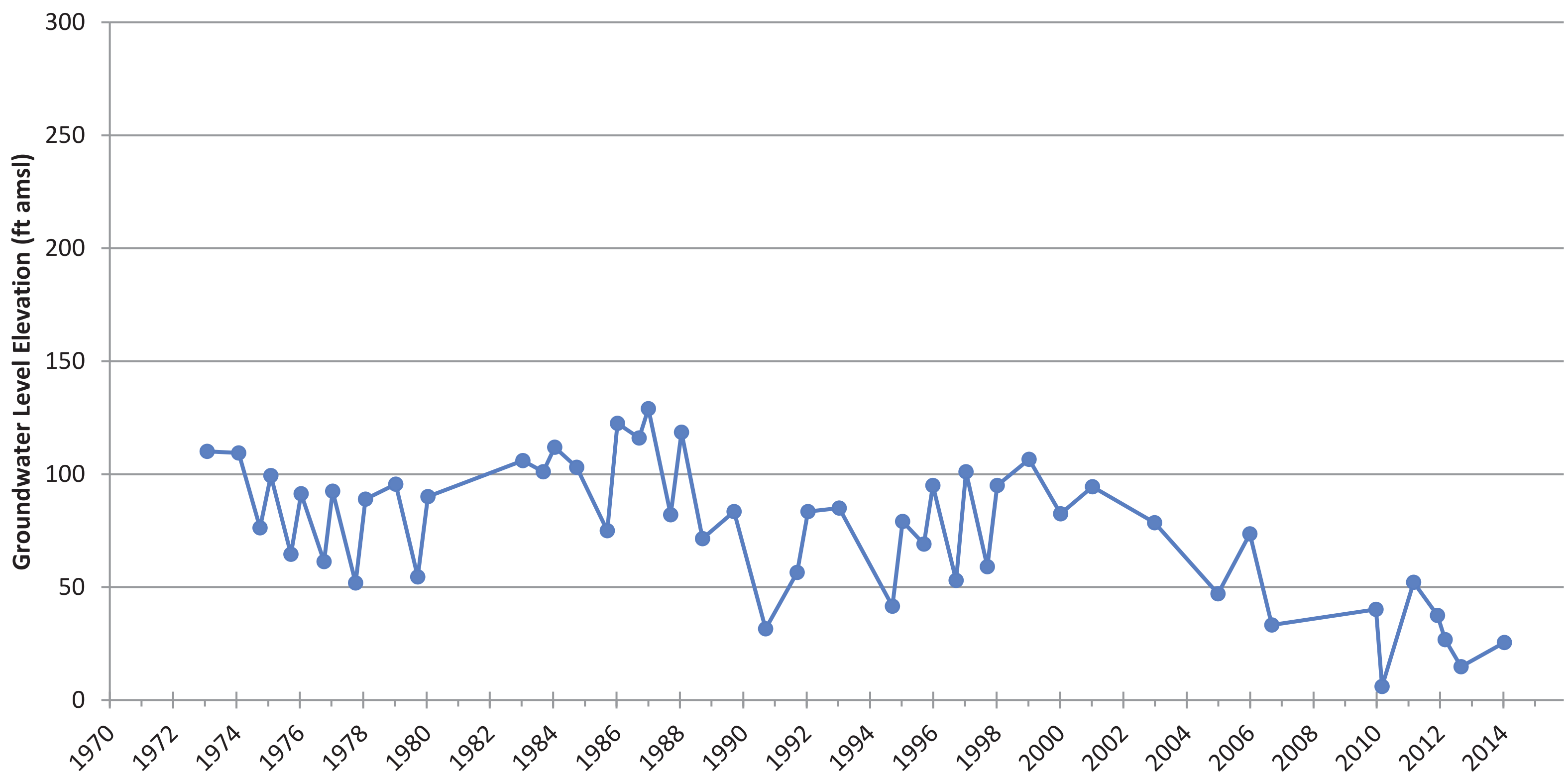
Groundwater Hydrographs - Deep

24S/25E-36J01



Groundwater Hydrographs - Deep

23S/23E-02A01



File Original with DWR

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

Page 1 of 2

Owner's Well No. Well #1 No. e0078297

Date Work Began 8/16/08 Ended 10/07/08

Local Permit Agency Tulare County Environmental Health Division

Permit No. 08-0339 Permit Date 7/9/08

DWR USE ONLY – DO NOT FILL IN

21S/23E25

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (X) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Reverse Rotary FLUID ___

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
50 – 80	Brown clay, gravel
80 – 90	Brown clay
90 – 230	Brown clay, gravel
230 – 260	Gray clay, gravel
260 – 280	Gray clay
280 – 310	Gray clay, sand
310 – 320	Gray clay, gravel
320 – 360	Gray clay, sand
360 – 370	Gray clay
370 – 380	Gray clay, sand
380 – 410	Gray clay, gravel
410 – 420	Clay and cobbles, gravel
420 – 470	Clay and gravel
470 – 490	Gray clay
500 – 510	Gray clay, sandy
510 – 530	Gray clay
530 – 540	Gray clay, sandy
540 – 550	Gray clay
550 – 570	Clay and gravel
570 – 580	Coarse sand
580 – 590	Clay, gravel, and sand
590 – 610	Clay and little gravel
610 – 620	Clay and gravel
620 – 630	Gray clay and gravel
630 – 640	Gray clay
640 – 720	Gray clay and gravel
720 – 730	Gravel
730 – 740	Clay
740 – 760	Gray clay and gravel
760 – 790	Gray clay

TOTAL DEPTH OF BORING 1280 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1270 (Feet)

WELL OWNER

[redacted]

CITY STATE ZIP

WELL LOCATION

Address 5850 Ave 160

City Tipton STATE CA ZIP 93272

County Tulare County

APN Book 200 Page 190 Parcel 004

Township 21S Range 23E Section 25

Latitude 36 4 46.53 NORTH (DEG. MIN. SEC.) Longitude 119 26 11.47 WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance Of Well from Roads Buildings, Fences, Rivers etc and attach map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (X)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (X)

WATER SUPPLY

X Domestic ___ Public

___ Irrigation ___ Industrial

MONITORING ___

TEST WELL ___

CATHODIC PROTECTION ___

HEAT EXCHANGE ___

DIRECT PUSH ___

INJECTION ___

VAPOR EXTRACTION ___

SPARGING ___

REMEDIATION ___

OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER N/A (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 259.6 (Ft.) & DATE MEASURED 10/04/08-10/07/08

ESTIMATED YIELD 2008 (GPM) & TEST TYPE Constant

TEST LENGTH 37 (Hrs.) TOTAL DRAWDOWN 216.88 (Ft.)

** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	OUTSIDE DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 – 40	40			X		Steel	32	.375	
0 – 640	28	X				Steel	18	.375	
640 – 660	28		X			Steel	16	.312	.060 Standard Louver
660 – 1260	26		X			Steel	16	.312	.060 Standard Louver
1260 – 1270	26	X				Steel	18	.375	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (X)	BEN-TONITE (X)	FILL (X)	FILTER PACK (TYPE/SIZE)
0 – 20	X			
20 – 1260			X	1/4 x 10 Gravel Pack

ATTACHMENTS (X)

X Geologic Log

X Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Layne Christensen Company (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 11001 Etiwanda Ave CITY Fontana STATE CA ZIP 92337

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 10/10/08 C-57 LICENSE NUMBER 510011

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

File Original with DWR

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Owner's Well No. Well #1 No. e0078297

Date Work Began 8/16/08 Ended 10/07/08

Local Permit Agency Tulare County Environmental Health Division

Permit No. 08-0339 Permit Date 7/9/08

DWR USE ONLY — DO NOT FILL IN
21S/23E-25 2/B
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (X) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Reverse Rotary FLUID ___

DEPTH FROM SURFACE FL to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
790 - 910	Gray clay and gravel
910 - 920	Gray clay, sand and gravel
920 - 940	Clay and coarse sand
940 - 950	Clay, sand, and gravel
950 - 960	Sand and gravel
960 - 1030	Sandy clay
1030 - 1040	Sandy clay and gravel
1040 - 1060	Gray clay and gravel
1060 - 1070	Gravel and gray clay
1070 - 1120	Gray clay
1120 - 1150	Gray clay and coarse sand
1150 - 1160	Gray clay and gravel
1160 - 1200	Gray clay
1200 - 1260	Gray clay and gravel

TOTAL DEPTH OF BORING 1280 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1270 (Feet)

WELL OWNER

[redacted]

CITY STATE ZIP

WELL LOCATION

Address 5850 Ave 160

City Tipton STATE CA ZIP 93272

County Tulare County

APN Book 200 Page 190 Parcel 004

Township 21S Range 23E Section 25

Latitude 36 4 46.53 NORTH (DEG. MIN. SEC.) Longitude 119 26 11.47 WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance Of Well from Roads Buildings, Fences, Rivers etc and attach map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (X)

X NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (X)

WATER SUPPLY
X Domestic ___ Public
X Irrigation ___ Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER N/A (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 259.6 (Ft.) & DATE MEASURED 10/04/08-10/07/08

ESTIMATED YIELD 2008 (GPM) & TEST TYPE Constant

TEST LENGTH 37 (Hrs.) TOTAL DRAWDOWN 216.88 (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (inches)	TYPE (-) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	OUTSIDE DIAMETER (inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (inches)

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (X)	BEN-TONITE (X)	FILL (X)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (X)

X Geologic Log
X Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Layne Christensen Company (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 11001 Etiwanda Ave CITY Fontana STATE CA ZIP 92337

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 10/10/08 C-57 LICENSE NUMBER 510011

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR 22S/23E/16

Page 1 of 1

Owner's Well No. 6535

Date Work Began 09/26/94, Ended 10/04/94

Local Permit Agency TULARE CO ENVIRONMENTAL HEALTH

Permit No. 30036 Permit Date 08/24/94

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 545936

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ______ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	3	TOP SOIL
3	15	SANDY YELLOW CLAY
15	110	SAND WITH BROWN CLAY STREAKS
110	250	SANDY BLUE CLAY W/SAND STRKS
250	300	SAND W/BLUE CLAY STREAKS
300	325	SANDY BLUE CLAY
325	400	SAND WITH BLUE CLAY STREAKS
400	420	BLUE CLAY
420	435	SANDY BLUE CLAY
435	555	CORCORAN CLAY
555	700	SAND WITH BLUE CLAY STREAKS
700	860	INTERBEDDED SAND & BLUE CLAY
860	885	SANDY BLUE CLAY
885	930	SAND WITH BLUE CLAY STREAKS
930	970	INTERBEDDED SAND & BLUE CLAY
970	1010	SAND WITH BLUE CLAY STREAKS
1010	1090	INTERBEDDED SAND & BLUE CLAY
1090	1210	SILTY BLUE SAND
1210	1300	INTERBEDDED SAND

CONFINED

TOTAL DEPTH OF BORING 1270 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1210 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address HWY 43 AVE 120

City

County TULARE

APN Book 291 Page 060 Parcel 19001

Township 22 S Range 23 E Section 16

Latitude ___ NORTH (DEG. MIN. SEC.) Longitude ___ WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

___ Domestic

___ Public

X Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD ROTARY FLUID MUD

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ______ (Ft.) & DATE MEASURED ______

ESTIMATED YIELD* ______ (GPM) & TEST TYPE ______

TEST LENGTH ______ (Hrs.) TOTAL DRAWDOWN ______ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	540	28"					ACCESS TUBE	2"	SCH 40	
0	560	28"	X				ASTM-135	16"	.312	
560	690	28"		X			DBL MILLSLOT	16"	.312	0.060
690	710	26"	X				ASTM-135	12-3/4	.312	
710	720	26"		X			DBL MILLSLOT	12-3/4	.312	0.050
720	730	26"	X				ASTM-135	12-3/4	.312	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	X			SAND SLURRY
50	540			X	GRAVEL
540	1270			X	SAND PACK

ATTACHMENTS (✓)

___ Geologic Log

___ Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other ______

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING COMPANY, INC. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 20 W. Kentucky Ave. CITY Woodland STATE CA ZIP 95695

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 10/13/94 C-57 LICENSE NUMBER 132783C57

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 1 of 1

Owner's Well No. 6535P2

Date Work Began 09/26/94, Ended 10/04/94

Local Permit Agency TULARE CO ENVIRONMENTAL HEALTH

Permit No. 30036 Permit Date 08/24/94

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 545937

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ______ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*

TOTAL DEPTH OF BORING 1270 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1210 (Feet)

WELL OWNER

[redacted]

CITY STATE ZIP

WELL LOCATION

Address SAME AS PAGE ONE

City

County TULARE

APN Book 291 Page 060 Parcel 19001

or Township 22 S Range 23 E Section 16

or Latitude ___ NORTH DEG. MIN. SEC. Longitude ___ WEST DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

___ Domestic

___ Public

X Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD ROTARY FLUID MUD

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ______ (Ft.) & DATE MEASURED ______

ESTIMATED YIELD* ______ (GPM) & TEST TYPE ______

TEST LENGTH ______ (Hrs.) TOTAL DRAWDOWN ______ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
730	760	26"		X			DBL MILLSLOT	12-3/4	.312	0.050
760	810	26"	X				ASTM-135	12-3/4	.312	
810	860	26"		X			DBL MILLSLOT	12-3/4	.312	0.050
860	900	26"	X				ASTM-135	12-3/4	.312	
900	930	26"		X			DBL MILLSLOT	12-3/4	.312	0.050
930	970	26"	X				ASTM-135	12-3/4	.312	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (✓)

___ Geologic Log

___ Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other ______

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING COMPANY, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. Kentucky Ave. Woodland CA 95695
ADDRESS CITY STATE ZIP

Signed ______ WELL DRILLER/AUTHORIZED REPRESENTATIVE 10/13/94 DATE SIGNED 133783C57 C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 1 of 1

Owner's Well No. 6535P3

Date Work Began 09/26/94, Ended 10/04/94

Local Permit Agency TULARE CO ENVIRONMENTAL HEALTH

Permit No. 30036 Permit Date 08/24/94

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 545938

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION Describe material, grain size, color, etc.

TOTAL DEPTH OF BORING 1270 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1210 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address SAME AS PAGE ONE

City

County TULARE

APN Book 291 Page 060 Parcel 19001

Township 22 S Range 23 E Section 16

Latitude ___ NORTH DEG. MIN. SEC. Longitude ___ WEST DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

___ Domestic

___ Public

X Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD ROTARY FLUID MUD

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD* ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

* May not be representative of a well's long-term yield.

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
970	1000	26"		X			DBL MILLSLOT	12-3/4	.312	0.050
1000	1020	26"					COMPRESSON		SECTION	
1020	1050	26"		X			DBL MILLSLOT	12-3/4	.312	0.050
1050	1060	26"	X				ASTM-135	12-3/4	.312	
1060	1080	26"		X			DBL MILLSLOT	12-3/4	.312	0.050
1080	1090	26"	X				ASTM-135	12-3/4	.312	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (✓)

___ Geologic Log

___ Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING COMPANY, INC. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 20 W. Kentucky Ave. CITY Woodland STATE CA ZIP 95695

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 10/13/94 C-57 LICENSE NUMBER 133783C57

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 545939

Page 1 of 1
Owner's Well No. 6535P4
Date Work Began ________, Ended ________
Local Permit Agency TULARE CO ENVIORNMENTAL HEALTH
Permit No. 30036 Permit Date 08/24/94

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ____ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION Describe material, grain size, color, etc.

TOTAL DEPTH OF BORING 1270 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1210 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address SAME AS PAGE ONE
City
County TULARE
APN Book 291 Page 060 Parcel 19001
Township 22 S Range 23 E Section 16
Latitude ___ NORTH DEG. MIN. SEC. Longitude ___ WEST DEG. MIN. SEC.

LOCATION SKETCH (NORTH / SOUTH / WEST / EAST)

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)
___ MONITORING
WATER SUPPLY
___ Domestic
___ Public
X Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD ROTARY FLUID MUD

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ____ (Ft.) & DATE MEASURED ____
ESTIMATED YIELD* ____ (GPM) & TEST TYPE ____
TEST LENGTH ____ (Hrs.) TOTAL DRAWDOWN ____ (Ft.)
* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
1090 - 1140	26"		X			DBL MILLSLOT	12-3/4	.312	0.050
1140 - 1150	26"	X				ASTM-135	12-3/4	.312	
1150 - 1210	26"		X			DBL MILLSLOT	12-3/4	.312	0.050

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ____

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING COMPANY, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 W. Kentucky Ave. Woodland CA 95695
ADDRESS CITY STATE ZIP

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE 10/13/94 DATE SIGNED 133783C57 C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

23/26-1J1

9-003 (December 1949)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

(Conflict in attached sheet)

No. 23/26-1J1

OTHER Nos. 11572 #1

WELL LOG

State California County Tulare Subarea Ducor-Famoso

Owner [redacted]

T.D. = 1913 E-log
T.D. = 1830 complet

Location 0.49 miles N of sec. line (¢ Ave 88) + 50 ft. W of Rd. 208

Drilled by Hylton Drilling Co. Address 17th + I st, Bakersfield

Date 12-6-56 Casing diam. Land-surf. alt. 410

Source of data Examination of dry rotary samples - Partial log

(Enter type of well, perforations, yield, and drawdown at end of log)

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
1030-1110	Sand, medium to coarse	80	
1110-1230	Sand, and clay, dark green	120	
1230-1270	Sand medium to coarse, some dark green clay	40	
1270-1290	Sand, medium to coarse	20	
1290-1390	Clay, sandy dark greenish	100	
1390-1430	Sand, fine to coarse	40	
1430-1450	Clay, dark green	20	
1470-1490	Sand medium to coarse	20	
1490-1510	clay, dark green	20	
1510-1630	Clay, sandy, dark green	120	
1630-1650	Sand, clayey to coarse	20	
1650-1690	Clay, sandy dark green	40	
1690-1700	Sand, clayey to coarse	10	
1700-1780	Gravel, 2-8mm with some dark green clay + sand	80	
1780-1820	Gravel 2-8mm + dark green clay	40	
1820-1840	Gravel 2-8mm with some dark green clay + sand	20	
1840-1900	Gravel 2-8mm + dark green clay	60	

RECORD BY George S. Hilton DATE 12-6-56 SHEET 1 OF 1

U. S. GOVERNMENT PRINTING OFFICE 16—01537-1

23/26-1J1

23/26-1J1

23/26-1J1 Maze (Camp, S.A.) #1 12-14-56
1830 ft pipe, perf 1370-1830, Schlumberger ran. to 2100± E-log completed
3 Mi W Terrabella 1/2 mi S on 208.

0-20 Surf fm
20-46 Sd & Gravel
46-84 Sdy brn clay
84-290 Sdy brn clay w/streaks of sd.
290-314 Tough sdy brown clay
314-378 Sdy brn clay w/streaks of sd
378-390 Hard sd
390-670 Sdy brn clay w/streaks hard sd
670-975 Sdy blue clay w/ streaks sd.
975-1015 Hard sdy blue clay & Shale.
1015-1127 Hard blue clay w/streaks of shale
1127-1350 Hard sdy clay
1350-1830 Sdy blue clay w/streaks of sd.

RECORD BY [illegible] DATE 12-6-56 SHEET 1 OF 1

ORIGINAL

File with DWR

Notice of Intent No.________

Local Permit No. or Date________

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 085678

State Well No. 22/27-16

Other Well No.________

[redacted]

(2) LOCATION OF WELL (See instructions):
County Tulare Owner's Well Number________
Well address if different from above________
Township 22 Range 27 Section 16
Distance from cities, roads, railroads, fences, etc. 3/8 mile East of Road 224 on South side of Ave. 128.

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☒
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☒ No ☐ Size 1/4"
Diameter of bore 27-1/2"
Packed from 0 to 1240 ft.

(7) CASING INSTALLED:
Steel ☒ Plastic ☐ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall
0	1240	14"	1/4"

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Slot size
800'	1240'	.125x 2-1/2"

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☐ No ☒ If yes, to depth____ ft.
Were strata sealed against pollution? Yes ☐ No ☒ Interval____ ft.
Method of sealing____

(10) WATER LEVELS:
Depth of first water, if known Unknown ft.
Standing level after well completion____ ft.

(11) WELL TESTS:
Was well test made? Yes ☒ No ☐ If yes, by whom?____
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test____ ft. At end of test____ ft
Discharge____ gal/min after____ hours Water temperature____
Chemical analysis made? Yes ☐ No ☒ If yes, by whom?____
Was electric log made? Yes ☒ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 1240 Depth of completed well 1240

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	90	Sand
90	94	Gravel
94	237	Gravel
237	277	Gravel
277	338	Clay w/Sand Streaks
338	399	Clay w/Gravel Streaks
399	522	Clay w/Sand Streaks
522	590	Blue Clay
590	700	Blue Clay
700	770	Clay
770	936	Sandy Clay
936	1088	Sand w/Clay Streaks
1088	1166	Sandy Clay
1166	1186	Coarse Sand & Clay
1186	1240	Sand w/Shale Streaks

OUTSIDE CORC. CLAY AREA

Work started 11-5-1979 Completed 11-30-1979

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED [signature] (Well Driller)

NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)

Address Rt. 1 Box 1101

City Delano, CA Zip 93215

License No. 148282 Date of this report 3-24-80

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0094537

DWR Use Only – Do Not Fill In

22S/26E-24

State Well Number/Site Number

N Latitude | W Longitude

APN/TRS/Other

Page 1 of 4

Owner's Well Number #2

Date Work Began 03/28/2009 Date Work Ended 5/20/2009

Local Permit Agency Tulare County Environmental Health Services

Permit Number 09-138 Permit Date 3/16/09

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Reverse Rotary Drilling Fluid Polybore

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
40	110	Sand Gravel
110	150	Sand
150	190	Sand Gravel Clay
190	240	Sand Clay
240	290	Sand
290	360	Sand Clay
360	400	Clay
400	1,120	Sand Clay
1120	1,270	Clay

Total Depth of Boring 1270 Feet

Total Depth of Completed Well 1240 Feet

Well Owner

[redacted]

Well Location

Address 1/4 Mile North of Ave 112 / 50' West of Rd. 208

City Pixley County Tulare

Latitude ___ Deg. Min. Sec. N Longitude ___ Deg. Min. Sec. W

Datum ___ Decimal Lat. ___ Decimal Long. ___

APN Book 302 Page 280 Parcel 013

Township 22S Range 26E Section 24 S

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West | East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well

○ Modification/Repair

○ Deepen

○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply

☐ Domestic ☐ Public

☑ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

○ Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 270 (Feet below surface)

Depth to Static Water Level 270 (Feet) Date Measured 05/06/2009

Estimated Yield * 2,600 (GPM) Test Type Constant Rate

Test Length 12.0 (Hours) Total Drawdown 190 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	40	42	Conductor	A53 Grade B	.375	30		
0	670	26	Blank	A53 Grade B	.312	16		
670	700	26	Ful Flo	Ful Flo A139	.312	16	Louver	0.080
700	800	26	Standard Flo	SF A139	.312	16	Louver	
800	820	26	Ful Flo	Ful flo A139	.312	16	Louver	0.080
820	840	26	Standard Flo	SF A139	.312	16	Louver	

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	40	Cement	Annular Seal
0	1,270	Filter Pack	4x16 SRI

Attachments

☐ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Bakersfield Well & Pump Co.

Person, Firm or Corporation

7212 Fruitvale Ave. Bakersfield CA 93308

Address City State Zip

Signed [signature] 7/13/2009 440537

C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0094537

2/6

DWR Use Only – Do Not Fill In

22S/26E-24 State Well Number/Site Number

Latitude N | Longitude W

APN/TRS/Other

Owner's Well Number #2

Date Work Began 03/28/2009 Date Work Ended 5/20/2009

Local Permit Agency Tulare County Environmental Health Services

Permit Number 09-138 Permit Date 3/16/09

Geologic Log

Orientation ⊙ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Reverse Rotary Drilling Fluid Polybore

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
40	110	Sand Gravel
110	150	Sand
150	190	Sand Gravel Clay
190	240	Sand Clay
240	290	Sand
290	360	Sand Clay
360	400	Clay
400	1,120	Sand Clay
1120	1,270	Clay

Total Depth of Boring 1270 Feet

Total Depth of Completed Well 1240 Feet

Well Owner

[redacted]

Well Location

Address 1/4 Mile North of Ave 112 / 50' West of Rd. 208

City Pixley County Tulare

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

Datum Decimal Lat. Decimal Long.

APN Book 302 Page 280 Parcel 013

Township 22S Range 26E Section 24 S

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North / West / East / South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⊙ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⊙ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 270 (Feet below surface)

Depth to Static Water Level 270 (Feet) Date Measured 05/06/2009

Estimated Yield * 2,600 (GPM) Test Type Constant Rate

Test Length 12.0 (Hours) Total Drawdown 190 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
840	900	26	Ful Flo	Ful Flo A139	.312	16	Louver	0.080
900	910	26	Standard Flo	SF A139	.312	16	Louver	
910	930	26	Ful Flo	Ful Flo A139	.312	16	Louver	0.080
930	950	26	Standard Flo	SF A139	.312	16	Louver	
950	990	26	Ful Flo	Ful flo A139	.312	16	Louver	0.080
990	1,030	26	Standard Flo	SF A139	.312	16	Louver	

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	40	Cement	Annular Seal
0	1,270	Filter Pack	4x16 SRI

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Bakersfield Well & Pump Co.
Person, Firm or Corporation

7212 Fruitvale Ave. Bakersfield CA 93308
Address City State Zip

Signed [signature] 7/13/2009 440537
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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3/5

File Original with DWR

State of California
Well Completion Report
Refer to Instruction Pamphlet
No. e0094537

DWR Use Only – Do Not Fill In
22S/26E-24
State Well Number/Site Number
N Latitude | W Longitude
APN/TRS/Other

Page 3 of 4
Owner's Well Number #2
Date Work Began 03/28/2009 Date Work Ended 5/20/2009
Local Permit Agency Tulare County Environmental Health Services
Permit Number 09-138 Permit Date 3/16/09

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify
Drilling Method Reverse Rotary Drilling Fluid Polybore

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
40	110	Sand Gravel
110	150	Sand
150	190	Sand Gravel Clay
190	240	Sand Clay
240	290	Sand
290	360	Sand Clay
360	400	Clay
400	1,120	Sand Clay
1120	1,270	Clay

Total Depth of Boring 1270 Feet
Total Depth of Completed Well 1240 Feet

Well Owner

[redacted]

Well Location

Address 1/4 Mile North of Ave 112 / 50' West of Rd. 208
City Pixley County Tulare
Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W
Datum ___ Decimal Lat. ___ Decimal Long. ___
APN Book 302 Page 280 Parcel 013
Township 22S Range 26E Section 24 S

Location Sketch
(Sketch must be drawn by hand after form is printed.)
North
West
East
South
Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity
⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses
⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well
Depth to first water 270 (Feet below surface)
Depth to Static Water Level 270 (Feet) Date Measured 05/06/2009
Estimated Yield * 2,600 (GPM) Test Type Constant Rate
Test Length 12.0 (Hours) Total Drawdown 190 (Feet)
*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
1,030	1,060	26	Ful Flo	Ful Flo A139	.312	16	Louver	0.080
1,060	1,110	26	Standard Flo	SF A139	.312	16	Louver	
1,110	1,130	26	Ful Flo	Ful Flo A139	.312	16	Louver	0.080
1,130	1,145	26	Standard Flo	SF A139	.312	16	Louver	
1,145	1,170	26	Ful Flo	Ful flo A139	.312	16	Louver	0.080
1,170	1,200	26	Standard Flo	SF A139	.312	16	Louver	

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	40	Cement	Annular Seal
0	1,270	Filter Pack	4x16 SRI

Attachments
☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other
Attach additional information, if it exists.

Certification Statement
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief
Name Bakersfield Well & Pump Co.
Person, Firm or Corporation
7212 Fruitvale Ave. Bakersfield CA 93308
Address City State Zip
Signed [signature] 7/13/2009 440537
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0094537

Page 4 of 4

Owner's Well Number #2

Date Work Began 03/28/2009 Date Work Ended 5/20/2009

Local Permit Agency Tulare County Environmental Health Services

Permit Number 09-138 Permit Date 3/16/09

DWR Use Only – Do Not Fill In

22S/26E-24

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical O Horizontal O Angle Specify

Drilling Method Reverse Rotary Drilling Fluid Polybore

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
40	110	Sand Gravel
110	150	Sand
150	190	Sand Gravel Clay
190	240	Sand Clay
240	290	Sand
290	360	Sand Clay
360	400	Clay
400	1,120	Sand Clay
1120	1,270	Clay

Total Depth of Boring 1270 Feet

Total Depth of Completed Well 1240 Feet

Well Owner

[redacted]

Well Location

Address 1/4 Mile North of Ave 112 / 50' West of Rd. 208

City Pixley County Tulare

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

Datum Decimal Lat. Decimal Long.

APN Book 302 Page 280 Parcel 013

Township 22S Range 26E Section 24 S

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well

O Modification/Repair

O Deepen

O Other

O Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply

☐ Domestic ☐ Public

☑ Irrigation ☐ Industrial

O Cathodic Protection

O Dewatering

O Heat Exchange

O Injection

O Monitoring

O Remediation

O Sparging

O Test Well

O Vapor Extraction

O Other

Water Level and Yield of Completed Well

Depth to first water 270 (Feet below surface)

Depth to Static Water Level 270 (Feet) Date Measured 05/06/2009

Estimated Yield * 2,600 (GPM) Test Type Constant Rate

Test Length 12.0 (Hours) Total Drawdown 190 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
1,200	1,220	26	Ful Flo	Ful Flo A139	.312	16	Louver	
1,220	1,240	26	Blank	A53 Grade B	.312	16		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	40	Cement	Annular Seal
0	1,270	Filter Pack	4x16 SRI

Attachments

☐ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Bakersfield Well & Pump Co.

Person, Firm or Corporation

7212 Fruitvale Ave Bakersfield CA 93308

Address City State Zip

Signed C-57 Licensed Water Well Contractor 7/13/2009 440537

Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

24/27-34

ORIGINAL
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No.______
(Insert appropriate number)

WATER WELL DRILLERS REPORT
(Sections 7076, 7077, 7078, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA

Do Not Fill In
Nº 118749
State Well No. 24/27E-34
Other Well No.______

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Kern Owner's number, if any—

R. F. D. or Street No. ¼ mile East of Hwy 65 and ¼ mile North of Ave. 2

(3) TYPE OF WORK (check):

New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:

SINGLE ☒ DOUBLE ☐

From 0 ft. to 1750 ft. 14" Diam. ¼" Gage or Wall

If gravel packed: Diameter of Bore 25½ from ft. to ft.

top to bottom

Type and size of shoe or well ring

Size of gravel: ¼"

Describe joint collar w/ fillet weld

(7) PERFORATIONS:

Type of perforator used machine

Size of perforations .125 x 2 in., length, by 6 cc in.

From 600 ft. to 1750 ft. 2 Perf. per row 14 Rows per ft.

(8) CONSTRUCTION:

Was a surface sanitary seal provided? ☐ Yes ☒ No To what depth ft.

Were any strata sealed against pollution? ☐ Yes ☒ No If yes, note depth of strata

From ft. to ft.

Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found unknown ft.

Standing level before perforating ft.

Standing level after perforating ft.

(10) WELL TESTS:

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. draw down after hrs.

Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

Was electric log made of well? ☒ Yes ☐ No

(11) WELL LOG:

Total depth 1750 ft. Depth of completed well 1750 ft.

Formation: *Describe by color, character, size of material, and structure.*

From (ft.)	To (ft.)	Formation
0	9	top soil
9	127	sand
127	409	sandy clay
409	564	clay
564	740	sandy clay
740	743	sand
743	881	blue clay
881	943	sandy clay
943	1066	hard shale
1066	1220	sandy clay
1220	1370	blue shale
1370	1441	hard blue shale
1441	1565	hard shale
1565	1750	shale w/ sand streaks

CONFIDENTIAL
Water Code Sec. 13752

Work started 12-28-68 19 , Completed 1-15-68 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)

Address 1744 Inyo St.
Delano, Calif. 93215

[SIGNED] (signature)
Well Driller

License No. 148282 Dated 10-23-68, 19

87849 5-65 25M QUIN DWR 188 (REV. 3-64)

ORIGINAL 24/27-20

File Original, Duplicate and Triplicate with the REGIONAL WATER POLLUTION CONTROL BOARD No. 5 (Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

LOCATION NOT CHECKED

Do Not Fill In

Nº 60087

State Well No.

Other Well No. 24S/27E-20

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare Owner's number, if any—

R. F. D. or Street No.

1/4 mile North of Ave. 16
3/8 mile East of Rd. 216

(3) TYPE OF WORK (check):

New well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) EQUIPMENT:

Rotary [X]
Cable [ ]
Dug Well [ ]

(6) CASING INSTALLED:

SINGLE [X] DOUBLE [ ]

From ft. to ft. Diam. Gage or Wall

1,824 ft. 14" ¼ single

If gravel packed

Diameter of Bore 26 3/4" from to ft.

Top to bottom

Type and size of shoe or well ring

Size of gravel: 3/8"

Describe joint Butt welded

(7) PERFORATIONS:

Type of perforator used Machine

Size of perforations 1/8 X 1cc in., length, by in.

From ft. to ft. Perf. per row 21 Rows per ft. 3

648 ft. to 1824 ft.

(8) CONSTRUCTION:

Was a surface sanitary seal provided? [ ] Yes [X] No To what depth ft.

Were any strata sealed against pollution? [ ] Yes [X] No If yes, note depth of strata

From ft. to ft.

Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found not known ft.

Standing level before perforating ft.

Standing level after perforating ft.

(10) WELL TESTS:

Was a pump test made? [ ] Yes [X] No If yes, by whom?

Yield: gal./min. with ft. draw down after hrs.

Temperature of water Was a chemical analysis made? [ ] Yes [X] No

Was electric log made of well? [ ] Yes [X] No

(11) WELL LOG:

Total depth 1824 ft. Depth of completed well 1824 ft.

Formation: Describe by color, character, size of material, and structure.

From (ft.)	To (ft.)	Formation
0	86	Sandy Top Soil
86	196	Sandy Clay
196	200	Hard Sand
200	285	Sandy Clay
285	302	Hard Sand
302	460	Sandy Clay
460	500	Sandy Clay
500	540	Hard Clay
540	543	Sand
543	620	Hard Clay
620	640	Hard Shale
640	723	Hard Clay
723	763	Shale
763	840	Blue Clay
840	843	Sand
843	1042	Blue Clay
1042	1105	Shale
1105	1125	Soft Clay
1125	1140	Shale
1140	1230	Blue Clay
1230	1233	Sand
1233	1275	Blue Shale
1275	1295	Hard Shale
1295	1450	Clay
1450	1452	Hard Shale
1452	1481	Clay
1481	1515	Hard Shale
1515	1526	Clay
1526	1570	Hard Shale
1570	1574	Sand
1574	1616	Hard Shale
1616	1626	Sand
1626	1636	Shale
1636	1691	Clay & Shale
1691	1739	Sand
1739	1824	Hard Shale

CONFIDENTIAL
Section 7076 I, Water Code

Work started 12/26/59 19 . Completed 1/21/60 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc. (Person, firm, or corporation) (Typed or printed)

Address 1744 High Street
Delano, Calif.

[SIGNED] Ronald Egan
Well Driller

License No. 148282 Dated 7-15-60

87023 6-57 30M QUIN SPO

DWR 188 (REV. 3-54)

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e059519

Page 1 of 2

Owner's Well Number

Date Work Began 07/12/2007 Date Work Ended 9/25/2007

Local Permit Agency Tulare County Environmental Health Department

Permit Number 07-0234 Permit Date 5/23/07

DWR Use Only – Do Not Fill In

23S/27E-34

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	32	Drill conductor
32	115	Fine to coarse sand
115	125	80% fine to coarse sand, 20% clay
125	135	Coarse sand with some clay
135	155	Fine to coarse sand
155	186	Fine to coarse sand with a little clay
186	245	5% fine to medium sand, 95% brown clay
245	330	95% brown and white clay, 5% medium sand
330	345	60% brown clay, 40% fine to medium sand
345	350	Brown clay
350	370	70% brown clay, 30%fine to medium sand
370	470	80% brown clay, 20% fine to medium sand
470	483	60% white and brown clay, 40% fine to medium sand
483	493	90% white and brown clay, 10% sand
493	503	80% fine to medium sand, 20% clay
503	535	95% blue & brown clay, 5% fine sand
535	567	Blue and brown clay, with some shale and fine sand
567	785	80% blue and brown clay, 20% sand
785	816	Hard blue and brown clay with some sand
816	878	90% blue-green shale and fine sand
878	888	80% blue clay and shale with some fine sand
888	898	90% clay and hard shale with fine to medium sand
898	970	Clay and hard shale
970	1,006	Clay and hard shale with some fine sand
1006	1,038	80% blue clay with shale and fine sand
1038	1,058	70% blue clay and shale with fine to medium sand
1058	1,100	80% blue clay and shale with fine sand
1100	1,110	60% clay and shale, 40% fine to coarse sand
1110	1,130	Blue clay and shale with some fine sand

Total Depth of Boring 1832 Feet

Total Depth of Completed Well 1800 Feet

Well Owner

[redacted]

Well Location

Address Hwy 56 & 240th, 1 mile SW

City Ducor County Tulare

Latitude 35 Deg. 52 Min. 51 Sec. N Longitude 119 Deg. 2 Min. 37 Sec. W

Datum WGS84 Decimal Lat. Decimal Long.

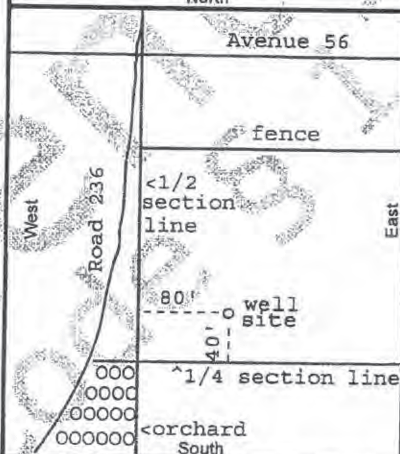
APN Book 321 Page 160 Parcel 009

Township 23S Range 27E Section 34

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North



South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 511 (Feet below surface)

Depth to Static Water Level 511 (Feet) Date Measured 09/25/2007

Estimated Yield * 2,000 (GPM) Test Type Constant Rate

Test Length 8.0 (Hours) Total Drawdown 26 (Feet)

*May not be representative of a well's long term yield. PL 537

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	20	36	Conductor	A53B	.375	30		
0	160	26	Solid	A53B	.375	16		
160	760	26	Solid	A53B	.312	16		
760	880	26	Perforated	A53B	.312	16	Millslot	0.070
880	1,000	26	Perforated	A53B	.312	16	Millslot	0.070
1,000	1,260	26	Perforated	A53B	.312	16	Millslot	0.040

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	150	Cement	10-sack
150	1,832	Filter Pack	1/4 x 10 Gravel

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Rottman Drilling Co.
Person, Firm or Corporation

46471 N. Division Street Lancaster CA 93535-5906
Address City State Zip

Signed Matthew W Rottman 10/26/07 316599
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

2/2

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e059520

Owner's Well Number

Date Work Began 07/12/2007 Date Work Ended 9/25/2007

Local Permit Agency Tulare County Environmental Health Department

Permit Number 07-0234 Permit Date 5/23/07

DWR Use Only – Do Not Fill In

23S/27E-34

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
1,130	1,200	Blue clay and shale with some fine sand
1,200	1,210	Blue clay, 30% fine to medium sand
1210	1,240	blue clay, shale, and some fine sand
1240	1,290	Fie to medium sand with some clay
1290	1,330	Blue clay with some sand
1330	1,400	Grey-blue clay and shale
1400	1,440	Fine to coarse sand with some clay
1440	1,452	70% clay with fine to medium sand
1452	1,534	Fine to coarse sand, 30%clay
1534	1,630	Fine to coarse sand, 30%clay with some silt
1630	1,693	Fine to coarse sand with some clay and silt
1693	1,724	Fine sand with some silty clay
1724	1,755	Fine to coarse sand with silty blue-green clay
1755	1,774	Blue-green silty clay with shale and fine sand
1774	1,786	Coarse sand with hard silty clay
1786	1,817	Hard blue clay with a little sand or shale
1817	1,832	Hard blue clay

Total Depth of Boring 1832 Feet

Total Depth of Completed Well 1800 Feet

Well Owner

[redacted]

Well Location

Address Hwy 56 & 240th, 1 mile SW

City Ducor County Tulare

Latitude 35 Deg. 52 Min. 51 Sec. N Longitude 119 Deg. 2 Min. 37 Sec. W

Datum WGS84 Decimal Lat. Decimal Long.

APN Book 321 Page 160 Parcel 009

Township 23S Range 27E Section 34

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West SEE PAGE 1 East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well

○ Modification/Repair

○ Deepen

○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply

☐ Domestic ☐ Public

☑ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

○ Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 511 (Feet below surface)

Depth to Static Water Level 511 (Feet) Date Measured 09/25/2007

Estimated Yield * 2,000 (GPM) Test Type Constant Rate

Test Length 8.0 (Hours) Total Drawdown 26 (Feet)

*May not be representative of a well's long term yield. PL 537

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
1,260	1,500	26	Perforated	A53B	.312	16	Millslot	0.080
1,500	1,740	26	Perforated	A53B	.312	16	Millslot	0.070

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	150	Cement	10-sack
150	1,832	Filter Pack	1/4 x 10 Gravel

Attachments

☐ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Rottman Drilling Co.

Person, Firm or Corporation

46471 N. Division Street — Address; Lancaster — City; CA — State; 93535-5906 — Zip

Signed [signature] C-57 Licensed Water Well Contractor

10/26/07 Date Signed

316599 C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 1 of 1

Owner's Well No. North

Date Work Began 6-4-04, Ended 8-20-04

Local Permit Agency Tulare County Environmental Health

Permit No. 5400542 Permit Date 5-19-04

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 0925804

DWR USE ONLY — DO NOT FILL IN

23S/27E-27

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Reverse Circulation FLUID Poly Bore

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	60	Clay & Gravel
60	200	Sand & Clay
200	240	Sand & Little Clay
240	370	Sand & Grey Clay
370	380	Clay & Little Sand
380	390	Green Clay & Sand
390	400	Clay & Little Sand
400	410	Sand & Clay
410	440	Green Clay & Sand
440	540	Green Clay & Fine Sand
540	550	Green Clay Sand & Little Rock
550	930	Sand & Grey Clay
930	940	Grey Clay
940	960	Fine Sand & Grey Clay
960	1000	Sand Grey Clay & Shell
1000	1060	Sand & Grey Clay
1060	1090	Sand Grey Clay & Little Rock
1090	1150	Sand & Grey Clay
1150	1230	Sand Shell & Grey Clay
1230	1270	Shell & Grey Clay
1270	1290	Fine Sand & Shell ; Grey Clay
1290	1380	Fine Sand & Grey Clay
1380	1430	Grey Clay
1430	1460	Fine Sand & Grey Clay
1460	1500	Grey Clay

TOTAL DEPTH OF BORING 1425 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1405 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 1/4 Mile N. of Ave 56 75' W of Bradly

City Ducor

County Tulare

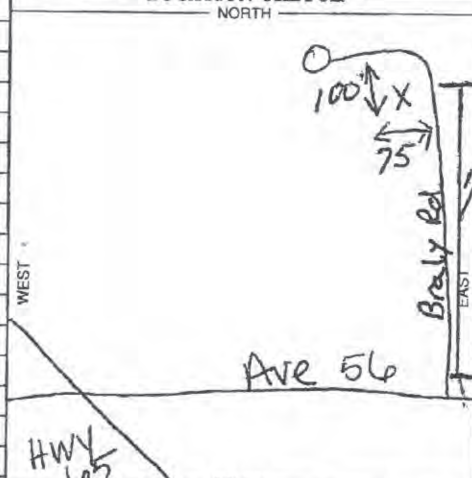
APN Book 321 Page 080 Parcel 025

Township 23 Range 27E Section 27

Lat ___ N DEG. MIN. SEC. Long ___ W DEG. MIN. SEC.

LOCATION SKETCH

NORTH



WEST EAST SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

USES (✓)

WATER SUPPLY
___ Domestic X Public
___ Irrigation ___ Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 502 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 502 (Ft.) & DATE MEASURED 7-26-04

ESTIMATED YIELD * 550 (GPM) & TEST TYPE Constant/ Flowmeter

TEST LENGTH 24 (Hrs.) TOTAL DRAWDOWN 97 (Ft.)

** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	42			x		ASTM 139	30	5/16	
+2	1015	26	x				ASTM A 606	14	5/16	
1015	1035	26	x				ASTM A 606	14	5/16	Comp Section
1035	1385	26		x			A 606 Ful Flo	14	5/16	.060
1385	1405	26	x				ASTM A 606	14	5/16	
+2	1010	26				x	A53 Grade B	3	Sch.40	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	995	x			
995	1000		x		
1000	1425				6x16 CCST

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Bakersfield Well & Pump Co.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 7212 Fruitvale Ave CITY Bakersfield STATE CA ZIP 93308

Signed [signature] C-57 LICENSED WATER WELL CONTRACTOR DATE SIGNED 11-11-04 C-57 LICENSE NUMBER 440537

DWR 188 REV. 05-03 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM OSP 03 78836

ORIGINAL 23/27-19R1
File Original, Duplicate and Triplicate with the REGIONAL WATER POLLUTION CONTROL BOARD No.______ (Insert appropriate number)

WATER WELL DRILLERS REPORT
(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

LOCATION NOT CHECKED
Do Not Fill In
Nº 14164
State Well No. 19R1
Other Well No. 23S/27E-34

(1) OWNER:
[redacted]

(2) LOCATION OF WELL:
County Tulare Owner's number, if any— 5
R. F. D. or Street No. E. End of Road 64

(3) TYPE OF WORK (check):
New well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) EQUIPMENT:
Rotary [XX]
Cable [ ]
Dug Well [ ]

(6) CASING INSTALLED:
SINGLE [X] DOUBLE [ ]

From ft.	to ft.	Diam.	Gage or Wall
0	795	16"	5/16"
~~795~~			
780	1610	14"	1/4"

If gravel packed

Diameter of Bore	from ft.	to ft.
27½"	0	1610

Type and size of shoe or well ring
Size of gravel: 1/2"
Describe joint

(7) PERFORATIONS:
Type of perforator used Machine
Size of perforations 125 mesh in., length, by 2" in.

From ft.	to ft.	Perf. per row	Rows per ft.
645	1610	14 rows on 6" centers	

(8) CONSTRUCTION:
Was a surface sanitary seal provided? [ ] Yes [ ] No To what depth ft.
Were any strata sealed against pollution? [X] Yes [ ] No If yes, note depth of strata
From 1610 ft. to 1817 ft.
Method of Sealing cemented

(9) WATER LEVELS:
Depth at which water was first found ft.
Standing level before perforating ft.
Standing level after perforating ft.

(10) WELL TESTS:
Was a pump test made? [X] Yes [ ] No If yes, by whom? L.S.A.Camp Co.
Yield: 3500 gal./min. with 37 ft. draw down after 6 hrs.
Temperature of water Was a chemical analysis made? [ ] Yes [ ] No
Was electric log made of well? [X] Yes [ ] No

(11) WELL LOG:
Total depth 1817' ft. Depth of completed well 1610 ft.
Formation: *Describe by color, character, size of material, and structure.*

ft. to	ft.	
0	15	Surface
15	130	Sand with strs of clay
130	360	Sandy brown clay
360	460	Sandy br. clay w/ stks of sand
460	696	Sandy blue " " " "
696	800	Sandy clay
800	845	Hard Sand
845	900	Hard Sandy Blue Clay
900	960	Sand w/ thin streaks blue clay
960	1127	Blue shale
1127	1220	Hard blue shale w/ stks hard sand
1220	1517	Blue clay w/ streaks of sand
1517	1817	Sand w/ streaks of blue clay and hard shale

CONFIDENTIAL Section 7076.1, Water Code

Work started 6-5-57 19 Completed 6-21-57 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME HYLTON DRILLING CO. (Person, firm, or corporation) (Typed or printed)
Address 716 Eye Street
Bakersfield, Calif.
[SIGNED] Reese Hylton (Well Driller)
License No. 111580 Dated June 25, 1957

33689 3-54 20M QUIN SPO DWR FORM NO. 246 (REV. 3-54)

ORIGINAL
File with DWR
Page 1 of 2
Owner's Well No. ________
Date Work Began 5-19-08, Ended 6-30-08
Local Permit Agency TULARE COUNTY
Permit No. 08-0200 Permit Date 4-23-08

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 0942277

DWR USE ONLY — DO NOT FILL IN
23S/27E-07 1/2
STATE WELL NO./STATION NO.
LATITUDE | LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID MUD

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0 – 50	TOP SOIL
50 – 100	SAND
100 – 140	SANDY CLAY
140 – 150	SAND
150 – 180	CLAY
180 – 190	SAND
190 – 290	CLAY
290 – 310	SAND
310 – 350	SANDY CLAY
350 – 360	SAND
360 – 390	SANDY CLAY
390 – 410	SAND
410 – 490	SANDY CLAY
490 – 510	SAND
510 – 660	SANDY CLAY
660 – 690	SAND
690 – 730	SANDY CLAY
730 – 750	SAND
750 – 820	SANDY CLAY
820 – 830	CLAY
830 – 850	SAND
850 – 960	SANDY CLAY
960 – 980	SAND
980 – 1010	SHALE
1010 – 1050	SANDY CLAY
1050 – 1060	CLAY
1060 – 1080	SAND
1080 – 1090	CLAY
1090 – 1100	SAND
1100 – 1110	CLAY

TOTAL DEPTH OF BORING ________ (Feet)
TOTAL DEPTH OF COMPLETED WELL ________ (Feet)

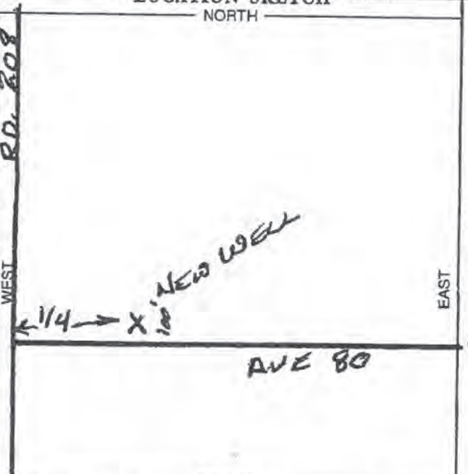
WELL OWNER

[redacted]

WELL LOCATION

Address 1/4 E/o RD 208 100 N/o AVE 80
City TERRA BELLA
County TULARE
APN Book 320 Page 010 Parcel 013
Township 23S Range 27E Section 07
Lat ___ N DEG. MIN. SEC. Long ___ W DEG. MIN. SEC.

LOCATION SKETCH

NORTH


SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

USES (✓)
WATER SUPPLY
___ Domestic ___ Public
X Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ________ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 476 (Ft.) & DATE MEASURED 8-6-08
ESTIMATED YIELD * 1300 (GPM) & TEST TYPE PUMP
TEST LENGTH 16 (Hrs.) TOTAL DRAWDOWN 551 (Ft.)
* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 – 40					X	A53B	33/4	.188	
0 – 625		X				A53B	15 1/4	.312	
625 – 1800			X			A53B	15 1/4	.312	.90

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 – 30	X			
30 – 1800				1/4" GRAVEL

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
X Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ________
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WHITTEN PUMP INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

502 COUNTYLINE RD DELANO CA 93215
ADDRESS CITY STATE ZIP

Signed [signature] 8/11/2008 148282
C-57 LICENSED WATER WELL CONTRACTOR DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 05-03 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM OSP 03 78836

ORIGINAL
File with DWR
Page 2 of 2
Owner's Well No.
Date Work Began 5-19-08, Ended 6-30-08
Local Permit Agency TULARE COUNTY
Permit No. 08-0200 Permit Date

(CONTINUED)

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 0942278

DWR USE ONLY — DO NOT FILL IN
23S/27E-07 | 2/2
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ___ FLUID ___

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
1110 1130	SAND
1130 1140	CLAY
1140 1150	SAND
1150 1170	CLAY
1170 1180	SAND
1180 1220	CLAY
1220 1250	SAND
1250 1290	SANDY CLAY
1290 1310	CLAY
1310 1330	SAND
1330 1350	CLAY
1350 1360	SAND
1360 1440	CLAY
1440 1450	SANDY CLAY
1450 1570	SAND
1570 1580	CLAY
1580 1610	SAND
1610 1670	CLAY
1670 1720	SAND
1720 1760	SANDY CLAY
1760 1800	SAND

TOTAL DEPTH OF BORING ___ (Feet)
TOTAL DEPTH OF COMPLETED WELL ___ (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address
City
County
APN Book ___ Page ___ Parcel ___
Township 23S Range 27E Section 07
Lat ___ DEG. MIN. SEC. N Long ___ DEG. MIN. SEC. W

LOCATION SKETCH

NORTH
WEST EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS CITY STATE ZIP
Signed [signature] C-57 LICENSED WATER WELL CONTRACTOR DATE SIGNED 8/11/2008 C-57 LICENSE NUMBER

ORIGINAL
File with DWR

Page 1 of 1

Owner's Well No. ______

Date Work Began 01-03-01 Ended 01-30-01

Local Permit Agency TULARE COUNTY ENVIRONMENTAL HEALTH

Permit No. ______ Permit Date 01-03-01

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 783343

DWR USE ONLY — DO NOT FILL IN

23S/26E-23R1

STATE WELL NO./STATION NO.

LATITUDE | LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID MUD BENTONITE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	260	SANDY CLAY
260	275	SAND
275	500	SANDY CLAY
500	515	SAND
515	570	SANDY CLAY
570	590	CLAY
590	635	SANDY CLAY
635	660	SAND
660	700	SANDY CLAY
700	720	SAND
720	770	SANDY CLAY
770	795	CLAY
795	875	SANDY CLAY
875	895	SAND
895	960	SANDY CLAY
960	995	SAND
995	1105	SANDY CLAY
1105	1120	SAND
1120	1145	CLAY
1145	1165	SAND
1165	1240	SANDY CLAY
1240	1265	CLAY
1265	1510	CLAY WITH SAND STREAKS
1510	1530	SAND
1530	1620	SANDY CLAY
1620	1645	SAND
1645	1670	SANDY CLAY
1670	1685	SAND
1685	1690	SANDY CLAY
1690	1720	SAND

TOTAL DEPTH OF BORING 1720 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1700 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 1-1/8 MILE NORTH OF AVENUE 56 AND

City 1/4 MILE WEST OF ROAD 200

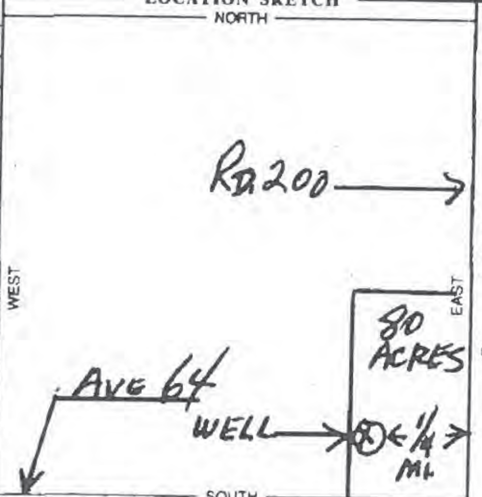
County TULARE COUNTY ENVIRONMENTAL HEALTH

APN Book 319 Page 160 Parcel 01

Township 23S Range 26E Section 23R

Latitude ___ NORTH (DEG. MIN. SEC.) Longitude ___ WEST (DEG. MIN. SEC.)

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
X Irrigation ___ Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ______ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ______ (Ft.) & DATE MEASURED ______

ESTIMATED YIELD * ______ (GPM) & TEST TYPE ______

TEST LENGTH ______ (Hrs.) TOTAL DRAWDOWN ______ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	600	27	X				A53B	15.37	.312	
600	1700	27		X			A53B	15.37	.312	.100X2-1/2
0	30					X	A252	3.75		

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20	X			
20	1700				1/4" GRAVEL

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ______

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WHITTEN PUMPS, INC. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 502 COUNTY LINE RD. CITY DELANO STATE CA. ZIP 93215

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 3/9/01 C-57 LICENSE NUMBER 148282

DWR 188 REV. 11/97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR
Page 1 of 1
Owner's Well No. ____
Date Work Began 3/16/05, Ended 4/13/05
Local Permit Agency Environmental Health Services
Permit No. 23791 Permit Date 2/24/05

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 0915717

DWR USE ONLY — DO NOT FILL IN
23S/26E-11
STATE WELL NO./STATION NO.
LATITUDE | LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ____ FLUID ____

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
50'	30"	Cond. Pipe
50	58	Clay
58	80	Sand
80	118	Clay
118	128	Sand
128	200	Clay
200	220	Sand
220	225	Clay
225	238	Sand
238	280	Clay
280	290	Sand
290	440	Sand, Clay
440	458	Sand, Rock
458	568	Sand, Clay
568	578	Sand
578	660	Clay
660	718	Sand, Rock
718	720	Clay
720	742	Sand
742	768	Clay
768	778	Sand
778	788	Clay
788	818	Sand
818	828	Clay, Sand
828	898	Sand
898	920	Clay
920	1000	Sand
1000	1069	Clay

TOTAL DEPTH OF BORING 1069 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1011 (Feet)

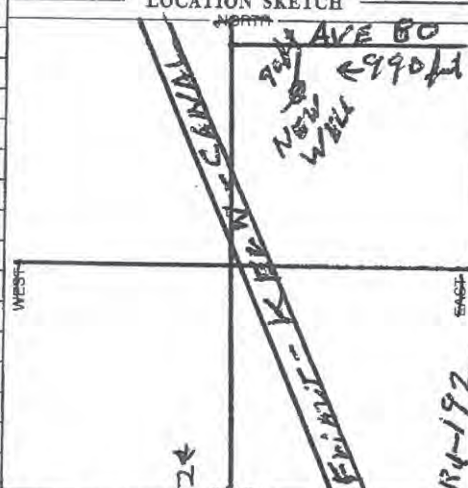
WELL OWNER

[redacted]

WELL LOCATION

Address Ave. 56 E. to 192, 192 N. to Ave. 80,
City Ave. 80, 3/8 mi. E. On L. side of rd.
County Tulare
APN Book ____ Page ____ Parcel ____
Township 23 Range 26 Section 11
Lat ____ DEG. MIN. SEC. N Long ____ DEG. MIN. SEC. W

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

USES (✓)
WATER SUPPLY
___ Domestic ___ Public
X Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ____ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ____ (Ft.) & DATE MEASURED ____
ESTIMATED YIELD * ____ (GPM) & TEST TYPE ____
TEST LENGTH ____ (Hrs.) TOTAL DRAWDOWN ____ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	1011	27½						16	312	.090
										32 Row
Blank Casing - 567'										
Perf. " - 444'										
0 - 50' top sanitary seal										

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ____
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

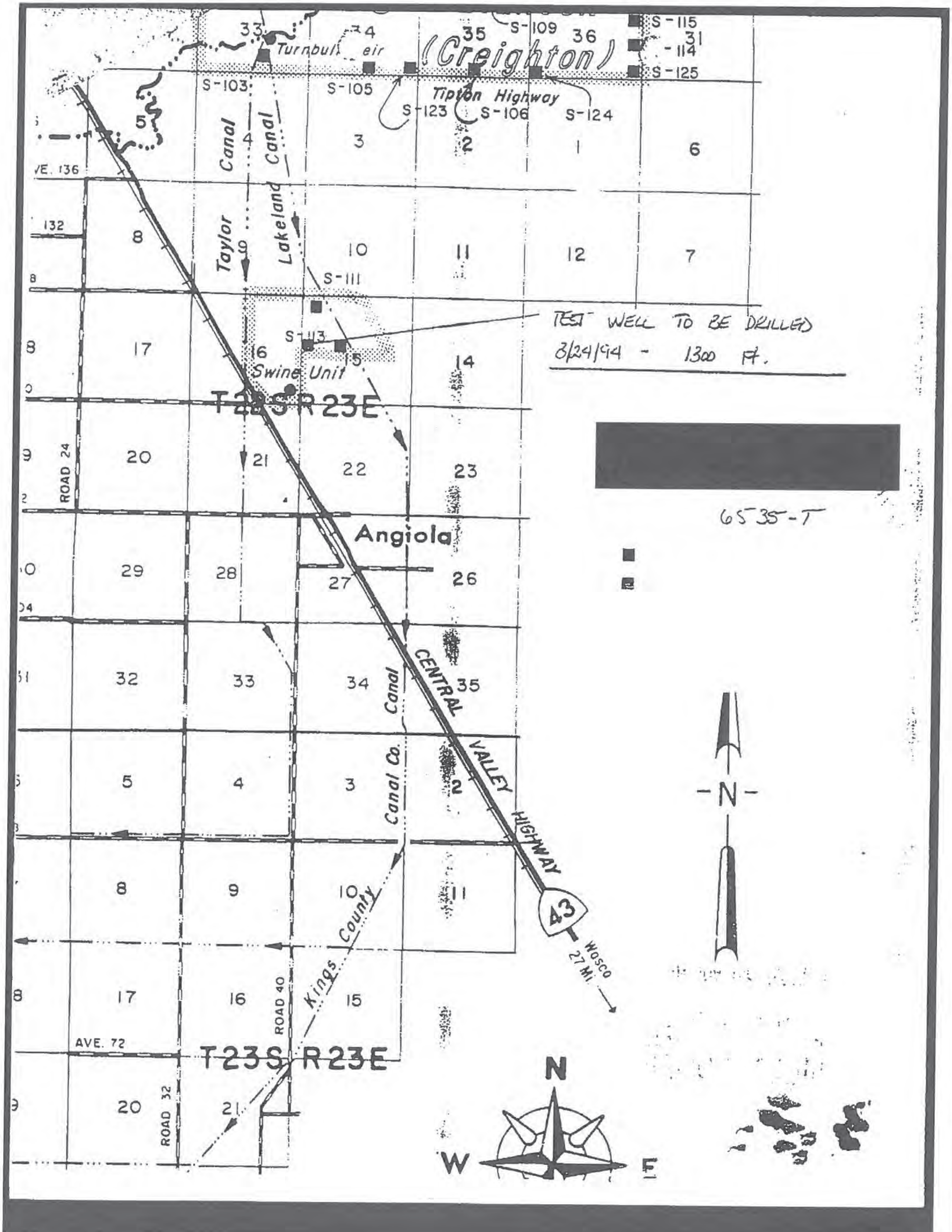
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WASCO DRILLING COMPANY, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

P. O. Box 181 | Wasco | Ca. | 93280
ADDRESS | CITY | STATE | ZIP

Signed [signature] C-57 LICENSED WATER WELL CONTRACTOR
4/18/05 DATE SIGNED
582658 C-57 LICENSE NUMBER

DWR 188 REV. 05-03
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM
OSP 03 78836



S-115
S-114
S-125
S-109
(Creighton)
Turnbull Weir
S-103
S-105
Tipton Highway
S-123
S-106
S-124
Taylor Canal
Lakeland Canal
AVE. 136
132
S-111
S-113
TEST WELL TO BE DRILLED
8/24/94 - 1300 Ft.
Swine Unit
T23S R23E
[redacted]
ROAD 24
6535-T
Angiola
CENTRAL VALLEY HIGHWAY
Canal
Canal Co.
Kings County
43
WOSCO 27 MI.
ROAD 40
AVE. 72
ROAD 32
T23S R23E
N
W
E

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0079777

DWR Use Only – Do Not Fill In		
22S/23E-05		
State Well Number/Site Number		
N		W
Latitude		Longitude
APN/TRS/Other		

Page 1 of 1

Owner's Well Number 1

Date Work Began 10/15/2007   Date Work Ended 2/25/2008

Local Permit Agency Tulare Co. Environmental Health

Permit Number 07-0493   Permit Date 10/4/07

Geologic Log

Orientation O Vertical O Horizontal O Angle Specify ______

Drilling Method ______ Drilling Fluid ______

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
50	220	Fine Sand
220	280	Sand , Light Clay
280	310	Fine Sand
310	380	Fine Sand , Light Clay
380	450	Fine Sand , Light Clay
450	590	Clay
590	830	Fine Sand , Light Clay
830	970	Clay , Light Sand
970	1,050	Clay , Sand
1050	1,060	Fine Sand , Clay
1060	1,240	Sand , Clay ,

Total Depth of Boring 1240 Feet

Total Depth of Completed Well 1240 Feet

Well Owner

[redacted]

Well Location

Address West side Hwy. 43 @ Ave. 136

City Corcoran   County Tulare

Latitude 36 Deg. 2 Min. 24 Sec. N   Longitude 119 Deg. 30 Min. 49 Sec. W

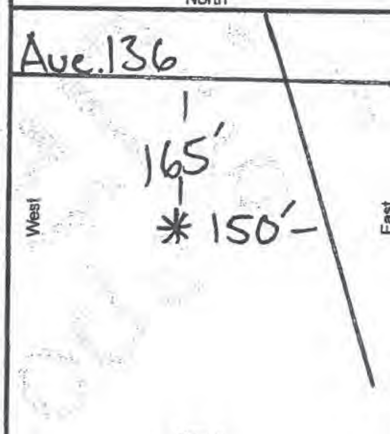
Datum ______ Decimal Lat. ______ Decimal Long. ______

APN Book 291 Page 030 Parcel 043

Township 22S Range 23E Section 5

Location Sketch

(Sketch must be drawn by hand after form is printed.)



Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

- ⦿ New Well
- O Modification/Repair
  - O Deepen
  - O Other ______
- O Destroy
  - Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ⦿ Water Supply
  - ☑ Domestic ☐ Public
  - ☑ Irrigation ☐ Industrial
- O Cathodic Protection
- O Dewatering
- O Heat Exchange
- O Injection
- O Monitoring
- O Remediation
- O Sparging
- O Test Well
- O Vapor Extraction
- O Other ______

Water Level and Yield of Completed Well

Depth to first water 275 (Feet below surface)

Depth to Static Water Level 275 (Feet) Date Measured 02/25/2008

Estimated Yield * 1,650 (GPM) Test Type Constant Rate

Test Length 6.0 (Hours) Total Drawdown 430 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	50	40	Conductor	A 53 Grade B	5/16	32		
0	590	26	Blank	A 53 Grade B	5/16	16		
590	700	26	Screen	A 53 Grade B	5/16	16	Milled Slots	0.060
700	910	26	Blank	A 53 Grade b	5/16	16		
910	1,240	26	Screen	A 53 Grade B	5/16	16	Milled Slots	0.060

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	100	Cement	Sanitary Seal
100	1,240	Filter Pack	6 X 12

Attachments

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other ______

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Bakersfield Well & Pump Co.
Person, Firm or Corporation

7212 Fruitvale Avenue (Address)   Bakersfield (City)   CA (State)   93308 (Zip)

Signed ______ C-57 Licensed Water Well Contractor   9-24-2008 Date Signed   440537 C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL 23/24-27 C
File Original, Duplicate and Triplicate with the REGIONAL WATER POLLUTION CONTROL BOARD No. 5
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

LOCATION NOT CHECKED
Do Not Fill In
No. 63272
State Well No. 27C1
Other Well No. 23S/24E-27

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare Owner's number, if any—
R. F. D. or Street No.
1/2 mile East of Road 88 and
1 mile North of Ave. 56.
125S ∉ 0.45 mi E/O NW Cor.

(3) TYPE OF WORK (check):

New well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) EQUIPMENT:

Rotary [X]
Cable [ ]
Dug Well [ ]

(6) CASING INSTALLED:

SINGLE [X] DOUBLE [ ]

From ft. to ft.	Diam.	Gage or Wall	If gravel packed: Diameter of Bore 26" from ft. to ft.
600 ft.	16"	¼ single	Top to bottom
1002 ft.	14"	¼ single	

Type and size of shoe or well ring
Size of gravel: 3/8"
Describe joint Butt Welded

(7) PERFORATIONS:

Type of perforator used Machine
Size of perforations 1/8 X 1cc in., length, by in.
From ft. to ft. 4 Perf. per row 18 Rows per ft.
804 ft. to 1602 ft.

(8) CONSTRUCTION:

Was a surface sanitary seal provided? [ ] Yes [X] No To what depth ft.
Were any strata sealed against pollution? [ ] Yes [X] No If yes, note depth of strata
From ft. to ft.
Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found Unknown ft.
Standing level before perforating ft.
Standing level after perforating ft.

(10) WELL TESTS:

Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. draw down after hrs.
Temperature of water Was a chemical analysis made? [ ] Yes [X] No
Was electric log made of well? [ ] Yes [X] No

(11) WELL LOG:

Total depth 1602 ft. Depth of completed well 1602 ft.
Formation: *Describe by color, character, size of material, and structure.*

From ft.	To ft.	Formation
0	3	Top Soil
3	279	Sandy Clay
279	330	Clay
330	334	Sand
334	420	Sandy Clay
420	423	Sand
423	466	Sandy Clay
466	490	Clay
490	493	Sand
493	580	Sandy Clay
580	634	Clay
634	645	Shale
645	670	Clay
670	680	Shale
680	726	Clay
726	770	Blue Clay
770	773	Sand
773	778	Shale
778	820	Blue Clay
820	823	Sand
823	879	Blue Clay
879	910	Clay
910	970	Sandy Clay
970	1029	Clay
1029	1040	Shale
1040	1095	Sandy Clay
1095	1100	Sand
1100	1125	Sandy Clay
1125	1221	Hard Shale
1221	1310	Hard Clay
1310	1320	Hard Shale
1320	1324	Sand
1324	1355	Clay
1355	1450	Hard Shale
1450	1454	Sand
1454	1503	Shale
1503	1595	Shale & Clay
1595	1602	Hard Shale

DTW = 170' 11-18-70 JD

Work started 1/28/61 19 . Completed 2/18/61 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)
Address 1744 High Street
Delano, California
[SIGNED] [signature] Well Driller
License No. 148282 Dated 3/27/1961

87028 8-57 80M QUIN SPO
DWR 188 (REV. 3-54)

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0094489

Page 1 of 3

Owner's Well Number ______

Date Work Began 03/18/2009 Date Work Ended 4/20/2009

Local Permit Agency Tulare County Environmental Health Services

Permit Number 09-0120 Permit Date 3/9/09

DWR Use Only – Do Not Fill In

24S/26E-30

State Well Number/Site Number

Latitude N / Longitude W

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify ______

Drilling Method Reverse Rotary Drilling Fluid Water

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
50	80	Sand Gravel
80	120	Sand Gravel Clay
120	160	Sand
160	280	Sand Clay
280	360	Sand Gravel
360	470	Sand Gravel Clay
470	500	Clay
500	550	Sand Clay
550	640	Sand Gravel Clay
640	770	Sand Clay
770	820	Sand Gravel Clay
820	1,190	Clay Sand
1190	1,290	Clay
1290	1,330	Sand Clay
1330	1,410	Clay

Total Depth of Boring 1410 Feet

Total Depth of Completed Well 1150 Feet

Well Owner

[redacted]

Well Location

Address N / W corner of Ave 12, Rd. 168

City Delano County Tulare

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

Datum ______ Decimal Lat. ______ Decimal Long. ______

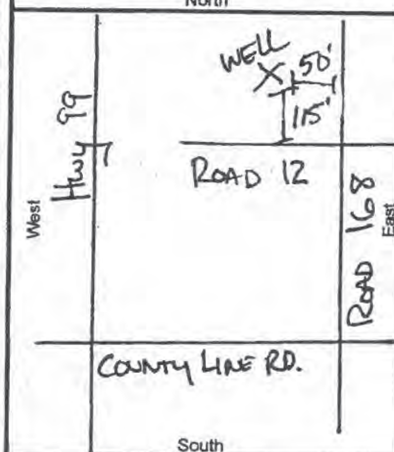
APN Book 338 Page 080 Parcel 018

Township 24 S Range 26 E Section 30

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North



West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other ______
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other ______

Water Level and Yield of Completed Well

Depth to first water 223 (Feet below surface)

Depth to Static Water Level 223 (Feet) Date Measured 04/18/2009

Estimated Yield * 1,500 (GPM) Test Type Constant Rate

Test Length 12.0 (Hours) Total Drawdown 166 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size If Any (Inches)
0	50	42	Conductor	A53Grade B	.312	30		
0	530	26	Blank	A53Grade B	.312	16		
530	600	26	Ful Flo	Ful Flo A139	.312	16	Louver	0.090
600	620	26	StandardFlo	SF A139	.312	16	Louver	
620	640	26	Ful Flo	Ful Flo A139	.312	16	Louver	0.090
640	680	26	Standard Flo	SF A139	.312	16	Louver	

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	50	Cement	Annular Seal
0	1,170	Filter Pack	4x16 SRI
1,170	1,410	Fill	Backfill

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other ______

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Bakersfield Well & Pump Co.
Person, Firm or Corporation

7212 Fruitvale Ave. Bakersfield CA 93308
Address City State Zip

Signed [signature] 7/9/2009 440537
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Notice of Intent No. 159690
Local Permit No. or Date 5/20/82

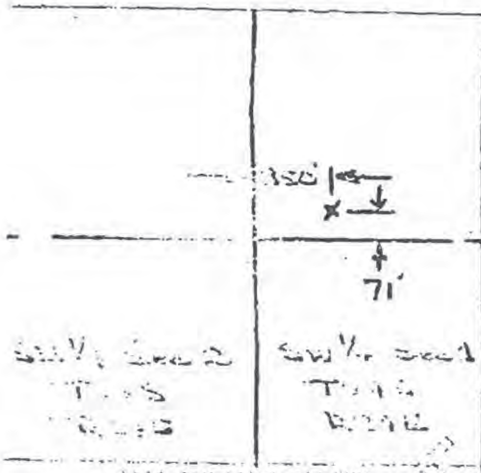
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

1/3
Do not fill in
No. 49066
State Well No. 24/24-1G
Other Well No.

(1) [redacted]

(2) LOCATION OF WELL (See instructions):
County Tulare Owner's Well Number 010-13A
Well address if different from above SW corner of the NW 1/4
Township 24S Range 24E Section 1G
Distance from cities, roads, railroads, fences, etc. 3 3/4 miles west of Earlimart, CA and 1½ miles south of the Alpaugh-Ducor Road; Avenue 56.



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well X Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation X
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary X Reverse X
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes XX No ☐ Size Birdseye
Diameter of bore 28"
Packed from 1400 to 450 ft.

(7) CASING INSTALLED:
Steel X Plastic ☐ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall
0	640	16	5/16
760	780	12	5/16
		12	5/16

(8) PERFORATIONS: RM - FF
Type of perforation or size of screen

From ft.	To ft.	Slot size
640	760	3/32
Reduction & comp. sect.		
780	1382	3/32

(9) WELL SEAL:
Was surface sanitary seal provided? Yes X No ☐ If yes, to depth 50 ft.
Were strata sealed against pollution? Yes X No ☐ Interval 40 ft.
Method of sealing Bentonite Pellets

(10) WATER LEVELS:
Depth of first water, if known Unknown ft.
Standing level after well completion 207 ft.

(11) WELL TESTS:
Was well test made? Yes X No ☐ If yes, by whom? Driller
Type of test Pump X Bailer ☐ Air lift ☐
Depth to water at start of test 207 ft. At end of test 241 ft.
Discharge 2500 gal/min after 12 hours Water temperature N/A
Chemical analysis made? Yes ☐ No X If yes, by whom?
Was electric log made? Yes X No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 1405 ft. Depth of completed well 1382 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	50	Conductor
50	70	70% sand, 30% clay
70	80	50% sand, 50% clay
80	90	Sand
90	130	Brown Clay
130	170	80% sand, 20% sandy brown clay
170	190	Hard brown clay
190	210	90% brown clay 20% sand
210	220	50% clay, 50% sand
220	230	Soft brown clay
230	240	Sandy gray clay
240	250	90% sand, 10% clay
250	260	50% sandy gray clay, 50% sand
260	270	70% sandy gray clay, 30% sand
270	280	50% sandy gray clay, 50% sand
280	350	Gray clay
350	360	Gray sandy clay
360	390	70% sandy blue clay, 30% sand
390	400	60% sandy gray clay, 40% fine sand
400	410	Sandy gray clay
410	420	80% sandy gray clay, 20% sand
420	440	100% gray clay
440	480	100% soft blue clay
480	490	50% gray clay, 50% sand
490	500	70% gray clay, 30% sand
500	510	100% soft blue clay
510	520	Hard blue clay
520	530	50% sand, 50% blue clay
530	540	100% fine sand
540	550	100% clay
550	560	70% sand, 30% clay
560	570	50% sand, 50% blue & gray clay
570	600	100% sand
600	610	100% brown clay
610	620	100% sand
620	630	95% brown & blue clay, 5% sand
630	650	100% brown & blue clay
650	660	70% soft brown clay, 30% sand

Work started 5-24-1982 Completed 6-10-1982

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED [signature] (Well Driller)

NAME Layne-Western Company, Inc.
(Person, firm, or corporation) (Typed or printed)
Address P.O. Box 3216
City Bakersfield, CA Zip 93385
License No. 407409 Date of this report July 6, 1982

DUPLICATE

WR 128 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

TRIPLICATE
Owner's Copy

Page ___ of ___

Owner's Well No. 18E

Date Work Began 7-15-91, Ended 7-17-91

Local Permit Agency Tulare

Permit No. 2 369745 Permit Date 7-12-91

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 489856

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION (Describe material, grain size, color, etc.)	DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION
0 - 4	Top Soil	294-298	sand
4 - 9	clay	298-301	clay
9 - 15	sand	310-310	sand
15 - 21	clay	310-316	clay
21 - 37	sand	316-336	sand
37 - 39	clay	336-347	clay
39 - 42	sand	347-355	sand
42 - 63	clay	355-400	clay
63 - 74	sand	400-408	sand
74 - 85	clay	408-411	clay
85 - 91	sand	411-426	sand
91 - 97	clay	426-431	clay
97 - 101	sand	431-435	sand
101 - 105	clay	435-440	clay
105 - 125	sand	440-452	sand
125 - 131	clay	452-669	clay
131 - 142	sand	669-716	sand
142 - 176	clay	716-722	clay
176 - 196	sand	722-731	sand
196 - 222	clays	731-747	clay
222 - 228	sand	747-765	sand
228 - 244	clay	765-771	clay
244 - 250	sand	771-775	sands
250 - 256	clay	775-800	clay
256 - 262	sand	800-807	sand
262 - 270	clay	807-820	clay
270 - 274	sand	820-825	sand
274 - 277	clay	825-830	clay
277 - 281	sand	830-852	sand
281 - 294	clay	852-863	clay
294 - 298		863-868	

TOTAL DEPTH OF BORING 960 (Feet)

TOTAL DEPTH OF COMPLETED WELL 930 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address Ave 112-½ mi W of Rd 56-200 ft S.

City Corcoran

County Tulare

APN Book Echoe Page 78 Parcel 293-240-03

Township 22S Range 23 E Section 26

Latitude ___ NORTH Longitude ___ WEST

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
- ___ Deepen
- ___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY
- ___ Domestic
- ___ Public
- X Irrigation
- ___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD Reverse FLUID Natural

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD* ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 - 50	38			X		steel	30	1/4	
0 - 560	30	X				steel	16	5/16	
560 - 580	30					Compression section 16/16 5/16			
580 - 930	30		X			louver	16	5/16	.070

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 - 50	X			Conductor
0 - 540				5/16x4
540 - 550		X		Tablets
550 - 930				5/16x4

ATTACHMENTS (✓)

- ___ Geologic Log
- ___ Well Construction Diagram
- ___ Geophysical Log(s)
- ___ Soil/Water Chemical Analyses
- ___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED) Grabow Well Drilling, Inc.

ADDRESS 12522 9th Ave. Hanford, CA 93230 CITY STATE ZIP

Signed ___ WELL DRILLER/AUTHORIZED REPRESENTATIVE 8-1-91 DATE SIGNED 288489 C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

AWD01763

TRIPLICATE
Owner's Copy

Page ____ of ____

Owner's Well No. ~~18E Continued~~

Date Work Began __________, Ended __________

Local Permit Agency __________

Permit No. __________ Permit Date __________

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 489857

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ______ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
863 868	sand
868 874	clay
874 879	sand
879 890	clay
890 902	sand
902 912	clay
912 920	sand
920 930	clayy
930 938	sand
938 960	clay

TOTAL DEPTH OF BORING ______ (Feet)

TOTAL DEPTH OF COMPLETED WELL ______ (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address __________

City __________

County __________

APN Book ______ Page ______ Parcel ______

or Township ______ Range ______ Section ______

or Latitude ___ NORTH (DEG. MIN. SEC.) Longitude ___ WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

___ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY
___ Domestic
___ Public
___ Irrigation
___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD __________ FLUID __________

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ______ (Ft.) & DATE MEASURED ______

ESTIMATED YIELD* ______ (GPM) & TEST TYPE ______

TEST LENGTH ______ (Hrs.) TOTAL DRAWDOWN ______ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ______

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME __________
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS ______ CITY ______ STATE ______ ZIP ______

Signed [signature]
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

22/23-23J1

CAL T7-54

U. S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

CALIFORNIA

WELL SCHEDULE

COUNTY: Tulare

AREA: Ducor [illegible]

Date 12-11, 1957 Well No. 22/23-23J1

Re[illegible] by R. L. Blessing Other No. Southlake #14E

Source of data [illegible] Other No.

1. Location: Map [illegible] Photo 5-452a
2. Owner [redacted]
   Driller .... Address ....
3. Topography Plain
4. Altitude: Lsd 211 ft; how obtained Topo; MP .... ft.
5. Type: Dug, cable, rotary, auger, jet March 1955; Finish G. P.
6. Depth: Rept. 1788 ft; Meas. .... ft; Obstruction .... ft.
7. Casing: Diam. 16 in. to 597 ft; 12 in. to 1788 ft. Type ....
   Perforations 597 to 1788
8. Aquifers 96.66 Oct 9, 1958
9. Water / Oil level 120.95 ft Stdg; rept / Pmpg; meas 12-11 1957 above / below T.C. which is 1.0 ft above / below Lsd
   Access on North side
10. Pump: Type Peerless turb; Dschg diam 10 in; length 25 ft MOTOR # 1012417
    Power U. S. Elec; HP 100; Meter No. 370917
11. Yield: Flow .... gpm, pump .... gpm, meas, rept, est. ....
    Drawdown .... ft after .... min / hrs pmpg. Specific cap. ....
12. Use: Dom, Stock, PS, RR, Ind, Irr, Obs, Destroyed, Unused, Test, ...
13. Quality .... Temp .... °F [illegible] 19........
    Taste, odor, color .... Sampled .... 19........
14. Other data: log, analyses, water levels, electric log ....
15. Remarks: [illegible]

Well No. 22/23-23J1

14E

PLOTTED FEB 1970

Well No. 22/23-23J1

Location: [illegible]

0.465 mile north and 90 ft west of SE corner sec. 23

Remarks: [illegible] # 4304

10-70 fld. ch'd. DTW-138' PERMISSION TO MEASURE PER FOR: WORKING LAND, WHO VERIFIED DEPTH, PERFS & APPROX. DATE DRILLED T.

AWD01664

24/24-4

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No. 5
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA

3427

LOCATION NOT CHECKED

Do Not Fill In
No. 63276 4E2

State Well No. USBE2
Other Well No. 24S/24E-4

(1) OWNER:
[redacted]

(2) LOCATION OF WELL:
County Tulare Owner's number, if any—
R. F. D. or Street No.
1/2 mile North of the town of Allensworth and 300 ft. West of Santa Fe Railway tracks.

(3) TYPE OF WORK (check):
New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ ☒Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:
SINGLE ☒ DOUBLE ☐
From ft. to ft. 14" Diam. 1/4" Gage or Wall
Top to 1,200 ft.

If gravel packed
Diameter of Bore 26" from ft. to ft.
Top to bottom

Type and size of shoe or well ring
Size of gravel: 3/8"
Describe joint: Butt welded

(7) PERFORATIONS:
Type of perforator used: Machine
Size of perforations: 1/8 x 1 cc in., length, by in.
From ft. to ft. 4 Perf. per row 18 Rows per ft.
798 ft. to 1,200 ft.

(8) CONSTRUCTION:
Was a surface sanitary seal provided? ☐ Yes ☒ No To what depth ft.
Were any strata sealed against pollution? ☐ Yes ☒ No If yes, note depth of strata
From ft. to ft.
Method of Sealing

(9) WATER LEVELS:
Depth at which water was first found: Unknown ft.
Standing level before perforating ft.
Standing level after perforating ft.

(10) WELL TESTS:
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. draw down after hrs.
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No
Was electric log made of well? ☐ Yes ☒ No

(11) WELL LOG:
Total depth 1,200 ft. Depth of completed well 1,200 ft.
Formation: Describe by color, character, size of material, and structure.

From	To	Formation
0	35	Sandy Clay Top Soil
35	218	Clay
218	300	Sandy Clay
300	369	Clay
369	482	Shale
482	487	Sand
487	610	Clay
610	616	Hard Clay
616	630	Sandy Clay
630	638	Hard Clay
638	787	Clay
787	813	Shale
813	935	Clay
935	995	Sandy Clay
995	1015	Clay
1015	1025	Sand
1025	1089	Clay
1089	1104	Hard Shale
1104	1178	Clay
1178	1200	Shale

DTW = 166 - 11-5-70 JD

Work started 6/27/61 19 , Completed 7/15/61 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)
Address 1744 High Street
Delano, California
[SIGNED] [signature]
Well Driller
License No. 148282 Dated January 31, 19 62

87022 6-57 20M QUIN SPO

DWR 188 (REV. 3-54)

24/23-31N1

ORIGINAL
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No.________
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA

Do Not Fill In
Nº 118716
State Well No.
Other Well No. 24S/23E-31N1

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare   Owner's number, if any— #20

R. F. D. or Street No.
SW Corner S 31, T24 S, R23 E

65'N & 85' E/o SW Cor.

(3) TYPE OF WORK (check):

New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:

SINGLE ☒ DOUBLE ☐

From	ft. to	ft.	Gage or Wall	If gravel packed: Diameter of Bore	from ft.	to ft.
0	400	16"OD	1/4	25 1/2	top to bottom	
400	1190	14"OD				

Type and size of shoe or well ring   Size of gravel: 1/4

Describe joint Collared with fillet weld

(7) PERFORATIONS:

Type of perforator used Machine

Size of perforations .100"X2 in., length, by 6cc in.

From ft.	to ft.	Perf. per row	Rows per ft.
490	1190	2	14

(8) CONSTRUCTION:

Was a surface sanitary seal provided? ☐ Yes ☒ No To what depth ft.

Were any strata sealed against pollution? ☐ Yes ☒ No If yes, note depth of strata

From ft. to ft.

Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found Unknown ft.

Standing level before perforating ft.

Standing level after perforating ft.

(10) WELL TESTS:

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. draw down after hrs.

Temperature of water   Was a chemical analysis made? ☐ Yes ☒ No

Was electric log made of well? ☒ Yes ☐ No

(11) WELL LOG:

Total depth ft. Depth of completed well ft.

Formation: *Describe by color, character, size of material, and structure.*

From ft.	to ft.	Formation
0	4	top soil
4	92	sandy clay
92	304	sandy clay
304	680	sandy clay
680	684	sand
684	723	sandy clay
723	843	Sandy clay
843	873	clay
873	934	sandy clay
934	1055	hard shale
1055	1186	hard clay
1186	1190	hard shale

PRM 10/70 292' TS + JD

C.Clay = 381'

CONFIDENTIAL
Water Code Sec. 7080

Work started Sept. 7 1966. Completed Sept. 19 1966

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)

Address 1741 Inyo Street
Delano, California

[SIGNED] [signature]
Well Driller

License No. 148282   Dated November 18, 1966

67849 8-63 35M QUIN ① △ SPO   DWR 188 (REV. 3-64)

ORIGINAL 24/23-22R2

File Original, Duplicate and Triplicate with the REGIONAL WATER POLLUTION CONTROL BOARD No.........
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA

Do Not Fill In

Nº 116291

State Well No. 22R2

Other Well No. 24S/23E-22

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare   Owner's number, if any--

R. F. D. or Street No.

Southeast corner sec 22 township 24S Range 23E

220'N & 75'N/O SE Cor.

(3) TYPE OF WORK (check):

New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:

SINGLE ☒ DOUBLE ☐

From ft.	to ft.	Diam.	Gage or Wall
0	500	16	1/4
500	1200	14	1/4

16" OD to 14" OD Transition Joint Slip jt.

Type and size of shoe or well ring

If gravel packed: Diameter of Bore 25½ from ... ft. to ... ft.; top to bottom

Size of gravel:

Describe joint collared W/ fillet weld

(7) PERFORATIONS:

Type of perforator used machine

Size of perforations .100 x 2 in., length, by 6cc in.

From 500 to 1200 ft. 2 Perf. per row 1½ Rows per ft.

...CTION:

...vided? ☐ Yes ☒ No To what depth ft.

...s? ☐ Yes ☒ No If yes, note depth of strata

ft.

ft.

ft.

...bom?

ft. draw down after hrs.

...a chemical analysis made? ☐ Yes ☒ No

...No

(11) WELL LOG:

Total depth 1205 ft. Depth of completed well 1205 ft.

Formation: Describe by color, character, size of material, and structure.

From ft.	to ft.	Formation
0	4	top soil
4	35	sandy clay
35	78	sandy clay
78	121	sandy clay
121	329	sandy clay
329	540	sandy clay
540	664	blue clay
664	874	clay hard
874	900	sandy clay
900	904	sand
904	934	clay
934	1058	shale & clay
1058	1146	hard shale
1146	1205	blue sand

DTW = 244' 10/30/70 75+JD

CONFIDENTIAL Water Code Sec. 13752

Work started 10/31/66 19 , Completed 11/14/66 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc. (Person, firm, or corporation) (Typed or printed)

Address 1744 Inyo Street

Delano, California

[SIGNED] (signature) Well Driller

License No. 148282 Dated 4/22/67, 19

RECEIVED APR ... SAN ...

DWR 188 (REV. 3-64)

24/23-22R2

ORIGINAL
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
CONTROL BOARD No.____
(Insert appropriate number)

WATER WELL DRILLERS REPORT

(Sections 7076, 7077, 7078, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA

Do Not Fill In
No. 116291
State Well No. 22R2
Other Well No. 24S/23E-22

(1) OWNER:

[redacted]

(2) LOCATION OF WELL:

County Tulare Owner's number, if any—

R. F. D. or Street No.

Southeast corner sec 22 ~~SR 29~~
township 24S Range 23E

220'N & 75'N/O SE Cor.

(3) TYPE OF WORK (check):

New well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) EQUIPMENT:

Rotary [X]
Cable [ ]
Dug Well [ ]

(6) CASING INSTALLED:

SINGLE [X] DOUBLE [ ]

From ft.	to ft.	Diam.	Gage or Wall
0	500	16	1/4
500	1200	14	1/4

16" OD to 14" OD
Transition Joint Slip jt.

Type and size of shoe or well ring:

If gravel packed

Diameter of Bore 25½ from ft. to ft.
top to bottom

Size of gravel:

Describe joint collared W/ fillet weld

(7) PERFORATIONS:

Type of perforator used machine

Size of perforations .100 x 2 in., length, by 6cc in.

From 500 to 1200 ft. 2 Perf. per row 1½ Rows per ft.

(8) CONSTRUCTION:

Was a surface sanitary seal provided? [ ] Yes [X] No To what depth ft.

Were any strata sealed against pollution? [ ] Yes [X] No If yes, note depth of strata

From ft. to ft.

Method of Sealing

(9) WATER LEVELS:

Depth at which water was first found unknown ft.

Standing level before perforating ft.

Standing level after perforating ft.

(10) WELL TESTS:

Was a pump test made? [ ] Yes [X] No If yes, by whom?

Yield: gal./min. with ft. draw down after hrs.

Temperature of water Was a chemical analysis made? [ ] Yes [X] No

Was electric log made of well? [X] Yes [ ] No

(11) WELL LOG:

Total depth 1205 ft. Depth of completed well 1205 ft.

Formation: *Describe by color, character, size of material, and structure.*

From ft.	to ft.	Formation
0	4	top soil
4	35	sandy clay
35	78	sandy clay
78	121	sandy clay
121	329	sandy clay
329	540	sandy clay
540	664	blue clay
664	874	clay hard
874	900	sandy clay
900	904	sand
904	934	clay
934	1058	shale & clay
1058	1146	hard shale
1146	1205	blue sand

DTW = 244' 10/30/70 75+30

CONFIDENTIAL
Water Code Sec. 13752

Work started 10/31/66 Completed 11/14/66

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Whitten Pumps, Inc.
(Person, firm, or corporation) (Typed or printed)

Address 1744 Inyo Street
Delano, California

[SIGNED] [signature]
Well Driller

License No. 148282 Dated 4/22/67

ORIGINAL
File with DWR
Page 1 of 2

Owner's Well No. 8104

Date Work Began 1/28/2008, Ended 2/1/2008

Local Permit Agency TULARE COUNTY HEALTH DEPT

Permit No. 07-0141 Permit Date 4/9/2007

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. E072308

DWR USE ONLY — DO NOT FILL IN
22S/23E-22

STATE WELL NO./STATION NO.

LATITUDE | LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD REVERSE FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain, size, color, etc.
0	5	CLAY TOP SOIL
5	8	COARSE SAND
8	12	SILTY BROWN CLAY
12	16	COARSE SAND
16	95	SILTY BROWN CLAY
95	175	SILTY TAN CLAY WITH SAND
175	285	SILTY BLUE GRAY CLAY WITH SAND
285	350	SAND WITH SILTY BLUE GRAY CLAY STREAKS
350	365	SILTY BLUE GRAY CLAY
365	420	SAND WITH SILTY BLUE GRAY CLAY STREAKS
420	435	SILTY BLUE GRAY CLAY
435	458	SAND
458	500	SILTY BLUE GRAY CLAY
500	630	SOFT BLUE GRAY CLAY
630	685	SAND WITH SILTY BLUE GRAY CLAY STREAKS
685	740	SAND
740	745	BLUE GRAY CLAY
745	810	SAND
810	865	SAND WITH BRITTLE BLUE GRAY CLAY STREAKS
865	940	BLUE GRAY CLAY WITH SAND STREAKS
940	995	SAND WITH BRITTLE BLUE GRAY CLAY STREAKS
995	1035	SAND
1035	1055	BLUE GRAY CLAY
1055	1140	BLUE GRAY CLAY WITH SAND STREAKS
1140	1196	SAND
1196	1205	BLUE GRAY CLAY

TOTAL DEPTH OF BORING 1090 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1050 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address .15 MI NOF AVE 112 & 250' WOF HWY 43

City CA

County TULARE

APN Book 291 Page 070 Parcel 010

Township 22 S Range 23 E Section 22

Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial

MONITORING —
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 320 (Ft.) & DATE MEASURED 4/19/2008

ESTIMATED YIELD * 1000 (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN 30 (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	360	28					ACCESS TB	2	SCH 40	
0	400	28	✓				ASTM-135	16	.312	
400	510	28	✓				ASTM-135	16	.375	
510	520	28					COMP SEC	16		
520	670	28	✓				ASTM-135	16	.312	
670	850	28		✓			DBL MILLSL	16	.312	.060

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	480	✓			SAND SLURRY
480	1090			✓	SRI#8 SAND

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

20 WEST KENTUCKY AVE — WOODLAND — CA — 95695
ADDRESS — CITY — STATE — ZIP

Signed [signature] — 04/29/08 — C57 A HIC - 13378
WELL DRILLER/AUTHORIZED REPRESENTATIVE — DATE SIGNED — C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR
Page 2 of 2

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. **E072308**

DWR USE ONLY — DO NOT FILL IN 2/
22S/23E-22-13
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. 8104
Date Work Began 1/28/2008, Ended 2/1/2008
Local Permit Agency TULARE COUNTY HEALTH DEPT
Permit No. 07-0141 Permit Date 4/9/2007

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain, size, color, etc.
0	5	CLAY TOP SOIL
5	8	COARSE SAND
8	12	SILTY BROWN CLAY
12	16	COARSE SAND
16	95	SILTY BROWN CLAY
95	175	SILTY TAN CLAY WITH SAND
175	285	SILTY BLUE GRAY CLAY WITH SAND
285	350	SAND WITH SILTY BLUE GRAY CLAY STREAKS
350	365	SILTY BLUE GRAY CLAY
365	420	SAND WITH SILTY BLUE GRAY CLAY STREAKS
420	435	SILTY BLUE GRAY CLAY
435	458	SAND
458	500	SILTY BLUE GRAY CLAY
500	630	SOFT BLUE GRAY CLAY
630	685	SAND WITH SILTY BLUE GRAY CLAY STREAKS
685	740	SAND
740	745	BLUE GRAY CLAY
745	810	SAND
810	865	SAND WITH BRITTLE BLUE GRAY CLAY STREAKS
865	940	BLUE GRAY CLAY WITH SAND STREAKS
940	995	SAND WITH BRITTLE BLUE GRAY CLAY STREAKS
995	1035	SAND
1035	1055	BLUE GRAY CLAY
1055	1140	BLUE GRAY CLAY WITH SAND STREAKS
1140	1196	SAND
1196	1205	BLUE GRAY CLAY

TOTAL DEPTH OF BORING 1090 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1050 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address .15 MI NOF AVE 112 & 250' WOF HWY 43
City CA
County TULARE
APN Book 291 Page 070 Parcel 010
Township 22 S Range 23 E Section 22
Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
✓ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 320 (Ft.) & DATE MEASURED 4/19/2008
ESTIMATED YIELD * 1000 (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN 30 (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
850	940	28	✓				ASTM-135	16	.312	
940	960	28		✓			DBL MILLSL	16	.312	.060
960	990	28	✓				ASTM-135	16	.312	
990	1030	28		✓			DBL MILLSL	16	.312	.060
1030	1050	28	✓				ASTM-135	16	.312	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	480	✓			SAND SLURRY
480	1090			✓	SRI#8 SAND

ATTACHMENTS (✓)

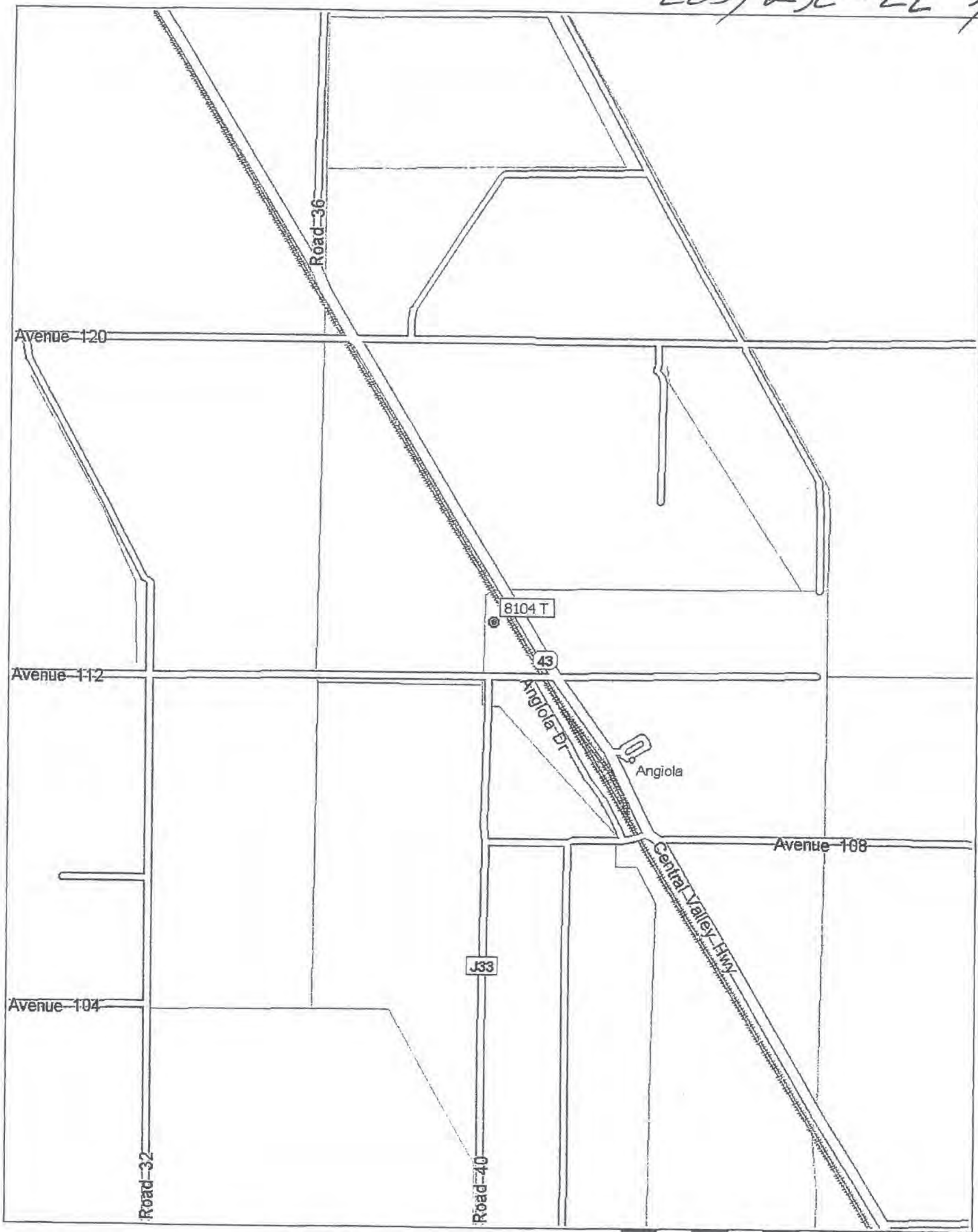
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME EATON DRILLING CO.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
20 WEST KENTUCKY AVE — ADDRESS; WOODLAND — CITY; CA — STATE; 95695 — ZIP
Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE
04/29/08 DATE SIGNED
C57 A HIC - 13378 C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

22S/23E-22 3/3



Road-36
Avenue-120
8104 T
43
Avenue-112
Angiola-Dr
Angiola
Avenue-108
Central-Valley-Hwy
J33
Avenue-104
Road-32
Road-40
0 mi
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0.4
0.6
0.8
1

W16

File Original with DWR

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Page 1 of 1

Owner's Well No. Well #16 or Layne Well #2 No. e077033

Date Work Began 5/8/08 Ended

Local Permit Agency Tulare County Env Health Services Div

Permit No. 08-0222 Permit Date 5/8/08

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (X) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Reverse Rotary FLUID

DEPTH FROM SURFACE Ft. to Ft.		DESCRIPTION Describe material, grain size, color, etc.
60	260	sand, clay
260	300	clay, sand
300	310	clay,sand, little, grvel
310	320	clay, sand
320	1330	sand, clay

TOTAL DEPTH OF BORING 1332 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1312 (Feet)

WELL OWNER

[redacted]

CITY STATE ZIP

WELL LOCATION

Address Ave 112 & Rd 40

City Corcoran CA 93212 (STATE ZIP)

County Tulare County

APN Book 311 Page 020 Parcel 010

Township 23S Range 23E Section 4

Latitude 35 57 26.38 NORTH (DEG. MIN. SEC.) Longitude 119 29 1.7 WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance Of Well from Roads Buildings, Fences, Rivers etc and attach map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (X)

X NEW WELL

MODIFICATION/REPAIR
- ___ Deepen
- ___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (X)

WATER SUPPLY
- X Domestic ___ Public
- X Irrigation ___ Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER Unknown (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 321.93 (Ft.) & DATE MEASURED Late July through 8/1/08

ESTIMATED YIELD 1685 (GPM) & TEST TYPE pump

TEST LENGTH 57 (Hrs.) TOTAL DRAWDOWN 163.56 (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	OUTSIDE DIAMETER (inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (inches)
0	40	36			X		Steel	30	.375	
0	870	26	X				Steel	16	.375	
870	910	26		X			Steel	16	.312	Full Flow .060
910	930	26	X				Steel	16	.375	
930	990	26		X			Steel	16	.312	VMS .060
990	1044	26	X				Steel	16	.375	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (X)	BEN-TONITE (X)	FILL (X)	FILTER PACK (TYPE/SIZE)
0	500	X			
500	510				Hole Plug
510	1312			X	Gravel Pack 1/4 X 10

ATTACHMENTS (X)

- X Geologic Log
- X Well Construction Diagram
- ___ Geophysical Log(s)
- ___ Soil/Water Chemical Analyses
- ___ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Layne Christensen Company (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 11001 Etiwanda Ave CITY Fontana STATE CA ZIP 92337

Signed [signature] DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 8/28/08 C-57 LICENSE NUMBER 510011

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

AWD02954

TRIPLICATE
Owner's Copy

Page 1 of 3

Owner's Well No. G-17 (old) = 6-28 (new)

Date Work Began 9/13/2007, Ended 10/9/2007

Local Permit Agency TULARE COUNTY

Permit No. 07-0438 Permit Date 9/11/2007

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. E054498

DWR USE ONLY – DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD REVERSE FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain, size, color, etc.)
0	10	SANDY BROWN CLAY
10	12	COARSE SAND
12	15	SANDY BROWN CLAY
15	34	SANDY BROWN CLAY & GRAVEL
34	41	COARSE SAND
41	50	BROWN CLAY
50	73	SAND
73	76	GRAVEL
76	85	CLAY
85	92	HARD CLAY
92	104	SOFT CLAY
104	116	SANDY HARD CLAY
116	124	SAND
124	136	HARD CLAY
136	141	SANDY CLAY
141	149	CLAY
149	158	SANDY CLAY
158	183	CLAY
183	194	SAND & GRAVEL
194	199	COARSE SAND
199	209	CLAY
209	235	SAND
241	268	SANDY CLAY
268	310	CLAY
310	332	SANDY CLAY
332	356	SAND & GRAVEL
356	365	SAND
365	371	CLAY
371	377	GRAVEL & COARSE SAND
377	384	CLAY

TOTAL DEPTH OF BORING 1120 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1120 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address RD 40 & AVE 112

City ANGIOLA CA

County TULARE

APN Book 291 Page 110 Parcel 003

Township 22 S Range 23 E Section 34

Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
✓ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	36"	5/16"	
0	760	30"	✓				STEEL	18"	3/8"	
760	762	30"	✓				STEEL	18" - 16	3/8"	
762	1122	28"		✓			STEEL	16"	3/8"	.050 SLO

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			SIX SACK
0	700			✓	1/4 X #8
700	1120			✓	6 x 16 / 1/4 # 1

ATTACHMENTS (✓)

___ Geologic Log
✓ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP

Signed [signature] 10/12/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

TRIPLICATE
Owner's Copy
Page 2 of 3

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. E054498

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. G-17
Date Work Began 9/13/2007, Ended 10/9/2007
Local Permit Agency TULARE COUNTY
Permit No. 07-0438 Permit Date 9/11/2007

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain, size, color, etc.
384	399	COARSE SAND & GRAVEL
399	411	SANDY CLAY
411	416	SAND
416	436	CLAY
436	455	COARSE SAND
455	482	SANDY CLAY
482	547	CLAY
547	553	SAND
553	594	CLAY
594	607	SANDY CLAY
607	663	CLAY
663	672	SANDY CLAY
672	718	CLAY
718	740	SANDY CLAY
740	786	SAND
786	810	SANDY CLAY
810	826	CLAY
826	847	SAND
847	861	COARSE SAND
861	884	SANDY CLAY
884	903	CLAY
903	941	SAND
941	960	CLAY
960	987	COARSE SAND
987	1004	SANDY CLAY
1004	1011	SAND
1011	1025	COARSE SAND
1025	1041	CLAY
1041	1058	SAND
1058	1064	CLAY

TOTAL DEPTH OF BORING 1120 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1120 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address RD 40 & AVE 112
City ANGIOLA CA
County TULARE
APN Book 291 Page 110 Parcel 003
Township 22 S Range 23 E Section 34
Latitude ___ DEG. MIN. SEC. ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH
WEST
EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial
MONITORING —
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	36"	5/16"	
0	760	30"	✓				STEEL	18"	3/8"	
760	762	30"	✓				STEEL	18" - 16	3/8"	
762	1122	28"		✓			STEEL	16"	3/8"	.050 SLO

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			SIX SACK
0	700			✓	1/4 X #8
700	1120			✓	6 x 16 / 1/4 # 1

ATTACHMENTS (✓)

— Geologic Log
✓ Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP
Signed ___ 10/12/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

TRIPLICATE
Owner's Copy
Page 3 of 3
Owner's Well No. G-17
Date Work Began 9/13/2007, Ended 10/9/2007
Local Permit Agency TULARE COUNTY
Permit No. 07-0438 Permit Date 9/11/2007

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. E054498

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD REVERSE FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain, size, color, etc.
1064	1081	COARSE SAND
1081	1100	SANDY CLAY
1100	1118	SAND
1118	1120	CLAY

TOTAL DEPTH OF BORING 1120 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1120 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address RD 40 & AVE 112
City ANGIOLA CA
County TULARE
APN Book 291 Page 110 Parcel 003
Township 22 S Range 23 E Section 34
Latitude ___ DEG. MIN. SEC. ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH
WEST EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
✓ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	36"	5/16"	
0	760	30"	✓				STEEL	18"	3/8"	
760	762	30"	✓				STEEL	18" - 16	3/8"	
762	1122	28"		✓			STEEL	16"	3/8"	.050 SLO

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			SIX SACK
0	700			✓	1/4 X #8
700	1120			✓	6 x 16 / 1/4 # 1

ATTACHMENTS (✓)

___ Geologic Log
✓ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP
Signed ___ 10/12/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

File Original with DWR

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

Page 1 of 2

Owner's Well No. 3 / E-22 No. e0078570

Date Work Began 5/19/08 Ended 10/3/08

Local Permit Agency Tulare County Environmental Health Division

Permit No. 08-0248 Permit Date 5/19/08

DWR USE ONLY – DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (X) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Reverse Rotary FLUID ___

DEPTH FROM SURFACE Ft. to Ft.		DESCRIPTION *Describe material, grain size, color, etc.*
40	60	Sand, pebbles
60	360	Sand
360	370	Sand, little clay
370	380	Sand, Clay
380	390	Sand, little clay
390	720	Sand, little clay
720	880	Clay, sand
880	1010	Sand, Clay
1010	1150	Clay, sand

RECEIVED OCT 14 2008 By

TOTAL DEPTH OF BORING 1160 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1140 (Feet)

WELL OWNER

[redacted]

CITY STATE ZIP

WELL LOCATION

Address 1.8 Mi E Hwy 43 off Ave 108

City Corcoran STATE Ca ZIP 93212

County Tulare County

APN Book 293 Page 230 Parcel 01

Township 22S Range 23E Section 25

Latitude 35 59 8.66 NORTH (DEG. MIN. SEC.) Longitude 119 26 30.18 WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH

WEST EAST SOUTH

Illustrate or Describe Distance Of Well from Roads Buildings, Fences, Rivers etc and attach map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (X)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (X)

WATER SUPPLY

X Domestic ___ Public

X Irrigation ___ Industrial

MONITORING ___

TEST WELL ___

CATHODIC PROTECTION ___

HEAT EXCHANGE ___

DIRECT PUSH ___

INJECTION ___

VAPOR EXTRACTION ___

SPARGING ___

REMEDIATION ___

OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER Unknown (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 328.95 (Ft.) & DATE MEASURED 9/30/08-10/3/08

ESTIMATED YIELD 2075 (GPM) & TEST TYPE Step and constant pump

TEST LENGTH 35 (Hrs.) TOTAL DRAWDOWN 74.08 (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	OUTSIDE DIAMETER (inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	40	40			X		Steel	30	.375	
0	640	26	X				Steel	16	.375	
640	700	26		X			Steel	16	.312	.060 Full Flow
700	720	26	X				Steel	16	.375	
720	800	26		X			Steel	16	.312	.060 Full Flow
800	860	26	X				Steel	16	.375	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (X)	BEN-TONITE (X)	FILL (X)	FILTER PACK (TYPE/SIZE)
0	500	X			8 Sac Sand Slurry
500	510				Hole Plug
510	1140			X	1/4 x 10 Greenfield Gravel Pack

ATTACHMENTS (X)

X Geologic Log

X Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Layne Christensen Company (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 11001 Etiwanda Ave CITY Fontana STATE Ca ZIP 92337

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 10/7/08 C-57 LICENSE NUMBER 510011

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

AWD01861

File Original with DWR

Page 2 of 2

STATE OF CALIFORNIA WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. e0078570

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. 3 / E-22

Date Work Began 5/19/08 Ended 10/3/08

Local Permit Agency Tulare County Environmental Health Division

Permit No. 08-0248 Permit Date 5/19/08

GEOLOGIC LOG

ORIENTATION (X) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Reverse Rotary FLUID ___

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION Describe material, grain size, color, etc.

TOTAL DEPTH OF BORING 1160 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1140 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 1.8 Mi E Hwy 43 off Ave 108

City Corcoran STATE Ca ZIP 93212

County Tulare County

APN Book 293 Page 230 Parcel 01

Township 22S Range 23E Section 25

Latitude 35 59 8.66 NORTH (DEG. MIN. SEC.) Longitude 119 26 30.18 WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance Of Well from Roads Buildings, Fences, Rivers etc and attach map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (X)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (X)

WATER SUPPLY

___ Domestic ___ Public

X Irrigation ___ Industrial

MONITORING ___

TEST WELL ___

CATHODIC PROTECTION ___

HEAT EXCHANGE ___

DIRECT PUSH

INJECTION ___

VAPOR EXTRACTION ___

SPARGING ___

REMEDIATION ___

OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER Unknown (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 328.95 (Ft.) & DATE MEASURED 9/30/08-10/3/08

ESTIMATED YIELD 2075 (GPM) & TEST TYPE Step and constant pump

TEST LENGTH 35 (Hrs.) TOTAL DRAWDOWN 74.08 (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (inches)	TYPE: BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	OUTSIDE DIAMETER (inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
860	900	26		X			Steel	16	.312	.060 Full Flow
900	940	26	X				Steel	16	.375	
940	960	26		X			Steel	16	.312	.060 Full Flow
960	1020	26	X				Steel	16	.375	
1020	1120	26		X			Steel	16	.312	.060 Full Flow
1120	1140	26	X				Steel-sump	16	.375	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (X)	BEN-TONITE (X)	FILL (X)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (X)

X Geologic Log

X Well Construction Diagram

Geophysical Log(s)

Soil/Water Chemical Analyses

___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

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ADDRESS 11001 Etiwanda Ave CITY Fontana STATE Ca ZIP 92337

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 10/7/08 C-57 LICENSE NUMBER 510011

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

TRIPLICATE
Owner's Copy
Page 1 of 2

STATE OF CALIFORNIA WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. E062799

Owner's Well No. E-21

Date Work Began 10/27/2007, Ended 11/16/2007

Local Permit Agency TULARE COUNTY

Permit No. 07-0479 Permit Date 10/2/2007

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD REVERSE FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain, size, color, etc.)
0	10	SANDY BROWN CLAY
10	13	MEDIUM SAND
13	28	SANDY BROWN CLAY
28	37	MEDIUM SAND
37	50	SANDY BROWN CLAY
50	67	CLAY
67	94	FINE SAND
94	107	CLAY
107	111	SAND
111	146	CLAY
146	164	SANDY CLAY
164	192	SAND
192	207	SANDY CLAY
207	239	SAND
239	268	CLAY
268	304	SANDY CLAY
304	309	SAND
309	332	CLAY
332	351	SAND
351	356	SANDY CLAY
356	401	SAND
401	426	SANDY CLAY
426	447	SAND
447	454	CLAY
454	470	SAND
470	492	SANDY CLAY
492	596	CLAY
596	616	SANDY CLAY
616	633	CLAY
633	643	SAND

TOTAL DEPTH OF BORING 1220 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1200 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address AVE 108, & HWY 43

City ANGIOLA CA

County TULARE

APN Book 293 Page 230 Parcel 001

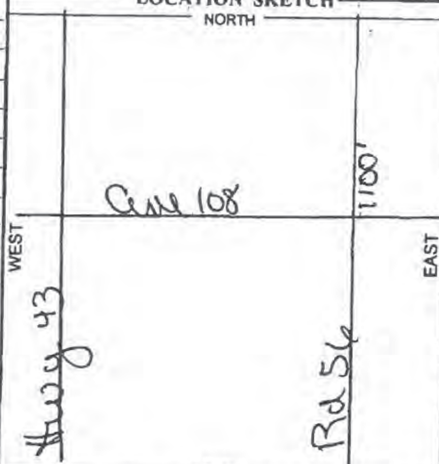
Township 22 S Range 23 E Section 25

Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST



EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	34"	5/16"	
0	640	28"	✓				STEEL	16"	3/8"	
640	1200	28"		✓			STEEL	16"	5/16"	.060 DBL

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			SIX SACK
0	600			✓	1/4
600	1220			✓	6 X 16

ATTACHMENTS (✓)

— Geologic Log
✓ Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP

Signed [signature] 11/26/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

AWD01824

TRIPLICATE
Owner's Copy

Page 2 of 2

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. **E062799**

Owner's Well No. E-21

Date Work Began 10/27/2007, Ended 11/16/2007

Local Permit Agency TULARE COUNTY

Permit No. 07-0479 Permit Date 10/2/2007

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./ STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD REVERSE FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
643	668	SANDY CLAY
668	677	CLAY
677	694	SAND
694	703	CLAY
703	716	SANDY CLAY
716	738	SAND
738	743	CLAY
743	760	SANDY CLAY
760	794	SAND
794	799	CLAY
799	811	SANDY CLAY
811	863	SAND
863	882	CLAY
882	910	SAND
910	932	CLAY
932	941	SAND
941	962	SANDY CLAY
962	991	SAND
991	1002	CLAY
1002	1013	SANDY CLAY
1013	1018	CLAY
1018	1026	SAND
1026	1063	SANDY CLAY
1063	1091	SAND
1091	1099	CLAY
1099	1126	SAND
1126	1150	CLAY
1150	1164	SANDY CLAY
1164	1176	SAND
1176	1220	CLAY

TOTAL DEPTH OF BORING 1220 (Feet)

TOTAL DEPTH OF COMPLETED WELL 1200 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address AVE 108, & HWY 43

City ANGIOLA CA

County TULARE

APN Book 293 Page 230 Parcel 001

Township 22 S Range 23 E Section 25

Latitude ___ DEG. MIN. SEC. ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
— Domestic — Public
✓ Irrigation — Industrial

MONITORING —
TEST WELL —
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	44"			✓		STEEL	34"	5/16"	
0	640	28"	✓				STEEL	16"	3/8"	
640	1200	28"		✓			STEEL	16"	5/16"	.060 DBL

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			SIX SACK
0	600			✓	1/4
600	1220			✓	6 X 16

ATTACHMENTS (✓)

— Geologic Log
✓ Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME MYERS BROS. WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

8650 E. LACEY BLVD. HANFORD CA 93230-4844
ADDRESS CITY STATE ZIP

Signed ___ 11/26/07 548214
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Appendix C

Groundwater Level Field Measurement Form

Field Groundwater Level Measurements

Well Name/ Number:	Checked By:
Project:	Field Personnel:

Well Name/Owner	Date	Time	Reference Point Elevation (ft)	Depth To Groundwater (ft)	Groundwater Elevation (ft)	Instrument Type

Appendix D

Chalk/Tape Groundwater Level Measurement

Sheet ______ of ________

Chalk/Tape Groundwater Level Measurements

Recorded By:

A	B	C	D	E	F	G	H
Well Name/Owner	Date	Time	Reference Point Elevation (ft)	Tape Measurement at Reference Point	Chalk Measurement	Depth To Groundwater (ft) (E - F)	Groundwater Elevation (ft) (D - G)

Thomas Harder & Co.
Groundwater Consulting

Appendix E

Quality Assurance Project Plan

ELEMENT 1: TITLE AND APPROVAL SHEETS

Draft Tule Basin Water Quality Coalition

Surface Water and Groundwater Monitoring Plan
Quality Assurance Program Plan

Revision
July 1, 2019

Approvals

____

R.L. Schafer, RCE, RAE Date
Tule Basin Water Quality Coalition
Program Coordinator

____

David De Groot, RCE Date
4Creeks, Inc.
Project Manager, Technical Lead

____

Michelle Parker Date
R.L Schafer & Associates
Quality Assurance Manager, Laboratory Coordinator

____

Belinda C. Vega, Laboratory Director Date
BSK Associates
Laboratory Program Manager

Draft Tule Basin Water Quality Coalition

Surface Water Monitoring Plan
Quality Assurance Program Plan

Revision
July 1, 2019

Approvals, cont.

____

David Sholes, Non-Point Source/AG Planning Date
California Regional Water Quality Control Board
QAPP Review

____

Renee Spears, Quality Assurance Officer Date
State Water Resources Control Board
QAPP Review

Element 2: TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ELEMENT 3: DISTRIBUTION LIST

Coalition Contacts:

R.L. Schafer
Tule Basin Water Quality Coalition
2904 W. Main Street
Visalia, CA 93291
559-627-2948
rschafer@rlsmap.com

David De Groot
4Creeks, Inc.
324 S. Sante Fe, Suite A
Visalia, CA 93292
(559) 802-3052
davidd@4-creeks.com

Laboratory Contacts:

BSK Associates
Belinda C. Vega
Laboratory Director
1414 Stanislaus
Fresno, CA 93706
559-497-2888 x 133
mvega@bskassociates.com

BSK Associates
Michael Ng
Quality Assurance Manager
1414 Stanislaus
Fresno, CA 93706
559-497-2888 x 118
mng@bskassociates.com

BSK Associates
Stephane Maupas
Project Management Supervisor
1414 Stanislaus
Fresno, CA 93706
559-497-2888 x 212
smaupas@bskassociates.com

QAPP Recipients

Patrick Pulupa
Executive Officer
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670

Clay Rodgers
Central Valley Regional Water Quality Control Board
Fresno Office
1685 E Street
Fresno, CA 93706

R.L. Schafer
2904 W. Main Street
Visalia, CA 93291

4 Creeks
324 S. Sante Fe, Suite A
Visalia, CA 93292

BSK Associates
1414 Stanislaus Street
Fresno, CA 93706

ELEMENT 4: PROJECT ORGANIZATION

Personnel

R.L. Schafer
Program Lead
Tule Basin Water Quality Coalition

Mr. Schafer graduated from the University of South Dakota, School of Mines and Technology in 1951, attended graduate school in the University of California and is a registered civil engineer in six states. Mr. Schafer specializes in water rights, hydrology, hydraulics & hydrography, water distribution systems, canals, pipelines and related structures; domestic water systems; well construction and equipment; drainage systems and flood control works. Mr. Schafer also directs land development projects, subdivisions of properties, topographic and boundary surveys and mapping thereof. Mr. Schafer has over 55 years of professional civil engineering experience representing private sector clients and numerous public districts in the San Joaquin Valley. Mr. Schafer has served as the Watermaster/Secretary of the Tule River Association since 1962, is a member of the Tulare County Water Commission, the Coordinator of the Tule Basin Water Quality Coalition, and is currently coordinating the formation and implementation of the Sustainable Groundwater Management Act in the Tule Sub-Basin.

David De Groot
Project Manager, Technical Lead
4Creeks, Inc.

Mr. De Groot graduated from Calvin College located in Grand Rapids, Michigan with his B.S. in Civil Engineering and is a registered civil engineer in the State of California. Mr. De Groot specializes in agriculture and water resource engineering, including hydrology, hydraulics, water distribution systems, canals, pipelines, waste management systems, irrigation systems, dairy design, and environmental permitting for agriculture and water related projects. Mr. De Groot has 13 years of professional engineering experience and represents many private clients and public districts within the Central Valley of California. Mr. De Groot is the Assistant Watermaster of the Tule River Association since 2009 and is the Technical Lead of the Tule Basin Water Quality Coalition.

Michelle Parker
QA Manager, Laboratory Coordinator
R.L. Schafer & Associates

Mrs. Parker has served as the Executive Assistant to R. L. Schafer and Office Manager of R. L. Schafer & Associates for 25 years, Treasurer of the Tule River Association with the responsibility for the preparation of all reports for the Tule River, along with preparation of the Tule River Association Annual Reports. Mrs. Parker also serves as the Treasurer, Enrollment Administrator and Quality Assurance Manager for the Tule Basin Water Quality Coalition. As the QA Manager for the Coalition, Ms. Parker has the responsibility for maintaining and distributing the official approved QAPP.

Belinda C. Vega, Laboratory Director
Program Manager, BSK Associates

Ms. Vega is the Laboratory Director of BSK Associates' (**BSK**) analytical laboratory in Fresno, CA. Ms. Vega received her B.S. in Environmental Resources Engineering from Humboldt State University and has been with BSK Associates since 2018. Prior to working with BSK, Ms. Vega served as the V.P. of Operations for Torrent Laboratory. She has also served as General Manager for Test America and President of EMLab P&K. For the purposes of this QAPP, Ms. Vega will act as the Program Manager for the sampling and analytical services performed in accordance with this QAPP. Ms. Vega's responsibility in this role will be to understand the plan requirements and work in conjunction with the Coalition contacts to ensure those requirements are met by the primary and subcontract laboratories.

Michael Ng, Quality Assurance Manager
QA Manager, BSK Associates

Mr. Ng is the Quality Assurance (**QA**) Manager at BSK's Fresno Analytical Laboratory (BSK Labs). Mr. Ng received his M.S. Chemistry from California State University, Los Angeles, and has over 30 years of experience in environmental laboratory industry. He will be acting in the role of quality assurance to ensure that all data produced by BSK are of a known and documented quality, consistent with standard industry practices and the State's Environmental Laboratory Accreditation Program. Mr. Ng will be the primary point of contact for all matters related to the laboratory quality system and data quality concerns.

Stephane Maupas, Project Management and Acquisition Manager
Project Manager, BSK Associates

Mr. Maupas is the Project Management and Acquisition Manager at BSK's Fresno Analytical Laboratory (BSK Labs). Mr. Maupas received his B.S. Chemistry from California Polytechnic State University, San Luis Obispo, and has over 20 years of experience in environmental laboratory industry. He will be acting in the role of Laboratory Project Manager to ensure that each sampling and analytical event is performed in accordance with program requirements. Mr. Maupas will be the primary point of contact for the Coalition personnel, coordinating the field sampling events and analytical testing required by each monitoring event.

Contracted Laboratories

The **COALITION** has contracted with the following laboratories for chemical testing, toxicity testing, and sampling services. Sub-contracting laboratories are mentioned under each primary laboratory.

BSK Associates (**BSK**)
Fresno Analytical Laboratory
1414 Stanislaus St
Fresno, CA 93706
(559) 497-2888
(559) 485-6935 fax
www.bskassociates.com

BSK provides testing services for the chemistry and microbiology samples for Tule Basin Water Quality Coalition as well as the sampling services at all surface water monitoring sites.

Aquatic Bioassay and Consulting (**ABC**)
29 N. Olive St.
Ventura, CA 93001
(805) 643-5621
(805) 643-2930 fax
www.aquaticbioassay.com

ABC will provide the aquatic toxicity testing for the Coalition. ABC has been providing this service for the COALITION over the last several years either directly or indirectly when the district was part of the former Southern San Joaquin Valley Water Quality Coalition. ABC will serve in a subcontract role (**SUBCONTRACT LABORATORY**) to BSK.

In the event that BSK determines that the service provided by the SUBCONTRACT LABORATORY is inadequate to meet the data quality or scheduling needs of the COALITION, BSK may elect to redirect the aquatic toxicity testing to an alternate provider, namely, Pacific EcoRisk Laboratory. Similar to ABC Laboratory, Pacific EcoRisk is California ELAP certified and can perform aquatic toxicity testing that meets the data quality objectives of this QAPP.

Pacific EcoRisk Environmental Consulting and Testing (**PER**)
2250 Cordelia Road
Fairfield, CA 94534
(707) 207-7760
(707) 207-7916 fax
www.pacificecorisk.com

Should it become necessary to utilize any other subcontract laboratories other than ABC and PER, BSK will inform the COALITION as to the need for the change and provide a letter for submission to the Regional Board to document the necessary deviation from the QAPP and to identify the new subcontract laboratories.

Laboratories used by the Coalition will be certified at a minimum under the California Environmental Laboratory Accreditation Program (**ELAP**). The laboratories listed in the QAPP will meet all Quality Assurance and Control requirements provided in this document. The selection of sub-contractors by a contracted lab must first be approved by the Coalition, and such sub-contractors must abide by the conditions set forth by the Regional Board and this QAPP document.

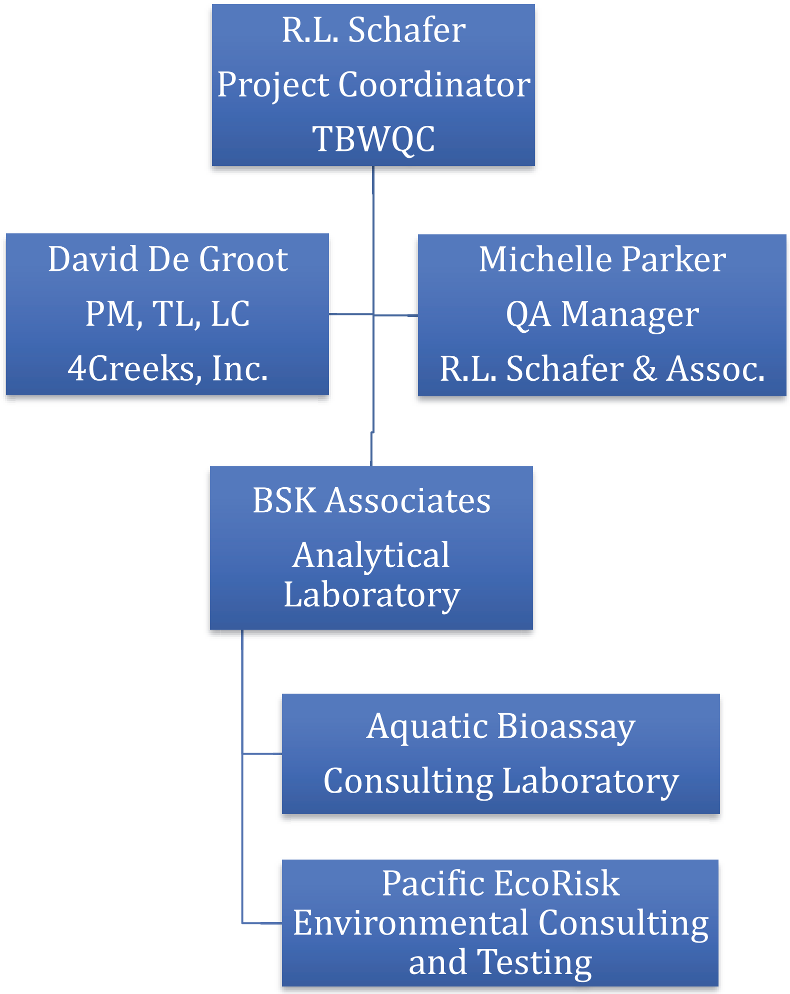


Figure 1. Organizational Chart

ELEMENT 5: PROBLEM DESCRIPTION AND BACKGROUND

Introduction

It is known that some waters of the State are negatively impacted by discharges from agricultural lands. Said discharges are likely to contain applied pesticides or chemical fertilizers that negatively impact the water quality and ecosystems present within the receiving waters. The TBWQC has conducted chemical and physical parameter testing of surface waters since 2004 on representative waterways within its boundaries, initially as part of the now dissolved Southern San Joaquin Valley Water Quality Coalition (SSJVWQC) and are currently under the California Regional Water Quality Control Board General Order R5-2013-0120.

The hydrology of the Coalition is one where surface water supplies are frequently limited, and when available in the case of Tule River, are only released from Success Reservoir to satisfy irrigation demands or flood-control. Groundwater is used by landowners where surface delivery infrastructure does not exist or when the public districts are unable to deliver irrigation water on the farmer's irrigation schedule.

This Plan is designed to monitor the constituents in Waters of the State, determine exceedances (if any), trace the source, under the Surface Water Monitoring Plan and the Groundwater Quality Trend Monitoring Workplan of the TBWQC, alter the Management Practices used to reduce/eliminate the exceedance. The Plan is further designed to provide groundwater quality (constituent) analyses as required by Order R5-2013-0120.

Project Objectives

In accordance with the requirements of the California Water Code, the Irrigated Lands Regulatory Program's Monitoring and Reporting Program Plan (MRP), the General Order objectives are to (1) categorize the current condition of the water of the state within the jurisdictional boundaries of the Coalition, (2) to identify any potential sources of pollutants that may contribute to the degradation of the water of the State, and, if identified, (3) to prevent further degradation (if any) of such water of the State as may be caused by irrigated agriculture through the implementation, where feasible, of management plans that prevent future negative impacts and eventual recovery of the waters to acceptable conditions that are protective of the identified beneficial uses.

Approaches Used

To achieve these objectives, the Coalition has implemented a Surface Water Monitoring Plan (SWMP) and a Groundwater Quality Trend Monitoring Workplan (GQTMW) with selected representative monitoring sites/wells within the TBWQC. Testing is done for physical and chemical constituents related to agricultural practices common to the region surrounding the monitoring site.

Surface water monitoring consists of monthly collection of samples at sites within natural channels that represent the beginning of irrigated agriculture, location of historic gaging stations, downstream of all sources of flow entering the waterway and other general conditions. When water is not present at the surface water sampling sites, monthly photo documentation of the monitoring sites are conducted. To maximize the occasions for surface water samples, Coalition personnel will monitor both the local agricultural irrigation schedules and the regional weather forecasts. During periods of active irrigation, regular stream flows or significant precipitation, the Coalition will conduct its monitoring events, but at the least monthly.

Groundwater monitoring consists of annual collection of samples from wells that are chosen to reflect the quality, as determined by the Coalition's Groundwater Quality Trend Monitoring Workplan (GQTMW) that employs wells in the upper most zone of first encountered groundwater as described in the Irrigated Lands Regulatory Program's MRP. Depth to groundwater measurements wells are conducted twice per year: during the Spring, normally during February for seasonal high data; and during the Fall, normally in October, for seasonal low data.

Regulatory Information

The Coalition covers essentially the center of the Tulare Lake Basin. The State has recognized that the conditions present within this Basin are distinctly different from the conditions found in the San Joaquin or Sacramento River Basins, and that the Tulare Lake Basin is closed and isolated from the San Joaquin-Sacramento River delta under normal hydrologic circumstances. As such, a separate basin plan was developed to address the Tulare Lake Basin.

Table 1 and Table 2 provide the Basin Plan Objectives (BPO) for surface water and groundwater, respectively, of the Tulare Lake Basin, as well as the spectrum of chemistries tested under the current monitoring and reporting program (MRP). Some of the BPO's for water quality are derived from standards in Title 22 of the California Code of Regulation. Many of the constituents listed do not have official numerical limits in place, although the interpretation of the narrative would lead to a zero tolerance.

Table 1: MRP Chemistries Tested for and BPOs for Tulare Lake Basin Surface Waters

CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS	CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS
Field Measurements			**Pesticides and 303(d) Parameters**		
Flow	-	cfs	2,4-D Acids & Salts	0.45	ug/L
EC	700	umhos/cm	Acetamiprid	0.01	ug/L
Temperature	Variable	°C	Aldicarb	3	ug/L
pH	6.5 – 8.3	pH units	Atrazine	1	ug/L
Dissolved Oxygen	5-7 (W/C)	mg/L	Azinphos-methyl	0.01	ug/L
			Captan	0.01	ug/L
Drinking Water			Carbaryl	2.53	ug/L
E. Coli	235	MPN/100mL	Carbofuran	0.5	ug/L
TOC	NA	mg/L	Chloropicrin	8.5	ug/L
			Chlorothalonil	0.025	ug/L
General Physical			Chlorpyrifos	0.015	ug/L
Hardness	NA	mg/L	Clothianidin	0.01	ug/L
TSS	NA	mg/L	Cyanazine	1	ug/L
Turbidity	Variable	NTU	DDD	0.001	ug/L
			DDE	0.001	ug/L
Metals			DDT	0.001	ug/L
Arsenic	10	ug/L	Demeton-s	NA	ug/L
Arsenic (Dissolved)	150	ug/L	Diazinon	0.1	ug/L
Boron	700	ug/L	Dichlorvos	0.085	ug/L
Cadmium	Variable	ug/L	Dicofol	NA	ug/L
Copper	Variable	ug/L	Dieldrin	0.056	ug/L
Lead	Variable	ug/L	Dimethoate	1	ug/L
Molybdenum	10	ug/L	Disulfoton	0.05	ug/L
Nickel	Variable	ug/L	Diuron	2	ug/L
Selenium	5	ug/L	Endrin	0.036	ug/L
Zinc	Variable	ug/L	Glyphosate	700	ug/L
			Imidacloprid	0.002	ug/L
Nutrients			Linuron	1.4	ug/L
Ammonia-N	0.025	mg/L	Malathion	0.1	ug/L
Nitrate-N	10	mg/L	Mancozeb	1	ug/L
Nitrite-N	1	mg/L	Methamidophos	0.35	ug/L
Orthophosphate-P	NA	mg/L	Methidathion	0.7	ug/L
			Methiocarb	5	ug/L
Water Toxicity			Methomyl	0.52	ug/L
Ceriodaphnia dubia			Methoxychlor	0.03	ug/L
Pimephales promelas			Methyl Parathion	0.08	ug/L
Selenastrum capricornutum			Molinate	13	ug/L
Sediment Toxicity					
Hyalella azteca					

CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS	CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS
Pesticides and 303(d) Parameters			**Pesticides and Sediment Parameters**		
Norflurazon	0.011	ug/L	Bifenthrin	-	ng/g
Oryzalin	0.3	ug/L	Chlorpyrifos	-	ng/g
Oxamyl	50	ug/L	Cyfluthrin	-	ng/g
Oxyfluorfen	0.003	ug/L	Cypermethrin	-	ng/g
Paraquat	3.2	ug/L	Esfenvalerate	-	ng/g
Paraquat Dichloride	0.19	ug/L	Fenpropathrin	-	ng/g
Pendimethalin	0.07	ug/L	Lambda cyhalothrin	-	ng/g
Phorate	0.7	ug/L	Permethrin	-	ng/g
Phosmet	140	ug/L	Piperonyl Butoxide	-	ng/g
Pyraclostrobin	0.0029	ug/L			
Pyrethrins	0.1	ug/L			
Pyridaben	0.01	ug/L			
Simazine	4	ug/L			
Tebuconazole	0.0102	ng/L			
Thiobencarb	3.1	ng/L			
Trifluralin	5	ug/L			
Ziram	1	ug/L			

Table 2: MRP Chemistries Tested for and BPOs for Tulare Lake Basin Ground Waters

CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS
Field Measurements		
EC	900-1,600	umhos/cm
Temperature	Variable	°C
pH	6.5 – 8.3	pH units
Dissolved Oxygen	5-7 (W/C)	mg/L
Inorganic Chemicals		
Nitrate as Nitrogen (N)	10	mg/L
Total Dissolved Solids (TDS)	500-1,000	mg/L
General Minerals		
Anions		
Carbonate (as CaCO3)	NA	mg/L
Bicarbonate (as CaCO3)	NA	mg/L
Chloride	500	mg/L
Sulfate	500	mg/L
Cations		
Boron	NA	ug/L
Calcium	NA	mg/L
Sodium	NA	mg/L
Magnesium	NA	mg/L
Potassium	NA	mg/L

Program Background

Surface Water Monitoring

The requirement for a comprehensive testing program as part of the Agricultural Discharge Waiver (now Irrigated Lands Regulatory Program) was put in place July 2003 with the installation of a new discharge waiver. The program was revised in January 2008 to incorporate additional requirements for the selection of sample sites and the development of management plans, if triggered. Most recently, a new order (R5-2013-0120) adopted by the RWQCB in September 2013 for the Tulare Lake Basin which has led to the dissolution of the SSJWQC and the establishment of numerous coalitions, each focus on those concerns specific to the subbasin of the former combined coalitions.

Limited laboratory testing (water column toxicity) along with physical parameter measurements (dissolved oxygen [DO], electrical conductivity [EC], pH, and temperature) were started on a systematic schedule in 2004. The water column toxicity tests included an evaluation of algae growth (*Selenastrum capricornutum*), fathead minnow (*Pimephales promelas*), and water flea (*Ceriodaphnia dubia*) survival. Each represents an important step in the aquatic food chain and when combined with the physical parameters, would be indicative of some form of water contamination. The laboratory test results for exceedances were transmitted to the Regional Board as an indicator of whether an exceedance existed in the Waters of the State within the Coalition.

Starting in June 2006, the testing of surface waters was expanded to include general chemistry (dissolved metals), nutrients, and pesticides that the Regional Board felt were important, and were consistent with other testing done under the Surface Water Ambient Monitoring Program (SWAMP). The surface water monitoring program was revised in 2008 to give the Coalitions greater flexibility in selecting the sampling sites, frequency of sampling, and constituents tested for as long as each change from the previous program could be adequately justified. Sampling of surface waters was increased to once per month for all monitoring sites. Reporting requirements under the program were also adjusted to quarterly reports of accumulated data (in a SWAMP compatible format) and one annual report of the data collected instead of two reports per year. The increased frequency of data reporting was to help the Regional Board see trends sooner, and the single report by the Coalitions was to help reduce costs.

The annual testing of surface waters was categorized as either Assessment or Core monitoring, with differing requirements for each. Surface water monitoring assessment sites are those sites that are new to the program and thus have no historical data associated with them.

Surface water monitoring core sites are those with historical data and are used for the monitoring of trends within the waterways of the Coalition. Both type of sites are monitored intensely for a one-year period, then only lightly sampled (lower chemistry test requirements) for the following two years, unless problems are detected during the first year.

A third type of surface water monitoring site to be monitored is a Special Project Monitoring Site, where research into a specific question is undertaken. Once sufficient data has been collected at such a site, it can be discontinued if no issues were identified.

Groundwater Quality Trend Monitoring

Previous to the implementation of the IRLP, monitoring of groundwater quality was performed under two Regional Water Quality Control Board programs: the Dairy General Order R5-2007-0035 adopted in May of 2007, and the individual Waste Discharge Requirements (WDR); along with two State Water Resources Control Board programs for the Division of Drinking Water and the Groundwater Ambient Monitoring and Assessment Program (GAMA), expanded in 2007. With the adoption of the ILRP General Order R5-2013-0120 by the RWQCB in September 2013, monitoring of waters of the State was expanded to include the determination of groundwater quality through the evaluations consisting of 1)

Groundwater Quality Assessment Report (GAR), 2) Management Practice Evaluation Program (MPEP), and 3) Groundwater Quality Trend Monitoring Program (GQTMP).

The purpose of the GAR was to provide a technical basis for the scope and level of effort for implementation of the of the General Order's groundwater monitoring and implementation provisions, accomplished by 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. At a minimum, the GAR is required to be reviewed and updated by the Coalition on a 5-year basis incorporating new information and data. The GAR provides the necessary foundation for design of the MPEP and GQTMP and identifies the areas where a GQTMP must be implemented. In January of 2016 the TBWQC received conditional approval on the Coalition's GAR.

The purpose for developing the MPEP was to evaluate the effectiveness of current agricultural management practices for protection of groundwater quality, consistent with the General Order requirements. The TBWQC 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.

The GAR's initial groundwater assessment is the basis for development of the GQTMP. With the findings and data gaps identified in the GAR the TBWQC developed their Groundwater Quality Trend Monitoring Workplan (GQTMW) to further investigate the conditions of the existing groundwater quality and develop a plan for determining trends in groundwater quality for evaluation of the effects of irrigated agriculture on groundwater quality. The TBWQC received conditional approval from the Regional Board on their Groundwater Quality Trend Workplan in September 2018.

Beginning in the Fall of 2018, the TBWQC was required to begin collecting groundwater quality samples from the monitoring network included in the GQTMW and annually in the summer thereafter. Constituents required to be sampled for annually by the MRP consist of field-tested physical parameters (electrical conductivity [EC], pH, dissolved oxygen [DO], temperature) and laboratory tested inorganic chemicals (nitrate as nitrogen). In addition to the annually tested constituents, the MRP requires laboratory tested constituent of total dissolved solids [TDS], general mineral anions (carbonate, bicarbonate, chloride and sulfate) and cations (boron, calcium, sodium, magnesium and potassium) be tested initially and once every 5 years thereafter.

Decisions Made with Information Obtained from Monitoring

The purpose of any testing program is to detect a constituent exceedance in the waters of the State as the first step. The second step is to evaluate the seriousness of the detection. Once detection has been made, the approach of the Coalition is to trace the constituent exceedance to its potential source. This includes a physical survey of the waterway for possible points of entry of applied irrigation waters (pipes, culverts, canal gates), evaluation and documentation of cropping patterns, and the eventual tracking of the application with the local agricultural commissioner. Once the likely source of the constituent exceedance has been identified, contact with the suspected grower(s) would begin so as to prevent future occurrences. A wide range of options are available, including improved irrigation waters management, changes in chemicals applied, changes in application methods, or any other procedure that would prevent the offsite movement of the detected constituent.

The data from the individual surface water and groundwater sampling points will be assessed according to the following beneficial use criteria:

Table 3: Coalition Sampling Points – Data Evaluation Criteria

Site name	Beneficial Use
Deer Creek at Road 120	Freshwater Habitat
Deer Creek at Road 176	Freshwater Habitat
Deer Creek at Road 248	Freshwater Habitat
Porter Slough near Road 192	Freshwater Habitat
Tule River at North Fork Road 144	Freshwater Habitat
Tule River at Road 92	Freshwater Habitat
White River at Road 208	Freshwater Habitat
GQTMP Supply Wells	Municipal & Domestic Supply

Element 6: Project Description

Surface Water Sample Sites Description

The Coalition has identified seven natural channel locations where surface monitoring will be conducted under the monitoring program. The locations and schedule were identified as being the most representative of the surface waters within the Coalition boundaries. For additional details concerning the choice of the individual monitoring locations and schedule, please refer to the TBWQC Surface Water Monitoring Plan (8/4/14) and the associated addendum (2/9/15).

The monitoring locations are as follows:

1. **Deer Creek At Road 120 – Pixley, CA Site Description**

The Deer Creek at Road 120 station is located approximately 3.5 miles southwest of Pixley, CA. The land use surrounding this location is predominantly irrigated agriculture, ranging between different row crops and permanent crops. The station is located within the Pixley Irrigation District.

2. **Deer Creek At Road 176 – Pixley, CA Site Description**

The Deer Creek at Road 176 station, a stream gaging station, located approximately 6 miles southeast of Pixley, CA. The land use surrounding this station is predominantly irrigated agriculture, consisting of permanent crops and limited row crops. This station is located within the Saucelito Irrigation District.

3. **Deer Creek At Road 248 – Terra Bella, CA Site Description**

The Deer Creek at Road 248 station is located where the foothills of the Sierra Nevada Mountains meet the flat lands of the basin, approximately 2.5 miles northeast of Terra Bella, CA. At this location, the land use is primarily range land for cattle grazing. This location is not within an Irrigation District boundary.

4. **Porter Slough Near Road 192 – Porterville, CA Site Description**

The Porter Slough Near Road 192 monitoring station is located approximately 4.5 miles northwest of the City of Porterville. Porter Slough is a natural distributary of the Tule River with the head works approximately 2.5 miles downstream of Success Dam. The Porter Slough channel traverses 12 miles through the City of Porterville and Porterville Irrigation District prior to terminating into a Lower Tule River Irrigation District (LTRID) canal. The sampling point is located within Porter Slough upstream of the discharge into the LTRID canal. This monitoring station is located within the Porterville Irrigation District.

5. **Tule River At Road 144 (North Fork) – Woodville, CA Site Description**

The Tule River at Road 144 station is located approximately 3.5 northwest of Woodville, CA. The Tule River bifurcates at Road 192 into North and South Fork channels.

Downstream on the South Fork at Road 168, the South Fork further bifurcates into a Middle Fork and South Fork. At Road 144, the South Fork and Middle Fork rejoin as the South Fork and at Road 104 the South Fork and North Fork rejoin back into one main Tule River channel that continues to the Tulare Lake Bed. The Tule River at Road 144 monitoring site is located along the North Fork of the Tule River, just downstream of where a LTRID canal discharges CVP water from the Friant-Kern Canal into the Tule River. The land uses surrounding this station are predominantly agriculture, ranging from row crops to different permanent crops and is located in the northern central portion of Lower Tule River Irrigation District (LTRID).

6. Tule River At Road 92 – Tipton, CA Site Description

The Tule River at Road 92 station is located approximately 4 miles northwest of Tipton, CA. The Tule River at Road 92 station is located downstream of where the North Fork, Middle Fork, and South Fork all merge together forming a single Tule River Channel to the Tulare Lake Bed. This station is surrounded by irrigated agriculture of row crops and several permanent crops within the LTRID.

7. White River At Road 208 – Earlimart, CA Site Description

The White River at Road 208 station is located approximately 4 miles southwest of Ducor, CA. The monitoring station is located above the beginning of irrigated agriculture with the land use below this station planted predominantly with various permanent crops. The station is located within the Delano Earlimart Irrigation District (DEID).

Maps and coordinates of the sample site locations are included in Element 10 (Sampling Process Design / Monitoring Points).

Groundwater Sample Sites Description

An initial goal of the selection of groundwater sampling sites was to identify existing irrigation/domestic wells of first encountered groundwater that have adequate physical information to ensure the trends analyzed over time are reliable. The spatial coverage for the selection from existing groundwater wells of the monitoring well network is proposed to be four wells per township with one well for each nine square miles of the Township. In addition, for each “selected” well, a back-up or “secondary” well will be identified and utilized in case the selected well is damaged or is no longer in production. During the initial field verification and monitoring, the selected well will be included in the program to establish baseline groundwater depth and quality data. After the initial monitoring, only the selected well will be sampled annually. If the selected well is damaged permanently or is no longer in use, a replacement for the selected or secondary well will be identified at that time. The TBWQC covers in whole or in part twenty-nine (29) townships, identified as follows:

1. Township 21 South, Range 25 East
2. Township 22 South, Range 25 East
3. Township 23 South, Range 25 East

4. Township 23 South Range 23 East; those four townships include the communities of Tipton, Pixley, Earlimart and Alpaugh
5. Township 20 South, Range 27 East
6. Township 21 South, Range 27 East
7. Township 23 South, Range 27 East
8. Township 24 South, Range 27 East; those four townships cover the City of Porterville and the communities of Strathmore, Terra Bella, Ducor and Richgrove
9. Township 21 South, Range 26 East; covers the communities of Woodville and Poplar
10. Township 24 South, Range 24 East; covers the small community of Allensworth
11. Township 24 South, Range 25 East; covers urban sprawl of the community of Earlimart
12. Township 24 South, Range 26 East
13. Township 21 South, Range 28 East
14. Township 21 South, Range 29 East
15. Township 22 South, Range 28 East
16. Township 22 South, Range 27 East
17. The portion of the Tule Basin in Township 20 South, Range 26 East
18. Township 22 South, Range 26 East
19. Township 23 South, Range 26 East
20. The portion of Township 25 South, Range 26 East; covered by the Delano-Earlimart Irrigation District in Kern County
21. The portion of Township 21 South, Range 23 East
22. Township 22 South, Range 23 East
23. Township 24 South, Range 23 East
24. Township 21 South, Range 24 East
25. Township 22 South, Range 24 East
26. Township 23 South, Range 24 East
27. Township 23 South, Range 28 East
28. Township 24 South, Range 28 East
29. The portion of Township 22 South, Range 29 East

Map of the Tule Basin Water Quality Coalition Boundary is included in Element 10.

Summary of Work Performed for Surface Water and Groundwater Sampling

Sampling Procedures for Surface Water

The following is a description of the surface water sampling techniques to be used under this QAPP. The basic processes used to collect samples will remain unchanged from the previous MRP/QAPP although incorporation of the frequency of monitoring will require a more real-time determination of the sampling windows. Sampling, site photographs and reports will continue on a monthly basis for each surface water monitoring site.

Prior to the sampling event, physical parameter equipment will be recalibrated using known laboratory standards and according to the manufacturer's instructions. This equipment includes pH meters, EC meters, and DO meters. Known standards are brought to the field to recheck the calibration (pH, EC) at each site prior to sample collection.

Field samples of the water are collected in bottles provided by the laboratory (chemistry) or in one-gallon amber jugs specially purchased for the sampling event (water column toxicity). The containers are marked with site identification description, date and time of collection along with any preservative added by the lab on water resistant labels. Photo documentation is performed at each surface monitoring site each month.

Glass bottles are wrapped to prevent breakage during transport to the collection sites, and after collection, "blue" or gel ice packs are placed with the samples to reduce the sample temperature as low as possible in the field. Once all sampling points are collected, the samples will be transported to a location where they will be repacked for transportation to the laboratory. Samples will then be packed in "wet" ice and delivered to the laboratory on the same day of collection. The samples are packed with sufficient ice to lower the sample temperature to ≤6°C but not frozen.

Chains of custody are filled out with matching information (sample ID, sample date and time, site, and tests required) and are given to either the courier or the lab representative when the samples change hands.

The hold time for the water column toxicity samples is 36 hours, and the samples are shipped no later than the morning after collection. Ice levels are rechecked prior to shipment.

Sampling Procedures for Groundwater

The physical parameter equipment shall be calibrated at the beginning and once during each sampling day in accordance with the equipment manufacturer's specifications, as outlined in the instruction manual for the EC meter used. This equipment includes pH meter, EC meter, and DO meter.

Water supply wells shall be sampled by purging the well for a period of time adequate to purge the pump riser pipe. If the well is currently pumping, the sample may be taken without purging the well. Water samples shall then be collected from the discharge point nearest the well head. Samples shall be collected directly into laboratory-prepared bottles. Samples may not be taken from any location after any treatment of the water for domestic use, such as from a faucet within the house.

Field measurements of temperature, pH, dissolved oxygen (DO), Electrical Conductivity (EC), will be conducted and recorded of aliquots of groundwater and not determined in the laboratory. Field water quality measurements and instrument calibration details will be recorded on the Well Sampling Record.

Efforts will be made to handle, store, and transport supplies and samples safely. Exposure to dust, direct sunlight, high temperature, adverse weather conditions, and possible contamination shall be avoided. Immediately following collection, samples shall be placed in a clean chest that contains ice or “blue” ice, and transported to the subcontracted laboratory as soon as practical. Samples should be chilled at 4°C to prevent degradation.

After samples have been collected and labeled, they shall be maintained under chain-of-custody procedures. These procedures document the transfer of custody of samples from the field to the laboratory. Each sample sent to the laboratory for analysis shall be recorded on a Chain of Custody record, which will include instructions to the laboratory for analytical services.

If the samples are to be left at a BSK sample drop-off location, the original chain-of-custody shall be sealed inside a plastic bag within the ice chest, and the chest shall be sealed with custody tape which has been signed and dated by the last person listed on the chain-of-custody. The laboratory shall sign as a receiver once samples are received.

Analytical Procedures

Once received by the laboratory, the samples will be checked for temperature and preservation requirements. Bottles will be inspected for integrity and any deviations noted as part of the sample conditions on receipt documentation. Any anomalies will be communicated to the Project Coordinator and corrective actions taken as required. At a minimum, the discrepancies will be noted as part of the Case Narrative included with the laboratory results.

Samples will be processed according to the test methods required by the General Order. All laboratory data will undergo a tertiary review process to ensure that the data meets the requirements of the method and the data quality objectives of the Order. The Laboratory Project Manager will create the Certificate of Analysis (Report). A case narrative will be written to identify any anomalies, QC failures or other material issues that do not meet the quality objectives of the Order.

A preliminary report will be provided to the Coalition within ten (10) business days of sample collection, and will include all partial laboratory results that are reviewed and completed by then. The preliminary and final reports will be sent via email to the Project Coordinator and QA Manager.

Finally, the laboratory will prepare the required electronic data deliverables (EDD) as required by the MRP of the Order. Prior to delivery to the Project Coordinator, the laboratory personnel will evaluate the EDD using the SWAMP data integrity validation program as provided by the California Environmental Data Exchange Network (CEDEN) for surface water analysis results or the GeoTracker Electronic Submittal of Information (ESI) "Check EDD" tool for groundwater analysis results. Any critical failures observed will be addressed and the EDD will be reevaluated. Once complete with no critical errors, the EDD will be sent to the Project Lead along with a copy of the error log returned by the CEDEN or GeoTracker validation program.

Resource and Time Constraints

There are no significant resource constraints associated with the Surface Water Monitoring Plan (SWMP) or the Groundwater Quality Trend Monitoring Workplan (GQTMW). Both the Coalition and the laboratories have adequate resources to effectively perform the tasks required under the Plan and the General Order.

The responsibility of surface water sampling will be that of the primary laboratory, BSK. BSK has offices in the Fresno and Bakersfield areas. The Fresno location will be the primary respondent and operate as the base for crew and the sample receiving location. Multiple personnel will be trained on the sample collection procedures to ensure that BSK can respond to the sampling events with a minimal amount of notification. In the event of a scheduling conflict, staff from BSK's Bakersfield location will be dispatched to collect samples for the Coalition.

Coalition staff is responsible for collecting groundwater samples and have multiple staff members stationed in Visalia trained to use field instruments and procedures required for sample collection. The Fresno-based laboratory has extensive equipment and personnel to accommodate the water quality analysis workload generated under the SWMP and GQTMW.

Time represents the most significant restraint for both surface water and groundwater monitoring. The sample collection will require the close coordination of both Coalition and Laboratory personnel. Coalition personnel will closely monitor both the scheduled irrigation program and the regional weather forecast as well as sample date coordination with well owners to ensure a timely notification of sampling requirements. Laboratory and Coalition personnel will have the required water sampling equipment and materials (e.g. field instruments, sample containers, ice chests, etc.) on hand as a matter of practice to minimize the time requirements for the commencement of field sampling. The primary laboratory, BSK has a sample drop-off location in Visalia that facilitates the transportation of samples.

ELEMENT 7: QUALITY OBJECTIVES AND CRITERIA

The primary goal of any sampling and analyses program is to produce data that is of known and documented quality and is suitable for its intended use. The data generated under the TBWQC's SWMP and GQTMP will be used to make decisions regarding water quality in the Coalition, ensuring the preservation of the environment and the protection of human health. To that end, the data quality objectives set forth in the SWMP and GQTMW are established to ensure that (1) the collection of samples are representative of the environmental conditions associated with agricultural activities, that (2) the samples are handled and processed in a manner consistent with the requirements of the methods used and the practices set forth in this QAPP, and that (3) the data generated from the project are of sufficient quality to make sound decisions regarding the impact of agricultural activities on the waters of the State.

Performance Criteria Goals

The success of any given monitoring event will be determined based on the characteristic of completeness. The quality of completeness is a function of the number of successful checks or evaluations made on a project versus the total number of observations made. The overall completeness goal for each monitoring event is 90%. A discussion of completeness for both the sampling and the analytical portions of the SWMP and the GQTMW will follow below.

Quantitation Limits

The data generated as part of the SWMP and the GQTMW must be at a level of sensitivity low enough to detect and quantify constituents of concern at levels needed for preservation of the environment and human health. With that, the majority of the chemical testing is done to the parts-per-billion level.

Chemistry

The laboratory will establish reporting limits (RLs) at a level at or below the requirements of the General Order. These RLs will be based on a calibration point at or below the equivalent sample concentration. The laboratory will not report any value below the RL without qualification as an estimated value. All reported results will be bracketed by a calibration point.

To determine the low value at which the laboratory can detect the presence of a target analyte, the laboratory will conduct a Method Detection Limit (MDL) study in accordance with the procedure set forth in 40 CFR Part 136 Appendix B. This value is the lowest concentration at which the lab can state the compound is present with 99% confidence that it is truly non-zero.

Some methods are not amenable to conducting method detection limits studies. These methods are identified in Table 8 with a "-" in the column labeled MDL. This table reflects the MDLs in existence at the time this QAPP is approved. As per the requirements of the Order, the MDLs will be regenerated or verified by the laboratory at least every two years or when a material change is made in the method or equipment used to generate the original MDL study.

To provide the program with the most sensitive data possible but with the statistical confidence that a result is not a false positive, the laboratory will report results that exist between the MDL and the RL. As these values are outside of the calibration range of the equipment used, there exists some uncertainty as to the accuracy of the result return. For values reported between the MDL and RL, the laboratory will identify these as estimated values by applying a qualifier to indicate the uncertainty of the measurement (e.g. "J-Flagged").

Toxicity

Water toxicity tests will be considered significant at the 95% level of significance. TIEs will not be initiated until 50% survival or below is reported. Phase I TIE testing, along with a retest of the failed test, will begin as quickly as practical by the laboratory.

Table 8 summarizes the analytes, ILRP PQLs, method detection limits and reporting limits for this project.

Quality Control Measurements

Every effort will be made to provide quality from both the field sampling activities and from the fixed facility laboratory activities. Field and laboratory personnel are trained on proper sampling and analysis techniques appropriate to the tasks performed. All activities will be performed in accordance with established standard operating procedures (SOPs). See the Table 6 for listing of the applicable SOPs.

The results of the field and analytical activities will be gauged on a number of characteristics. Those characteristics are:

1. <u>Representativeness</u>. The monitoring sites selected for the SWMP and GQTMP by the Coalition will be indicative of the water quality within the Tule Basin. The surface water monitoring sites selected by the Coalition reflect the quality of the flows into and out of the Coalition. Samples will be collected based on real-time assessments of water flows, including those associated with storm events. Samples will be handled to ensure they maintain the conditions at they exist in the field and will be released to the laboratory in a timely manner to ensure that hold times are met.

   The monitoring sites selected for the GQTMW by the Coalition must be consistent with and indicative of the water quality relevant to irrigated agriculture. The groundwater monitoring wells selected by the Coalition represent both high and low vulnerability areas, as well as areas contributing significant recharge to urban and rural communities where groundwater serves as a significant source of supply. Groundwater sampling will be collected on an annual basis. Samples will be handled to ensure they maintain the conditions at they exist in the field and will be released to the laboratory in a timely manner to ensure that hold times are met.

2. Comparability. All samples are to be collected in the same manner, from approximately the same location at each monitoring site. All conditions will be maintained as consistent as possible to ensure that testing performed across multiple monitoring events is comparable with variation only due to field conditions. Furthermore, tests used by the laboratory will be in accordance with the General Order requirements to ensure comparability to historical data generated for each of the sampling locations.

3. Sensitivity, Contamination, Accuracy, Recovery and Precision is determined based on the performance of the method on one or more quality control indicators.

   Sensitivity is an assessment of the ability of the method to detect the analytes of interest at levels that are significant to the Plan. Numerous factors can affect sample results such that the reporting limits would need to be elevated. These factors include dilutions due to target or non-target interferences, insufficient sample volumes, internal standard suppression, etc. Sensitivity will be assessed by comparing the Order required reporting limits to those actually observed for all samples.

   Contamination is an assessment of the field and laboratory background by the examination of a blank matrix known to be free of contaminants. The blank matrix (Method Blank) is carried through the entire analytical process and then assessed for the presence of the target constituent. The presence of such constituents in the blank indicates that the field conditions or laboratory background may be responsible for the presence of a target constituent in the sample.

   Accuracy is the ability of the method to generate a result within a prescribed range of its actual true value. For the test methods employed in this Plan, accuracy will be determined based on the use of a standard reference material (SRM) or Laboratory Control Sample (e.g. LCS, Blank Spike) that is free of interferences.

   Recovery is the ability of the method to produce an accurate result given the potential interferences of a sample matrix. This is accomplished by fortifying a sample matrix with a small amount of the target compounds. The fortified matrix (or matrix spike [MS]) is carried through the analytical process to determine if the sample matrix somehow interferes with the method itself, either via suppression or enhancement of the matrix spike result.

   Precision is the ability of the method to reproduce the same result within a prescribed acceptance range. For the test methods employed, precision will be assessed by the analysis of a Laboratory Control Spike Duplicate, a Matrix Spike Duplicate or a Laboratory Sample Duplicate. The laboratory duplicate differs from a field duplicate in that the lab duplicate will be a secondary aliquot taken from the same container as the parent sample. A field duplicate is a second sample collected from the source and is treated as a separate unique sample that is "blind" to the laboratory.

4. Completeness. Completeness will be determined based on the measurement of the amount of valid data obtained per monitoring event (by site) versus the amount planned. The target of the Plan is to achieve 90 percent completeness at each event. Efforts to prevent sample loss include careful packaging of the sample for transport, and collection of adequate volumes for analysis, laboratory losses (errors, QC failures, and equipment failure). The laboratory shall determine the volumes required for the tests requested, and it is assumed that this final volume contains sufficient surplus to account for laboratory issues. As such, they have specified or provided the necessary containers for the sampling collection process.

   Completeness will be determined at two levels: Field and Transport, and Laboratory with levels reported within each quarterly report. As BSK does the surface water sampling for the Coalition, the calculation of completeness will be performed by them. The following describes the Completeness calculation to be used.

   Field and Transport completeness will include: completion of the site inspection report elements as specified on the Field Data Sheet, results of field instrument calibration checks, actual test results for physical parameters, completion of the Chain of Custody with the requested analyte list with no broken sample containers, and all samples received within temperature requirements. Chain of Custody forms (Appendix A.1) are provided by the lab and are pre-populated to include the analyses requested as determined by the Core vs. Assessment sampling schedule. The samples are inspected prior to packing with ice for breakage. Bottle counts are done when the labels are affixed to the containers. The Field and Transport evaluation program ends with the signed Chain of Custody, the reporting of the conditions of the samples as they are unpacked by the lab. Laboratory failures (e.g. breakage of sample container, samples received out of hold time, temperature exceedance, etc.) will be documented. All other measures beyond this point are associated with the Laboratory Completeness assessment.

   Photo documentation shall constitute 100 percent Completeness for those times when no sample water is available at surface water monitoring sites.

   The logbook sheets used for documentation of the Field and Transport portion of the monitoring event is included in Appendix A.2. An example of the spreadsheet used for the determination of the Field and Transport completeness is provided in Appendix A.4.

   Completeness for the Field and Transport activities will be determined based on the number of assessment points satisfying the expected criteria versus the total number assessed per sample site (22 individual assessment criteria per location).

Laboratory Completeness is achieved via an exhaustive examination of the results of both, field samples and the quality control indicators for each of the laboratory analyses. The laboratory completeness assessment is based on the characteristics of laboratory data listed above: sensitivity, contamination, accuracy, recovery and precision.

Completeness for the Laboratory activities will be determined based on the number of sample results that are not materially impacted by data quality issues. The calculation is the number of unaffected sample results versus the total number of data points generated for the sampling event.

An example of the spreadsheet used in the determination of Laboratory Completeness is included in Appendix A.3.

Table 4: Data Quality Objectives –

Measurement or Analysis Type	Sensitivity	Contamination	Accuracy	Recovery	Precision	Completeness
Physical Parameters (EC, pH, DO, temp)	X		X		X	X
Toxicity	X	X	X	NA	X	X
Pathogens	X	X			X	X
Nutrients/Anions	X	X	X	X	X	X
Carbonate/Bicarbonate Alkalinity	X	X	X		X	X
TDS	X	X	X		X	X
TSS	X	X			X	X
Metals	X	X	X	X	X	X
Carbamates	X	X	X	X	X	X
Organochlorines	X	X	X	X	X	X
Organophosphates	X	X	X	X	X	X
Pyrethroids	X	X	X	X	X	X
Herbicides	X	X	X	X	X	X

ELEMENT 8: SPECIAL TRAINING NEEDS / CERTIFICATIONS

As of this time, there are no Coalition staff members with specialized training in chemistry or laboratory procedures, outside of the coursework taken as part of their general educational curriculum. BSK personnel involved in the project have been performing sample collection procedures for many years and are familiar with the maintenance and calibration of the equipment used and the sampling techniques involved. Technical questions are fielded by the contracted labs and their sampling crew.

BSK's Quality Assurance Manager is responsible for the oversight of training. The QA Manager will ensure that adequate training is provided to the laboratory personnel on the requirements of this Program. The training will consist of both written review and hands-on training, all documented and contained within the Laboratory's record keeping system. The training files are maintained by the Laboratory's Quality Assurance Department.

BSK's field technicians undergo initial training and annual refresher training thereafter on proper sample collection techniques for both water and sediment. Initial training consists of a review and acknowledgement of understanding of the laboratory's standard operating procedure on sample collection. This is followed by hands on sample collection working in conjunction with one of BSK's experienced samplers. This hands-on training will continue until the trainer witnesses and documents the satisfactory understanding demonstration of proper technique. Once the Field Technician has demonstrated sufficient knowledge and understanding of the project, the training will be documented and included in the laboratory's training records. The field technicians are trained according to the following SOPs: Field Sampling from Streams, Rivers and Canals (SR-SP-0015), and Safety for Stream and Canal Sampling (SF-SP-0010).

Coalition field technicians undergo an initial training on proper sample collection techniques for groundwater wells. Initial training consists of a review and acknowledgement of understanding of standard operation procedures on groundwater sample collection. This followed by a hands-on sample collection working in conjunction with one of BSK's experienced samplers. This hands-on training will continue until the trainer witnesses and documents the satisfactory understanding demonstration of proper techniques.

BSK's Project Manager will undergo initial training on the details of the QAPP and other project requirements. The training will be conducted by the Laboratory Program Manager or his designee. The training will consist of a reading of the QAPP and a follow up review with the Project Manager. Following this training, the first work order will be reviewed by the Project Manager as well, both on the initial receipt of samples and also at the time of reporting. This final stage of training will include a review of the final work product, the case narrative, the field logs and any other program requirements associated with the QAPP. Once the BSK Project Manager has demonstrated sufficient knowledge and understanding of the project, the training will be documented and included in the laboratory's training records.

ELEMENT 9: DOCUMENTS AND RECORDS

Record keeping is a critical component to any research project. The data collected by the Coalition is maintained in multiple locations. Each lab is required to maintain a copy of the data for a specified period of time according to each laboratory's standard record retention requirements.

Record Handling

Copies of the data submitted by the labs to the Coalition are kept at the Coalition office in electronic and, where necessary, hardcopy format. Additional copies of the data are submitted to the Regional Board along with the quarterly and annual reports. Copies of this data are kept at the local Board office in Fresno, the Regional Board office in Rancho Cordova (and at the Coalition's office).

Data is submitted to the Coalition by the BSK Laboratory in PDF format, and stored electronically. This is more efficient than paper copies of the reports, given the voluminous amounts of data generated. CD's containing the data are routinely made and stored in a secure manner.

Data submission is to be in a CEDEN and GeoTracker ESI compatible excel spreadsheet, for SWAMP and GQTMP respectively, prepared by the individual laboratories (in addition to the additional data formats submitted), which will be combined into a single spreadsheet for submission to the Regional Board. Staff at the Regional Board will be responsible for the upload of data into the CEDEN database. Coalition staff will be responsible for the upload of data into the GeotTracker ESI database,

Data collected and held by the Coalition will be stored for a minimum of seven years at the Coalition office. How long the data submitted to the Regional Board is held is unknown. The Laboratories will store the raw data in both hardcopy and electronic format in accordance with their respective record retention requirements. For CA ELAP certified laboratories – a required credential for this program – laboratories are required to maintain all records for a minimum of five years. Sufficient records must be maintained to allow complete reconstruction of the data.

Documents retained by the Coalition may include: paper copies of the field data sheets, executed Chains of Custody, purchase orders for lab services, and printed copies of the Chemistry, Microbiology and Water Column Toxicity results. All of which are also backed up electronically.

Each data submission to the Regional Board will be a standalone file stored electronically with the Coalition. Once SWAMP analysis results are submitted and accepted by the Regional Board, the data will be integrated into the CEDEN database as maintained by the Central Valley Regional Data Center (CV RDC). GQTMP analyses results with be submitted to the Regional Board through the GeoTracker ESI system.

The QAPP, will be submitted to the Regional Board in the form of a CD. Two versions will be submitted, one containing proprietary information regarding chemical testing and the other for public viewing. They will be clearly labeled. A paper copy of each version will be provided to the Regional Board for review on request.

Once the QAPP is approved by the Regional Board and signed by all required parties, an official copy will be maintained and controlled by the Coalition Quality Assurance Manager. The QA Manager will be responsible for distributing the official copy to the recipient list specified in Element 3. Due to its size, the official copy will be distributed via CD, sent either through mail (or similar delivery) or hand delivered to each recipient's location. In the event of a change in the QAPP, the QA Manager will be responsible for ensuring the timely delivery of the latest revision.

Report Format

Reports for the Chemistry, Microbiology and Water Column Toxicity will be provided in a manner consistent with this QAPP required content.

Documentation of the field activities will include copies of field logs with anomalies noted, results for field measurements, executed chains of custody, and any additional forms, records, or logs that contain information critical to the quality of the data obtained from the sampling event.

Analytical Reports or Certificates of Analysis will contain the following information:

a. Project Name
b. Sample Description
c. Sample Date and Time of Collection
d. Collection Technique (e.g. grab, composite)
e. Sample Type (e.g. field sample, field blank, field duplicate)
f. Preparation and Test Method
g. Parameter
h. Result
i. Dilution Factor
j. Reporting and Detection Limit
k. Units
l. Date / Time Prepared and Analyzed
m. Data Qualifies
n. Quality Control Data including Blanks, Spikes, Duplicates, Surrogates
o. Case Narrative explaining all data anomalies or deficiencies
p. Chain of Custody
q. Sample Conditions on Receipt Summary
r. Subcontract Reports

Record Distribution

The Project QA Manager will have the responsibility of ensuring that the stakeholders have the current version of all relevant documentation including the QAPP. The QA Manager will issue control copies of the current QAPP to each QAPP recipient listed in Element 3 of this QAPP. On a change or revision, the QA Manager will retract the old version of the document and replace with the most current version. The same process will be used for all other documents required by this Plan.

ELEMENT 10: SAMPLING PROCESS DESIGN

Sampling will be conducted according to the schedule mandated within the MRP, with visits of all surface water monitoring sites on a monthly basis and groundwater monitoring of wells on an annual basis. The date for the surface water sampling event is held open with Coalition as the presence of water at each sampling location is uncertain. This allows the contracted lab to work with the Coalition staff to determine the appropriate date for surface water sampling collection to maximize the collection of a sample at a time of water flow. The groundwater sample collection will be conducted during the summer months of each year.

Surface Water Sampling Process Design

The sampling design is to test for the specified chemistries at each of the identified surface water monitoring sites, thus creating defined areas that can be easily addressed should detection occur. Modifications to the list of tested chemistries are planned once cropping patterns and pesticide usages are analyzed.

The SWMP study design is a simple one because of the nature of the waterways involved. Nearly all of the river and creek systems within the Tulare Lake Basin have been optimized for irrigation deliveries. The flow in the Tule River below Success Dam is controlled by the Army Corps of Engineers, while Deer Creek and White River are smaller watersheds and uncontrolled streams. The Plan is designed to detect any occurrence of chemical contamination of these waterways, and then to trace the source. The method for the connection of any chemical contamination to its source and, ultimately, the management practices or runoff related events are outlined in the SWMP.

All surface water monitoring sites listed within the MRP will be visited during each month. It is anticipated that several of the sampling sites will only require photo documentation for the majority of the sample dates. This is due to infrequent flow in the waterway. Specific sampling points at each location have been identified and the rationale for each point is detailed in the SWMP.

Should a site become inaccessible due to field conditions that prevent a Coalition or Laboratory representative to safely access the site, the condition of the site will be documented and the sampling site revisited as soon as conditions allow. This documentation will be included with the report submitted for the follow up (or make up) sampling event. Resampling due to accessibility problems will be addressed on a case by case basis and coordinated between the contract Laboratory and the Coalition. However, as noted in the SWMP, part of the rationale for the selection of the sampling points was the reliability of each to be accessible at all but the most extreme conditions.

However, in some cases, resampling may not be an option due to inclement weather or some other water management constraint. In the event that it is determined a surface water sample must be collected, the specific sampling point may need to be modified. The Coalition Program Manager and Technical Lead will make the determination if this modification is required. If so, the Program Manager will have the responsibility of informing the Board of the modified sampling point and the rationale for doing so.

The occurrence of an exceedance at any of the surface water monitoring sites will trigger a review of the possible sites where the detected chemical could have been used. Also, a physical survey may be undertaken to determine where the chemical could have entered into the waterway. The exact course of action will depend upon the chemistry detected, and the conditions that were present when the sample was collected.

One or more of the surface water sampling sites may be wet during the full course of the year. For these samples, a full set of chemical tests (as specified by the MRP) will be analyzed during the first year of the program. Samples will be grab samples of ambient water.

A duplicate sample will be randomly collected from those sites with water present. However, given that some sites are more likely to be dry a portion of the year, those sites having water most of the year will likely be disproportionately chosen during most sampling events for the field duplicate. One duplicate will be collected for each event.

The only sources of natural variation within the testing program are the EC values. These sources of variation are natural, and as such, uncontrollable.

No known sources of bias exist within the testing program. Field instruments, which could be considered a source of bias, are constantly checked for calibration against known standards and rechecked at the field during the course of the day. The laboratories constantly recalibrate their instrumentation as per method, so that source of variation is minimized as well, the resultant data having no more variation than that inherently contained within the test methods employed.

Surface water sampling points for the coalition are identified in Table 5.

Table 5: Coalition Surface Water Sampling Point Coordinates

Site name	CEDEN Code	Latitude	Longitude
Deer Creek at Road 120	558DCR120	35.912400	-119.303729
Deer Creek at Road 176	558DCR176	35.946256	-119.181017
Deer Creek at Road 248	558DCR248	35.9929	-119.017900
Porter Slough near Road 192	558SPR192	36.116285	-119.134132
Tule River at Plano Street Bridge	TBD	36.055865	-119.133987
Tule River at North Fork Road 144	558TRA144	36.129178	-119.246882
Tule River at Road 92	558TRAR92	36.092952	-119.366727
White River ar Road 208	TBD	35.858597	-119.107887

All data collected as part of the sampling (pH, EC, temperature, turbidity, flow) will be considered critical to the program. All data will be used in the assessment of ambient conditions of the overall water quality. Field observations such as outside temperature, wind directions, time of the day, etc. will be considered informational and not critical to the Plan. However, such observations should be documented as they may help explain any possible anomalies in the analytical data such as unexpected detections for parameters that are historically low or absent in the watershed.

The sampling schedule for each location is included in the SWMP.

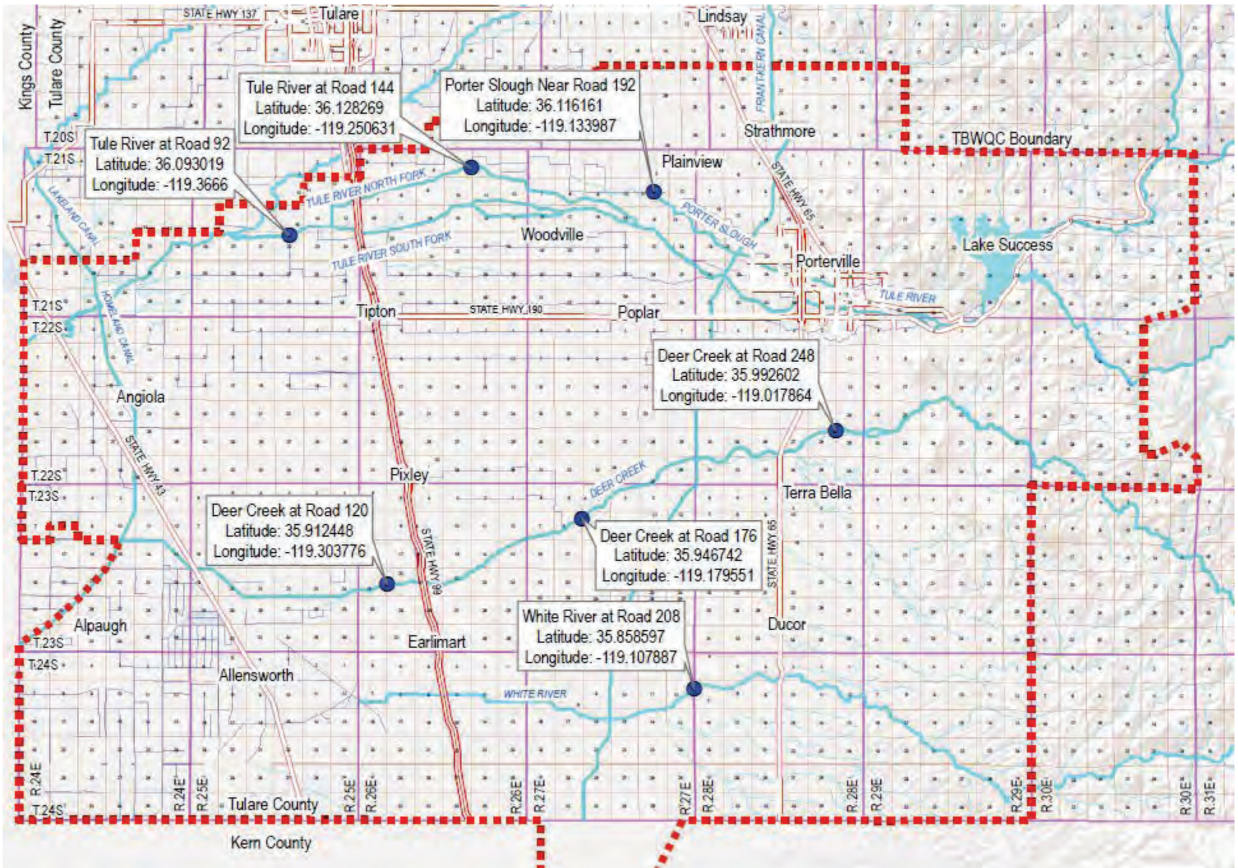


Figure 2: Tule Basin Water Quality Coalition Surface Water Monitoring Sites

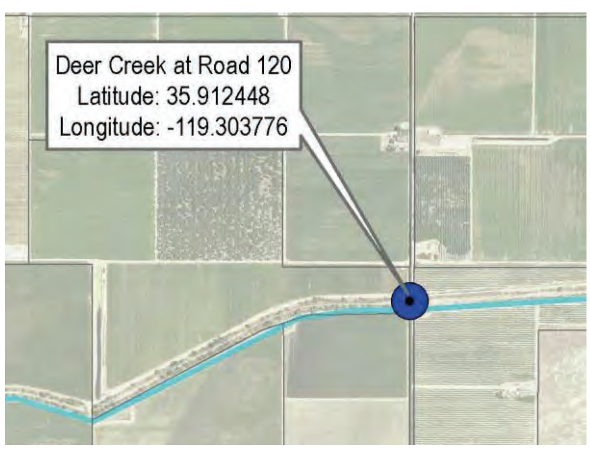


Figure 3: Deer Creek at Road 120 Site Map

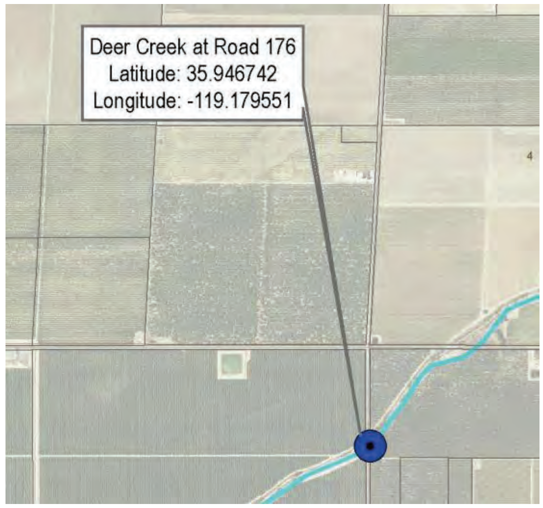


Figure 4: Deer Creek at Road 176 Site Map

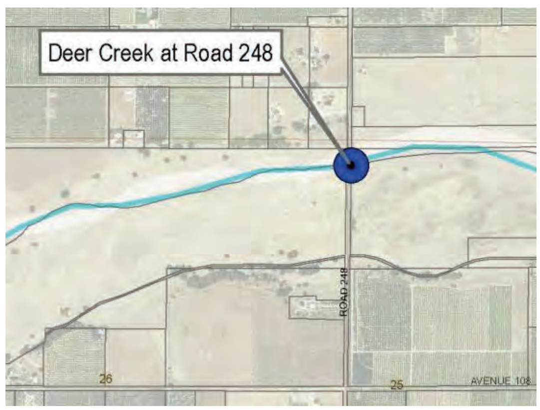


Figure 5: Deer Creek at Road 248 Site Map

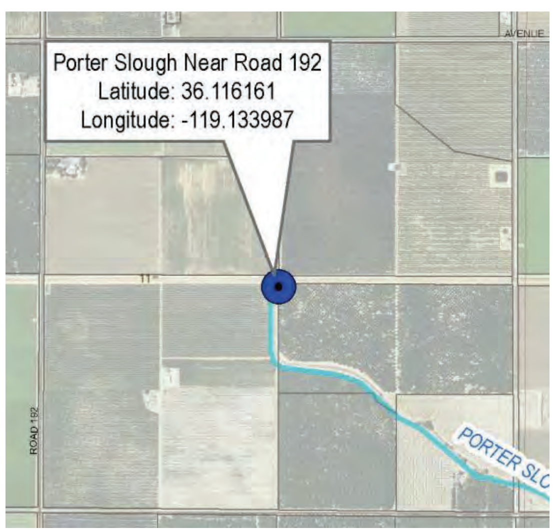


Figure 6: Porter Slough near Road 192Site Map

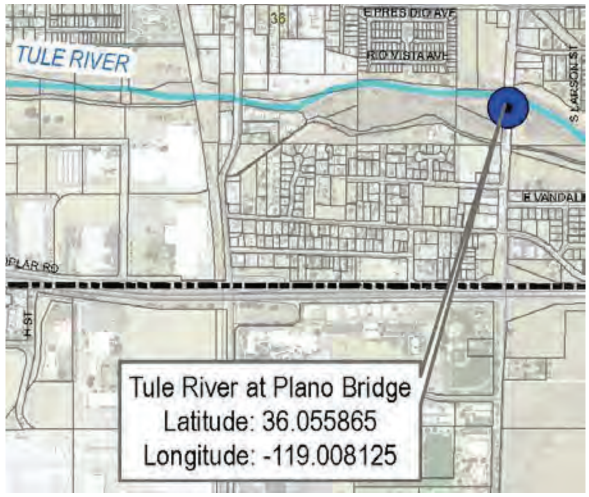


Figure 7: Tule River at Plano Street Bridge Aerial Site Map

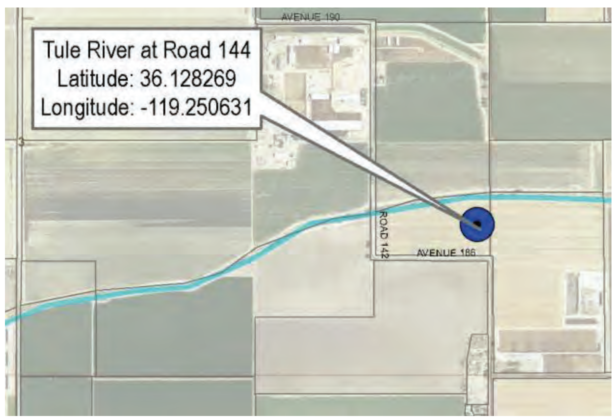


Figure 8: Tule River at North Fork Road 144 Site Map

Figure 9: Tule River at Road 92 Site Map

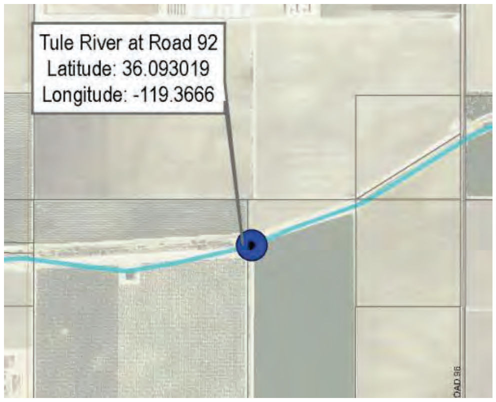


Figure 10: White River at Road 208 Site Map

Groundwater Sampling Process Design

The groundwater monitoring network as outlined in the GQTMW consists of sampling four wells per township, within both the High and Low Vulnerability areas within the TBWQC, provided, adequate existing wells are available. Domestic and shallow irrigation wells considered for the network are required to have permission from owners, be constructed in the upper most aquifer, with construction details, typically in the form of well completion reports.

Before wells are included in the monitoring program they must be reviewed and approved by the RWQCB to meet the requirements outlined in the MRP. Wells are presented to the RWQCB accompanied with GPS coordinates, well completion reports and construction details including: well depth, perforation intervals, seal information, and casing material.

The GQTMW for the TBWQC was designed in a two phased approach, see Figure 10. Phase 1 encompasses the township and ranges associated with disadvantaged communities (DACs) in the Coalition, with selection and monitoring of well beginning during the first year of the program (2018). Phase 2 makes up the remaining township and ranges within the Coalition and selection and monitoring of wells commencing in the second year (2019) of the program. In the third year of the program all wells will be sampled on the same schedule.

Wells in the GQTMP monitoring network will be sampled on an annual interval for a select group of water quality parameters and sampled every five years for a more extensive set of parameters. Monitoring includes field tested water quality parameters and laboratory analysis of nitrate as nitrogen and general minerals. Constituents and their frequency for analysis are outlined in the MRP.

Water samples shall be obtained from the wellhead, or as near the wellhead as possible, not from any point after the pressure tank. Samples shall not be collected from a faucet inside the home. Wells without these physical capabilities for field sampling were not considered for the trend monitoring well, unless a spigot is installed at or near the wellhead.

If the well goes dry (Drought conditions), or if a well is not selected due to field conditions or access limitations, another well will be identified to replace the well that cannot or can no longer be used. The identification of the secondary well, should the selected well be abandoned, in the nine square mile areas of each township will allow time for identification of a replacement without a gap in data within the township. The Coalition Program Manager and Technical Lead will make the determination if a replacement is required. If so, the Program Manager will have the responsibility of informing the RWQCB of the replacement sampling well location and the rationale for doing so.

Wells used for the monitoring network are included in the GQTMW and periodic updates to network development will be provided to the RWQCB.

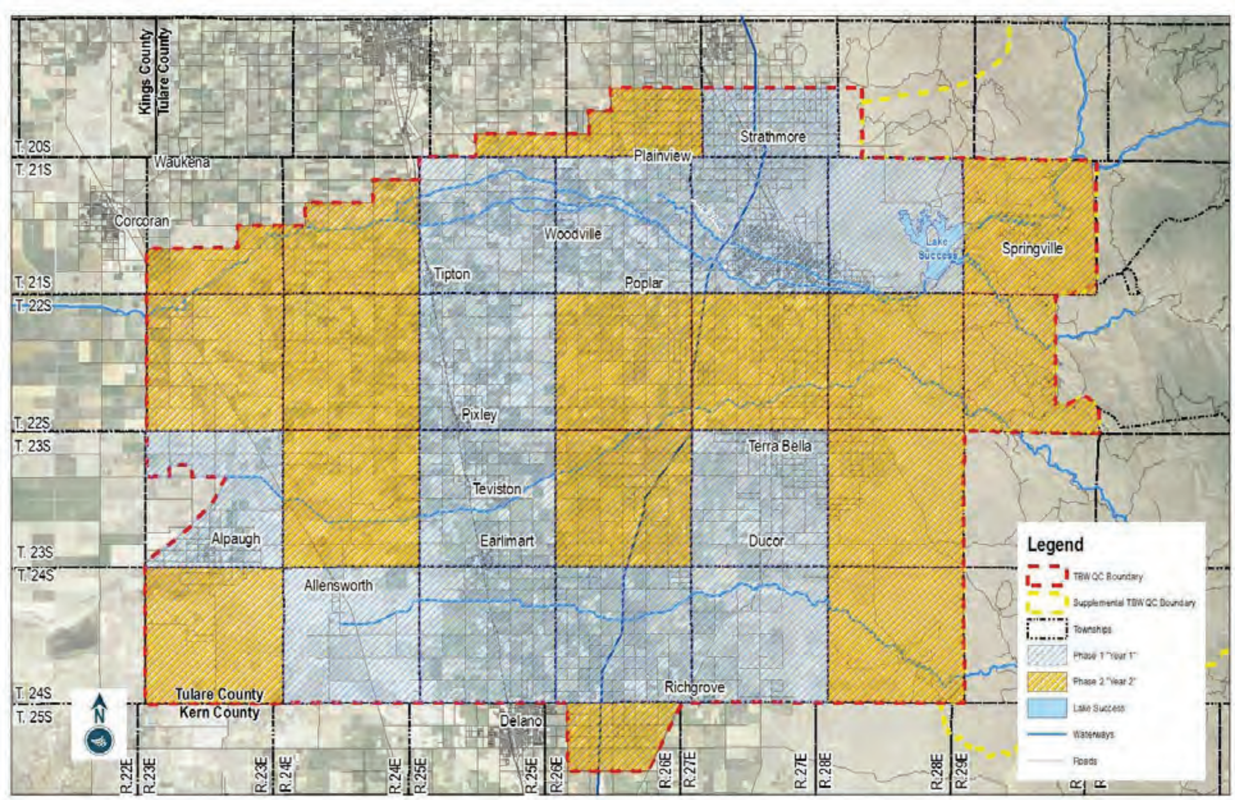


Figure 11: GQTMP Well Network

Element 11: Sampling Methods

A more detailed description of the sample collection procedures are listed in the SOP in Appendix B.1. As part of the sample collection, photo documentation of the monitoring site will occur. Field technicians will photo log the location, both upstream and downstream of the sampling point as well as the actual point of collection. GPS coordinates will be confirmed and if the point of collection changes, new GPS coordinates will be recorded. A change in the location will only occur on notification and approval of the Project Coordinator.

In the case that the sampling crew is responding to a stormwater event and cannot sample at the exact coordinates indicated in this QAPP, samples will be collected upstream and the Project Coordinator will be notified as soon as possible. Sample analysis will not begin until the location has been approved by the Project Coordinator or his designee. If there is a material difference in the location of actual collection versus the targeted location (>75 yds), the Coalition Project Coordinator will be responsible for notifying the RWQCB.

Safety precautions and procedures in the SOPs for *Field Sampling* must be followed by the sampling crew. Sampling cannot be conducted if the water conditions at the site are deemed hazardous or unsafe. The Project Coordinator will be notified as soon as possible when samplings cannot be performed.

General Sampling Requirements

For the **surface water** sample to be deemed acceptable, the following criteria must be met:

1. Water must be present at the sampling location.
2. The sampler must remain downstream of the sample bottle while the sample is being collected.
3. A delay between samples must occur to allow any disturbed sediment to clear the area of sample collection.
4. The Water Column Toxicity sample bottles should be rinsed with sample water before the final sample is collected.
5. The samples must be kept chilled prior to packing with ice for transport.

Unacceptable surface water samples would include samples from waters that are too shallow to completely submerge the sample container without excessive disturbance of the sediment.

For the **water supply well** sample to be deemed acceptable, the following criteria must be met:

1. Prior to collecting a water sample from a supply well, the water well shall be allowed to run for a period of time that is sufficient for water quality parameter readings for temperature, pH, EC, dissolved oxygen, and turbidity to stabilize to within 10 percent.
2. If the well is currently pumping, the sample may be taken without purging the well.
3. Water samples shall be collected from the discharge point nearest the well head.
4. Samples shall be collected directly into laboratory-prepared bottles. and shall not be taken from a location after treatment of the water for domestic use.
5. The samples must be kept chilled prior to packing with ice for transport.

Surface Water Sediment Sample Collection Requirements

Sediment samples are considered acceptable if the depth of the sediment collected does not exceed 1 inch or 2.5 cm (per method). The sediment must be collected within a reasonable distance of the water collection site, and in sufficient volume to perform an adequate analysis.

Unacceptable sediment samples are those collected from depths in excess of 1 inch or 2.5 cm, from distances too far away from the monitoring site (potentially representing different conditions than those present when water samples are collected), and samples of insufficient volume. Failure to transport the sample at controlled temperatures would also constitute an unacceptable sample.

As a safety precaution, sediment collection should only be performed in a shallow, slow flowing stream or canal waterway, where the water is between a minimal surface flow of a few inches to a maximum depth that is below the height of the sampler's knee. The stream or canal flow must be slow flowing of less than one foot per second. Sampling attempted in conditions exceeding these limitations must be conducted with special safety harness, retrieval gear or rescue apparatus.

Sample Collection Volumes

The volume of collected samples are designated by the contracted laboratory to allow for sufficient volume to test, plus additional volume for retesting in the event of laboratory errors (spillage, instrument failure, operator error). Breakage, unfortunately, cannot be anticipated once the sample is delivered to the lab, so no contingency plan is available for such an occurrence. The only recourse is to fully duplicate all samples, which is impractical for all concerned.

Sample Collection Procedures

<u>Pre-Collection</u>

The sequence of events for a sampling event is as follows:

1. Several days before the event, all bottles are collected and labeled for the event. They are then packed into labeled ice chests for transport.
2. The day before the event, the calibration of the field instruments is performed according to manufacturer specifications. Adequate supplies of standard solutions are placed within the field equipment box for instrumentation checks while at the monitoring sites. Battery issues with field instruments are addressed at this time.
3. The day of the sample, chests are loaded into the vehicle along with a chest filled with frozen "blue ice" sample temperature maintaining blocks.

<u>During Collection</u>

Once at a site, the sequence is as follows:

1. One team member begins the filling out of the sample sheet for the site (field sheet and chain of custody), and takes a photo of the site. The monitoring site where the sample is collected does not change from event to event so the GPS coordinates remain the same from event to event. The names of the sampling crew are recorded on the sample sheet.
2. Ice chests to be used at the site are carried from the vehicle to the sample site.
3. Date, sampler, and time of sample are recorded on the bottles within the chests.
4. Field instruments are checked against the standard solutions (pH and EC) where appropriate, and the data recorded.
5. Field sampling technician will don powder free, nitrile gloves to guard against contamination.
6. If entry into the water is required, field technician approaches the sampling point from downstream to minimize the chance of sediment in the collection field. If sediment is materially disturbed, the zone must be allowed to clear before collecting a sample. ***(surface water sampling)***
7. Samples will be taken with a large carboy to minimize the number of bottles carried into the water body. Once filled, the contents of the carboy will be transferred into the actual preserved sample containers.
8. After all bottles have been filled, a fresh sample is analyzed for field parameters: pH, EC, temperature and dissolved oxygen. The stream velocity is also measured and recorded on the field log for surface water sampling.
9. Water samples are collected until all bottles are filled. Care is exercised to repack the bottles to prevent breakage.
10. If a duplicate sample is to be collected at the site, steps 5 – 9 are repeated.
11. Site photos are taken, with photos of the sampling point, upstream and downstream. ***(surface water sampling)***
12. "Blue" or gel ice is placed in the chests once they are carried back to the vehicle.

Following Collection

After the samples are returned to the office, and offloaded from the vehicle, cubed ice is packed into the chests (blue ice is removed). Chemical test samples are then transported to the lab. Water Column Toxicity samples are stored within the office for transport the next morning if the sampling crew returns too late in the day to package and ship to the aquatic toxicity laboratory.

The Laboratory will provide additional sample containers for the Field Duplicate and Site Specific QC (MS/MSDs). The laboratory will identify the bottles by location and by sample type (Dup, MS/MSD). It is critical that the sampling crew fill ALL bottles provided in the manner specified by the laboratory. Failure to fill all containers may result in insufficient quality control data to meet the project data quality objectives.

There is limited sampling equipment required for the collection of both aqueous and sediment samples. For the aqueous samples, a large 3-L carboy is the only container that may be reused between sampling location. To that end, the carboy will be triple rinsed between sampling locations using 300mL of laboratory grade deionized water. The use of any detergent as a cleansing agent could be problematic given the low reporting limit requirements of the program. Once triple rinsed, the carboy will be sealed and remain closed until the next sampling location. Prior to collection at the next site, the carboy shall be rinsed under the above matrix prior to collecting any samples.

Alternatively, the Laboratory may elect to use virgin bottleware for the collection of samples. If so, no decontamination procedures are required. Additional carboys and any other sampling devices will be carried in the event that there is a problem with the carboy or other device that might be shared between locations.

For the sediment samples, the trowel or large scoop is the only device that may be in contact with each sample. Therefore, after use it will be first rinsed with water from the stream where the sample was collected. This is done to remove any remaining solids. It will then be triple rinsed with deionized water, stored in a clean Zip-lock bag and kept sealed till the next sampling site. Once at the next location, it will be rinsed in the river or stream prior to the collection of the next sample.

Post Collection Handling

Transport represents the greatest risk to the sample once collected, and every effort shall be made to package the samples in protective materials. Glass containers are wrapped in “bubble-wrap” both before and after sample collection. Care is exercised when placing the “blue-ice” temperature control materials within the ice chests after the sample is collected, to prevent breakage. Travel speeds on unimproved roads are also limited.

Water Column Toxicity samples are collected in 1-gallon cubitainer jugs, with 6 gallons of sample per site. Each jug is rinsed using sample water prior to filling with the final sample. Headspace is left at top of bottle to reduce risk of bottle breakage at lab.

As stated in the SOP section (Appendix B.1), the field instruments are rinsed in distilled water after the second (duplicate) reading, and stored within the instrument case. The pH meter is returned to a container containing pH 7 solution for transport.

Problems are always unforeseen. Barring a technical failure in the field instrumentation or an accident during or between the sampling events, most anticipated issues can be dealt with in a manner that will not substantially affect data usability. However, technical failures will result in the loss of all data generated by the field instrument from the point of failure on due to the need to return the instrument to the manufacturer for repairs. Battery issues are eliminated by inspecting the instrument during calibration and by maintaining backup supplies for field activities.

Automobile accidents or the dropping of a sample container are by nature unpredictable.

Access restrictions to the monitoring site are likely to be rare, and corrected (if practical) by hiking to the site.

Sufficient staff exists to cover a sampling event in the event of scheduling conflict or illness.

The only samples that require homogenization are the sediment samples, which are collected across the entire main waterway. Individual containers of approximately 1L will be collected with a sufficient number filled to cover all the testing required including the Toxic Identification Evaluation (TIE) if required. Once transported back to the Laboratory, all individual containers will be emptied and combined into a single sample. The sample will be homogenized in a large stainless steel container and once thoroughly mixed, returned to the original containers. These individual containers will then be distributed to the primary contract Laboratory as well as any subcontract laboratories.

ELEMENT 12: SAMPLE HANDLING AND CUSTODY

Samples are to be collected only in containers provided by the laboratory. Substitute containers are strictly forbidden as the integrity of such containers would be unknown. Any alternative containers provided to the laboratory will be rejected unless otherwise authorized in writing by the Project Coordinator and Program QA Manager.

Using the correct container is critical as each test method has specific preservation requirements. Samples are preserved to ensure that the condition of the sample at the time of analysis is consistent with the conditions as it existed in the field. The laboratory uses a variety of conditions to inhibit bacterial growth that would degrade target analytes, to prevent certain constituents from precipitating and falling out of solution, to prevent oxidation/reduction of the various constituents, and to prevent parameters from evolving off as a gas. The preservation technique and storage requirements for each test method are listed in Table 6.

Once collected, each sample and analysis has a finite amount of time before it must be prepared or analyzed. If the time period (known as the holding time) expires, the results may be considered invalid and would normally be a cause for rejection of the subsequent data. The holding times for each test method are listed in the following Table 6.

Table 6: Method Preservation, Storage and Holding Time Requirements

Parameter	Preservative	Container	Storage	Hold Time to Prepare	Hold Time to Analyze
Ammonia/Ammonium	H_2SO_4	Plastic	<6°C	28 Days	-
Carbamates	None	Clear Glass	<6°C	7 Days	40 Days
Carbonate/Bicarbonate	None	Plastic	<6°C	-	14 Days
Glyphosate	$Na_2S_2O_3$	Amber Glass	<6°C	14 Days	-
Hardness (Calc)	HNO_3	Plastic	Ambient	-	180 Days
Herbicides	None	Amber Glass	<6°C	7 Days	40 Days
Metals	HNO_3	Plastic	Ambient	-	180 Days
Metals (Dissolved)	None	Plastic	Ambient	-	180 Days
Nitrate, Nitrite	None	Plastic	<6°C	-	48 Hours
OCl Pesticides	None	Amber Glass	<6°C	7 Days	40 Days
OP Pesticides	None	Amber Glass	<6°C	7 Days	40 Days
o-Phosphate	None	Plastic	<6°C	-	48 Hours
Paraquat	$Na_2S_2O_3$	Amber Plastic	<6°C	7 Days	21 Days
Pathogens	$Na_2S_2O_3$	Acrylic	<6°C	8 Hours	-
Pyrethroids (Sediment)	None	Clear Glass	<6°C	14 Days	40 Days
Solids (TDS and TSS)	None	Plastic	<6°C	-	7 Days
TOC	H_3PO_4	Clear Glass	<6°C	-	28 Days
Toxicity	Chilled to <6°C/wet ice	Plastic	<6°C	-	36 Hours
Triazine Pesticides	None	Amber Glass	<6°C	7 Days	40 Days
Turbidity	None	Plastic	<6°C	-	48 Hours

Samples are transported within ice chests that contain “blue ice” blocks to maintain low temperatures until the samples can be packed with wet ice. Glass bottles are wrapped in bubble wrap to prevent breakage (it also insulates the samples before they are packed in ice). Toxicity samples are repacked in ice (or have the levels checked) the next morning prior to transport.

Chains of custody forms are provided by the contracted lab and include all of the required information for the proper handling of the samples collected. As the sample passes from the control of one entity to another, the form is signed off by the responsible parties. Copies of the completed custody forms are provided with the final lab reports.

The Quality Assurance Manager and Laboratory Coordinators are responsible for the review and filing of the chains of custody forms.

Once at the lab, the condition of the samples is logged, with copies of the log appended to the lab report. Barcodes are attached to the samples and logged in a computerized tracking system.

Storage of the samples, once they are released to the lab, will be at the condition specified above. Any exceptions to the holding times listed above are noted in the laboratory report and are addressed on a case by case basis. Sample preservation is effectively handled by the chemistry lab as the bottles supplied are pre-treated with the proper preservation (if required, see above Table 6). Samples with pH preservation will be checked on receipt to verify that the sample has reached the proper pH. Any deviations from the method preservation requirements will be brought to the attention of the Project Lead. The laboratory will not proceed with the analysis of any improperly preserved samples without the approval of the Project Lead. Any samples analyzed that were not received under proper preservation will be noted in the report case narrative.

Records are maintained within the contracted lab that includes the checking in and out of samples during the analytical process as well as the disposal of samples following completion of the analytical process and archival. Samples are held under proper storage conditions until all analyses are conducted. Once complete, samples will be moved to a temporary archive where they await disposal. Samples are held by the laboratory for 60 days prior to being disposed.

ELEMENT 13: ANALYTICAL METHODS AND FIELD MEASUREMENTS

Standard Operating Procedures

The contract laboratory utilizes a number of EPA or Standard Methods preparation and determinative methods. The laboratory has SOPs for each method employed as well as SOPs for the procedural activities in the laboratory. The following Table 7 lists the method specific SOPs for this project with the current revisions at the time of submittal of this QAPP. Laboratory SOPs are periodically reviewed and may be updated as necessary.

Table 7: Standard Operating Procedures

Parameter	Method Description	Doc ID	Rev. Date
Ammonia	Ammonia by Gas Diffusion and Automated Phenate	IO-SP-0036-01	1/16/15
Anions	Anions by Ion Chromatography	IO-SP-0085-03	12/18/17
Alkalinity	Alkalinity by PC-Titrate	IO-SP-0061-09	8/17/16
Glyphosate	Glyphosate by HPLC, Post Column Derivatization	OR-SP-0009-06	7/28/17
Hardness	Hardness by Calculation	IO-SP-0044-02	2/17/17
Metals	Metals by ICP-MS	MT-SP-0008-01	11/2/17
	Metals by ICP-AES	MT-SP-0007-01	11/6/17
	Total Recoverable Metals Preparation	MT-SP-0001-01	10/31/18
Ortho-Phosphate and Phosphorus	o-Phosphate and Phosphorus by Ascorbic Acid Reduction	IO-SP-0072-04	6/20/16
Paraquat	Paraquat by SPE, HPLC-UV	OR-SP-0011-06	5/25/17
Pathogens	Multi-Tube Fermentation for Total and Fecal Coliform, and E. Coli	WM-SP-0002-04	11/14/17
Pesticides – N,P, Pyrethroids	Nitrogen, Organophosphorous Pesticides Pyrethroid Pesticides by GC/MS	OR-SP-0034-02	2/17/17
Pesticides – OCl	Organochlorine Pesticides by GC-ECD	OR-SP-0019-04	3/28/17
Solids (TDS and TSS)	Solids by Gravimetric Determination	IO-SP-0020-05	3/29/16
Total Organic Carbon	TOC by TOC analyzer (SM 5310C)	IO-SP-0067-07	12/18/17
Toxicity – Algae	Chronic toxicity	EPA-821-R-02-013	2002
Toxicity – Flea	Acute toxicity	EPA-821-R-02-012	2002
Toxicity - Minnow	Acute toxicity	EPA-821-R-02-012	2002
Toxicity - Hyalella	10 Day Sediment Survival and Growth Test – Hyalella azteca	EPA-600-R-99-064	2000
Turbidity	Turbidity by Nephelometry	IO-SP-0029-04	4/20/15
Sample Collection	Field Sampling from Streams, Rivers and Canals	SR-SP-0015-01	6/8/16
Sample Collection	Safety for Stream and Canal Sampling	SF-SP-0010-00	6/6/16

Copies of these SOPs can be found in Attachment B. These SOPs are considered proprietary information by the laboratory and will be redacted for the purpose of the public version of this QAPP.

Instrumentation

The contract laboratory will utilize a wide range of equipment in the performance of the analytical testing. While not exhaustive in content, the following list of equipment represents the minimal amount of instrumentation required to perform the testing under this Plan. The list does not indicate each individual piece of equipment as the laboratory maintains redundant equipment in many cases.

See Tables 11, 12 and 13 for a listing of field and laboratory instrumentation.

Field Monitoring

All field measurements will be performed at the time of sampling. There will be no *in situ* or continuous monitoring of field conditions at the specific monitoring sites. Any information about the conditions at the sampling points between sampling events would need to be inferred from other indirect sources such as water flows at points upstream or downstream or measurements made or samples collected and analyzed for other purposes. Otherwise, there are no other requirements for the deployment, maintenance, calibration or storage of related data for field equipment.

Method and Instrument Performance Criteria

The contract laboratory performs testing for several watersheds in support of their ILRP monitoring requirements. The test methods employed have been tailored to meet the requirements of this Plan to ensure compliance with the General Order, WDR and QAPP guidelines. All methods utilized are based on approved, standardized methods. There are no other "in-house" or non-standardized methods used for this Plan.

The contract laboratory will observe the following list of performance criteria for the testing done in support of this Plan.

Quantitation and Detection Limits

Table 8: Methods, Reporting Limits and Detection Limits

		BSK Reporting Information			
Constituent	**ILRP PQL**	**RL**	**MDL[1]**	**Units**	**Method**
Physical Parameters					
Flow	1	-	-	cfs	Field
pH	0.1	0.1	-	pH Units	Field
EC	100	5	-	umhos/cm	Field
DO	0.1	0.1	-	mg/L	Field
Temp	0.1	-	-	°C	Field
Turbidity	1	0.1	-	NTU	SM 2130B
TDS	-	10	-	mg/L	SM 2540C
TSS	10	10	-	mg/L	SM 2540D
Hardness as CaCO3	10	0.41	-	mg/L	SM 2340B
TOC	-	0.5	0.086	mg/L	SM 5310C
Percent Solids / Moisture	-	0.1	-	%	SM 2540B
Pathogens					
Fecal Coliform	2	1.8	-	MPN/100mL	SM 9221E
E. coli	2	1.8	-	MPN/100mL	SM 9221F
Water Column Toxicity					
Algae	NA	NA	NA	Cell/mL, % Growth	EPA 821-R-02-013
Water Flea	NA	NA	NA	% Survival	EPA 821-R-02-012
Fathead Minnow	NA	NA	NA	% Survival	EPA 821-R-02-012
Sediment Toxicity					
Hyalella azteca	NA	NA	NA	% Survival	EPA 600-R-99-064
Carbamates					
Aldicarb	0.5	0.4	0.017	ug/L	EPA 8321A
Carbaryl	0.5	0.1	0.022	ug/L	EPA 8321A
Carbofuran	0.5	0.1	0.021	ug/L	EPA 8321A
Methiocarb	0.5	0.4	0.014	ug/L	EPA 8321A
Methomyl	0.5	0.1	0.018	ug/L	EPA 8321A
Thiobencarb	-	0.5	0.0065	ug/L	EPA 8270C
Oxamyl	0.5	0.4	0.021	ug/L	EPA 8321A
Organochlorines					
DDD	0.02	0.01	0.00072	ug/L	EPA 8081A
DDE	0.01	0.01	0.00061	ug/L	EPA 8081A
DDT	0.01	0.01	0.0007	ug/L	EPA 8081A
Dicofol	0.1	0.1	0.015	ug/L	EPA 8270C
Dieldrin	0.01	0.01	0.00097	ug/L	EPA 8081A

		BSK Reporting Information			
Constituent	**ILRP PQL**	**RL**	**MDL[1]**	**Units**	**Method**
Endrin	0.01	0.01	0.00081	ug/L	EPA 8081A
Methoxychlor	0.05	0.01	0.00091	ug/L	EPA 8081A
Toxaphene	-	0.5	0.035	ug/L	EPA 8081A
Organophosphates					
Azinphos-methyl (Guthion)	0.1	0.1	0.032	ug/L	EPA 8270C
Chlorpyrifos	0.015	0.015	0.0029	ug/L	EPA 8270C
Diazinon	0.02	0.02	0.0036	ug/L	EPA 8270C
Dichlorvos	0.1	0.1	0.0048	ug/L	EPA 8270C
Dimethoate	0.1	0.1	0.0075	ug/L	EPA 8270C
Demeton-S (Demeton [O,S])	0.1	0.1	0.025	ug/L	EPA 8270C or EPA 8321A
Disulfoton	0.05	0.05	0.025	ug/L	EPA 8270C or EPA 8321A
Malathion	0.1	0.1	0.0046	ug/L	EPA 8270C
Methamidophos	0.2	0.2	0.022	ug/L	EPA 8270C or EPA 8321A
Methidathion	0.1	0.1	0.011	ug/L	EPA 8270C
methyl Parathion	0.1	0.1	0.003	ug/L	EPA 8270C
Phorate	0.2	0.1	0.0033	ug/L	EPA 8270C
Phosmet	0.2	0.2	0.03	ug/L	EPA 8270C
Herbicides					
Atrazine	0.5	0.5	0.029	ug/L	EPA 8270C
Simazine	0.5	0.5	0.024	ug/L	EPA 8270C
Cyanazine	0.5	0.5	0.036	ug/L	EPA 8270C
Diuron	0.5	0.4	0.022	ug/L	EPA 8321A
Molinate	-	0.5	0.0043	ug/L	EPA 8270C
Glyphosate	5	5	2.1	ug/L	EPA 547
Paraquat	0.5	0.4	0.21	ug/L	EPA 549.2
Linuron	0.5	0.4	0.014	ug/L	EPA 8321A
Trifluralin	0.05	0.05	0.0056	ug/L	EPA 8270C
Metals (Total /Dissolved)					
Arsenic	1	0.2	0.059	ug/L	EPA 200.8
Boron	10	10	4.6	ug/L	EPA 200.8
Cadmium	0.1	0.1	0.075	ug/L	EPA 200.8
Calcium	-	0.1	0.046	mg/L	EPA 200.7
Copper	0.5	1.1	0.49	ug/L	EPA 200.8
Lead	0.5	0.2	0.041	ug/L	EPA 200.8
Magnesium	-	0.1	0.046	mg/L	EPA 200.7
Molybdenum	1	0.5	0.32	ug/L	EPA 200.8
Nickel	1	1	0.20	ug/L	EPA 200.8

		BSK Reporting Information			
Constituent	**ILRP PQL**	**RL**	**MDL[1]**	**Units**	**Method**
Potassium	-	2	0.91	mg/L	EPA 200.7
Selenium	1	1	0.76	ug/L	EPA 200.8
Sodium	-	1	0.46	mg/L	EPA 200.7
Zinc	1	1	0.68	ug/L	EPA 200.8
Nutrients					
Nitrate-N	0.05	0.06	0.028	mg/L	EPA 300.0
Nitrite-N	0.05	0.05	0.020	mg/L	EPA 300.0
Ammonia	0.1	0.1	0.038	mg/L	EPA 350.1
Orthophosphate (as P)	0.01	0.01	0.0049	mg/L	SM 4500-P E
Phosphorus-P	-	0.01	0.0015	mg/L	SM 4500-P E
General Mineral					
Carbonate as CaCO3	-	3	-	mg/L	SM 2320B
Bicarbonate as CaCO3	-	3	-	mg/L	SM 2320B
Chloride	-	1	0.51	mg/L	EPA 300.0
Sulfate	-	1	0.40	mg/L	EPA 300.0
Pyrethroids / Chlorpyrifos					
Chlorpyrifos	-	10	0.36	ug/Kg	EPA 8270C
Bifenthrin	1.0	1.0	0.12	ug/Kg	EPA 8270C
Cyfluthrin	1.0	2.0	0.39	ug/Kg	EPA 8270C
Cypermethrin	1.0	2.0	0.54	ug/Kg	EPA 8270C
Deltamethrin	-	2.0	0.47	ug/Kg	EPA 8270C
Esfenvalerate (+Fenvalerate)	1.0	1.0	0.45	ug/Kg	EPA 8270C
Fenpropathrin	1.0	1.0	0.077	ug/Kg	EPA 8270C
Permethrin (cis-Permethrin)	1.0	1.0	0.11	ug/Kg	EPA 8270C
Lambda Cyhalothrin	1.0	1.0	0.062	ug/Kg	EPA 8270C
Piperonyl Butoxide	-	0.5	0.19	ug/Kg	EPA 8270C

1. The MDLs listed are those in existence at the time this QAPP was written. MDLs may change over time as the laboratory conducts ongoing studies due to changes in the method or equipment or is required to do so as per the SWAMP requirements.

Method Performance

The laboratory will observe the following method and instrument criteria for this project.

Table 9: Laboratory Method QC Criteria

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spike (LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
Ammonia	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<RL*	*1 per batch of 20 samples, 90-110%*	*1 per batch of 20 samples, 20% RPD*	*1 per batch of 20 samples, 90-110%*	*1 per batch of 20 samples, 20% RPD*	*≤25% RPD*	*N/A*
Carbamates	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<MDL*	*1 per Batch of 20 Samples, 50-150%*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, 50-150%*	*1 per Batch of 20 Samples, 30% RPD*	*≤30% RPD*	*Applied to all samples and QC, 50-150%*
Glyphosate	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 20%, Continuing Verification every 10 field samples, %Diff ≤ 20%*	*<MDL*	*1 per batch of 20 samples, 70-130%*	*1 per Batch of 20 Samples, 30% RPD*	*1 per batch of 20 samples, 70-130%*	*1 per Batch of 20 Samples, 30% RPD*	*≤30% RPD*	*Applied to all samples and QC, 70-130% Rec*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spike (LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
Hardness (Calc)	*Performed by Calculation. See Metals QC Criteria.*	*Performed by Calculation. See Metals QC Criteria.*	*<RL*	*Performed by Calculation. See Metals QC Criteria.*	*Performed by Calculation. See Metals QC Criteria.*	*Performed by Calculation. See Metals QC Criteria.*	*Performed by Calculation. See Metals QC Criteria.*	*≤25% RPD*	*N/A*
Herbicides	*5 Pts Min. (Linear Fit, R≥0.995 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples, %Diff ≤ 15%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 10 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤30% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*
Metals	*Single Point calibration plus Calibration Blank, multi-point curves must be fit using Linear Regression, R≥0.995*	*2nd Source Verification following calibration, %Diff ≤ 10%, Reporting Limit Verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<2.2x MDL*	*1 per batch of 20 samples, 85-115%*	*1 per batch of 20 samples, 20% RPD*	*1 per batch of 20 samples, 70-130%*	*1 per batch of 20 samples, 20% RPD*	*≤25% RPD*	*N/A*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spike (LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
Anions – Nitrate, Nitrite, Chloride, Sulfate	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<RL*	*1 per batch of 20 samples, 90-110%*	*1 per batch of 20 samples, 20% RPD*	*1 per batch of 10 samples, 80-120%*	*1 per batch of 10 samples, 20% RPD*	*≤25% RPD*	*N/A*
OCl Pesticides	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples, %Diff ≤ 15%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤30% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*
OP Pesticides	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples or 12 hours , %Diff ≤ 20%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤30% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spike (LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
o-Phosphate	*5 Pts Min. (Linear Fit, R≥0.995)*	*2^{nd} Source verification following calibration, %Diff ≤ 15%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<RL*	*1 per batch of 20 samples, 90-110%*	*1 per Batch of 20 Samples, 20% RPD*	*1 per batch of 20 samples, 80-120%*	*1 per Batch of 20 Samples, 20% RPD*	*≤25% RPD*	*N/A*
Phosphorus	*5 Pts Min. (Linear Fit, R≥0.995)*	*2^{nd} Source verification following calibration, %Diff ≤ 15%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<RL*	*1 per batch of 20 samples, 90-110%*	*1 per Batch of 20 Samples, 20% RPD*	*1 per batch of 20 samples, 80-120%*	*1 per Batch of 20 Samples, 20% RPD*	*≤25% RPD*	*N/A*
Paraquat	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 20%, Continuing Verification at the beginning of the run, every 8 hours or 20 samples minimally*	*<MDL*	*1 per batch of 20 samples, 70-130%*	*1 per Batch of 20 Samples, 30% RPD*	*1 per batch of 20 samples, 70-130%*	*1 per Batch of 20 Samples, 30% RPD*	*≤30% RPD*	*N/A*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spike (LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
		thereafter, %Diff ≤ 20%							
Pathogens	*N/A*	*N/A*	*<RL[1]*	*N/A[1]*	*N/A*	*N/A*	*N/A*	*≤25% RPD*	*N/A*
Pyrethroids	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples or 12 hours , %Diff ≤ 20%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤30% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*
Solids (TDS, TSS)	*N/A*	*N/A*	*<RL*	***(TDS Only)*** *1 per Batch of 20 Samples, 70-130%*	*N/A*	*N/A*	*<20% RPD (Lab Dup)*	*≤25% RPD*	*N/A*
Toxicity	*N/A*	*N/A*	*0%*	*0%*	*NA*	*NA*	*NA*	*NA*	*NA*
Triazine Pesticides	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples or*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤30% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spike (LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
		12 hours , %Diff ≤ 20%							
Turbidity	*Single Point calibration plus Calibration Blank, dependent on expected range of use*	*2nd Source Verification following calibration, %Diff ≤ 10%, Reporting Limit Verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<RL*	*N/A*	*N/A*	*N/A*	*<20% RPD (Lab Dup)*	*≤25% RPD*	*N/A*
Alkalinity - Carbonate, Bicarbonate	*N/A*	*N/A*	*<RL*	*1 per Batch of 20 Samples, 80-120%*	*1 per Batch of 20 samples, 20% RPD*	*N/A*	*<20% RPD (Lab Dup)*	*≤25% RPD*	*N/A*

1. Pathogen analysis requires a daily positive control and negative control. BSK also performs a daily sterility check on prepared media.

Disposal Procedures

Most of the sample collected for any given monitoring event will be consumed as part of the analyses. However, as noted above, the contract laboratory will retain the remaining sample volume for a period of 60 days from receipt of the samples, approximately 45 days from the completion based on the standard turnaround time of 10 business days.

Once identified for disposal, samples are segregated into groups according to their waste classification. Any samples identified as hazardous based on the outcome of their testing will be put into the laboratory's waste streams and handled in accordance with EPA and DTSC regulations. Samples that are not determined to be hazardous based on the results of their testing will be disposed of according to their preservation type. Acidic and caustic samples will be neutralized and discarded down the sanitary sewer according to the local and Federal pre-treatment guidelines. Samples that are neutral are poured directly into the drain and flushed. Sample containers are rinsed and then recycled according to their material classification.

The laboratory maintains disposal records to indicate when each set of samples has been disposed.

Corrective Action Measures

The laboratory will take a variety of corrective actions for material failures related to sample conditions, holding time failures, preservation problems and quality control failures. All failures and corrective actions will be documented in the form of a data qualifier and / or addressed in detail in the Case Narrative at the beginning of the laboratory report. The details of these responses are included in the various method SOPs and other related supporting documentation. However, the general corrective actions related to a number of common QC failures are listed below:

<u>Calibration Linearity</u> failures are often caused by instrumentation that is in need of maintenance. If a calibration curve fails to meet linearity criteria, the instrument will be repaired and likely a new set of calibration standards prepared. Once complete, the instrument will be recalibrated.

<u>Initial (ICV) and Continuing Calibration (CCV)</u> failures occur periodically on the laboratory instrumentation. Often times these failures are associated with running large numbers of dirty samples which deteriorate the performance of the equipment. ICV failures will generally be handled by the preparation of a new set of calibration standards and ICV standard, and reanalysis of the ICV and CCV. This is often done in conjunction with maintenance performed consistent with that tied to calibration linearity problems.

<u>Method Blank Contamination</u> failures indicate that the ambient laboratory background may be contributing to sample contamination. The response to specific methods will vary but in general, any detection over a Reporting Limit (RL) will result in the re-

preparation and reanalysis of the associated samples unless the sample results are greater than 10x that found in the blank. Certain methods have corrective action requirements for detections above the MDL or at a multiple of the MDL. Those will be addressed on a case by case basis. All detections in the Method Blanks having a material impact on the data as defined by the ILRP QAPP guidelines will be addressed in the report case narrative.

Laboratory Control Spike Recovery and Precision failures are indicative of a problem in the analytical procedure. Recovery failures are generally addressed by a re-preparation and reanalysis of all samples and QC indicators. Several exceptions may be made where recoveries exceed the upper control limit and samples are non-detected for the failed compound. Precision failures will generally follow the same corrective action plan unless the RPD limit is narrower than the acceptance range for Recovery performance. Under those circumstances, the laboratory will not reject the results but will qualify the data to note the failure.

Matrix Spike Recovery and Precision failures indicate that the sample matrix itself may have some adverse effect on the method performance. However, if the LCS/LCSD recoveries meet control criteria, no corrective action will be needed. The problem at that point is assumed to be associated with the sample matrix itself and beyond the reasonable control of the laboratory. Sample results will be qualified and a note will be made in the case narrative. However, repeated failures for the same analyte will trigger an investigation as the ongoing failure may indicate that the method is poorly suited for a particular sample type and should be modified to address the performance issue.

Laboratory Duplicate failure may indicate a problem with sample homogeneity. On a Lab Duplicate failure, the sample itself will be examined for obvious matrix homogeneity issues. If there are no obvious reasons for the nature of the failure, the samples will be re-prepared and reanalyzed. If an obvious cause is determined, the sample results will be qualified and a note made in the case narrative. However, laboratory duplicate failures that occur when sample results are less than 10x the RL will be ignored as the magnitude of the RPD can be disproportionately affected by low sample results.

Field Duplicate failures indicate homogeneity or sampling issues that occur in the field. No corrective action is taken with such failures with the exception of qualifying the data and making a notation in the case narrative.

Surrogate Recovery failures will be addressed on a case by case basis. Samples with failing surrogate recoveries may be biased either high or low. Surrogate failures on clean matrices with no obvious sample interferences will be re-extracted if possible. Repeated failures will be assumed to be caused by matrix interference. If no re-extraction is possible, the data will be qualified. High surrogate failures on non-detected samples will be treated as immaterial to data usability and qualified only to call attention to the failure.

ELEMENT 14: QUALITY CONTROL

The laboratory will perform the following QC measures listed in Table 10 under this Plan.

Table 10: Required Quality Control by Method

	Samples per Batch	Method Blank	LCS / LCSD	MS / MSD	Lab Dup	Surr. Spike	Field Dup
Ammonia	20	X	X	X		N/A	X
Bicarbonate/ Carbonate Alkalinity	20	X	X		X	N/A	X
Carbamates	20	X	X	X		X	X
Glyphosate	20	X	X	X		X	X
Hardness (Calc)	20	X[3]	X[3]	X[3]		N/A	X
Herbicides	20	X	X	X		X	X
Metals	20	X	X	X		N/A	X
Anions	20	X	X	X		N/A	X
OCl Pesticides	20	X	X	X		X	X
OP Pesticides	20	X	X	X		X	X
o-Phosphate	20	X	X	X		N/A	X
Phosphorus	20	X	X	X		N/A	X
Paraquat	20	X	X	X			X
Pathogens	-	X[1]	X[1]	N/A		N/A	X
Pyrethroids	20	X	X	X		X	X
TOC	20	X	X	X		N/A	X
TDS	20	X	X[2]		X	N/A	X
TSS	20	X			X	N/A	X
Triazine Pesticides	20	X	X	X		X	X
Turbidity	20	X	N/A	N/A	X	N/A	X
Toxicity	NA	X[4]	X[4]	N/A	NA	N/A	X

1. Laboratory performs a sterility check, positive and negative control per day
2. Laboratory analyzes a certified standard reference material for TDS
3. QC for Hardness performed in analysis of Calcium and Magnesium which are used to determine Hardness by calculation
4. Laboratory performs a 0% control per test batch and reference toxicant per test batch or monthly depending on the species.

QC Definitions and Specifications - Chemistry

Method Blank

The method blank is a simulated sample comprised of a clean, interference-free matrix (typically deionized water) that is carried through the sample preparation and analysis procedure. It is used to determine if the ambient laboratory background is free from contaminants that may influence sample results. The results of the Method Blank are assessed against the MDL and RL, depending on the method. Contamination in a method blank may require corrective action as described in Element 13.

Laboratory Control Spike / Duplicate (Blank Spike / Duplicate)

The Laboratory Control Spike – sometimes referred to as Blank Spike – is an interference-free matrix that is fortified with the target analyte at a level reasonably expected to be found in the field sample. Alternatively, laboratories typically fortify at a level that is roughly the midpoint of the calibration range. The result obtained for this "spike" is compared to the level of fortification that results in a recovery value. The recovery is compared to a set of control limits to determine if the method is performing as expected.

LCS or BS recovery is determined according to the following calculation:

$$\%\ \text{Recovery} = \frac{Result\ Observed}{Fortification\ Level} \times 100$$

LCS or BS Duplicate results are evaluated not only for recovery but also for Relative Percent Difference (RPD), a measure of precision. RPD is determined by the following calculation:

$$Relative\ Percent\ Difference = \frac{|LCS\ Res - LCSD\ Res|}{Avg\ (LCS,\ LCSD)} \times 100$$

Matrix Spike / Duplicate

The Matrix Spike (MS) is a sample that has been fortified in the same manner as the LCS or BS. The MS result demonstrates the impact of the sample matrix on the method performance. MS performance is also based on recovery that is calculated as follows:

$$\%\ \text{Recovery} = \frac{(MS\ Result - MS\ Parent\ Sample\ Result)}{Fortification\ Level} \times 100$$

The Matrix Spike is also performed in duplicate to provide the data user with an indication of the impact of the sample matrix on the precision or reproducibility of the method. The MS Duplicate is assessed by RPD which is calculated as follows:

$$Relative\ Percent\ Difference = \frac{|MS\ Res - \ MSD\ Res|}{Avg\ (MS,\ MSD)} \times 100$$

Laboratory and Field Duplicates

A Laboratory Duplicate is a second aliquot of a sample taken from the same container as the original sample that is run in parallel with the original parent sample. The duplicate performance will indicate if the method and / or sample has some inherent variability that is atypical for the method. Like the LCSD or MSD, the Laboratory Duplicate is assessed based on RPD that is calculated in the same manner, comparing the result of the parent sample to that of the duplicate and dividing by the average of the two observations.

$$Relative\ Percent\ Difference = \frac{|Parent\ Res - Duplicate\ Res|}{Avg\ (Parent, Duplicate)}\ X\ 100$$

A Field Duplicate is a second collection of a sample, captured in its own unique container. The Field Duplicate is treated in the same manner as all other samples and is likewise assessed based on the same RPD calculation shown for the laboratory duplicate.

A failure of either the Laboratory or Field Duplicate indicates a potential lack of homogeneity in the sample collection or subsampling procedures.

- On failure of a Field Duplicate, the laboratory will inspect the sample containers for any observable differences between the primary and duplicate samples. If a material difference is observed (e.g. significant suspended or settled matter, differences in color or other physical characteristics), the laboratory will review both the field logs and the sampling procedure for any potential sources of variation. If there is an indication that a sampling error occurred, then the Coalition will be notified to make a determination regarding the usability and representativeness of the sample. If no problems are identified, the data will be qualified to indicate the discrepancy between results and reported to the Coalition.

- On failure of a Laboratory Duplicate, the laboratory will inspect the individual sample container used for the duplicate to ensure a correct subsampling occurred. If there is no obvious source of error, the laboratory will reanalyze the sample in duplicate to assess the situation. If a repeated error occurs, then the original data will be qualified and reported to the Coalition. If the error is no longer observed, then the original results will be discarded and the reanalysis will be reported. If there is an observable homogeneity issue that the laboratory cannot overcome, the results will be qualified as estimated values and reported to the Coalition.

QC Definitions and Specifications – Microbiology

Method Blank (Sterility Check)

The “method blank” for microbiology is a sterility check conducted on all the materials used in the analysis of all field samples, if the sterility check confirms there to be no ambient microbial background which could contribute to the presence of bacteria in the field samples. Positive growth in a sterility check would indicate that the materials used in the analysis of the samples may be contaminated and therefore all associated results should be rejected as suspect.

Negative Control

A Negative Control is used to ensure that the media used in the analysis of samples does not support growth for any pathogen other than that specifically targeted by the method. Should a Negative Control exhibit growth, it would indicate that the media in use is not specific enough for the pathogen and that growth observed for the samples may be attributable to species other than that of interest for the project.

Positive Control

The Positive Control sample ensures that the media used in the analyses of a pathogen is suitable for growing the species of interest. If a positive control exhibits no growth, then sample results are suspect as potential false negatives. The positive control must exhibit some growth to prove that the media can support the culturing of the target species.

QC Definitions and Specifications – Toxicology

0% Control

The 0% Control is used to assess the cleanliness of the laboratory environment and the quality of the laboratory grade water used for sample dilution. The control should not experience any mortality, as this would be indicative of a toxic substance in the dilution water which is adding to any toxicity attributable to the sample.

Reference Toxicant

The Reference Toxicant is a known toxicant that is tested with the organisms to evaluate their response. This demonstrates that the method performance is within plus or minus two standard deviations from the mean of past tests conducted with a particular organism.

ELEMENT 15: INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

The ready availability of equipment shall be maintained by the contract laboratory and the TBWQC as they are responsible for both the field and in-house laboratory analyses

Field Instrumentation / Equipment

Field units are maintained constantly as they are subject to use on applications other than under this Plan. The instruments are used for non ILRP activities, and any indication of failure can quickly be addressed as the need arises. Batteries are replaced on a regular schedule to insure against failure in the field. Backup batteries and other parts subject to failure will be maintained in supply to ensure no material downtime. The instruments are regularly checked for calibration against known standards. Calibration will be documented as required below.

The field sampling crew will be responsible for ensuring that all support equipment is maintained and in good working order. Equipment that is damaged in a way that will adversely affect usage will be replaced. The equipment will be cleaned according to standard operating procedures in place for environmental field sampling prior to the sampling event and between sample monitoring sites.

The field instrumentation requiring Inspection, Maintenance and Calibration includes:

Table 11: BSK Field Instrumentation

Instrument	Make	Model
DO Meter	Oakton	DO 300
EC, pH Meter, Temperature	Oakton	PC 10
Flow Meter	Global Water	FP 211

Table 12: TBWQC Field Instrumentation

Instrument	Make	Model
DO, EC, pH, Temperature Meter	YSI	Pro

Laboratory Instrumentation

The contract laboratories have sufficient redundancy in their instrumentation to recover from the failure of any particular instrument. Calibrations are ongoing, as are MDL studies and other indicators of method performance. The laboratory maintains service contracts for key pieces of equipment where redundant equipment is not feasible due to the substantial cost of replacement.

Compliance with method procedures is a must. Instrument failures or anomalous data are documented in the laboratory report either in the form of a data qualifier or in the case narrative at the beginning of the laboratory report.

Table 13: Laboratory Instrumentation

Instrument	Make	Model
pH, EC, Alkalinity Titrator	Mansci	PC-Titrate
Nutrient Analyzer	Westco	SmartChem 200
Continuous Flow Analyzer	Skalar	3000
Ion Chromatograph	Metrohm	930 Compact IC Flex
HPLC-UV/Vis, Fluor, PDA	Thermo Separations	AS 3000
HPLC-MS/MS	AB Sciex	4000
GC-ECD	Agilent	7890
GC-MS	Agilent	6890/5975, 6890/5973
TOC Analyzer	Tekmar	Phoenix 8000
Turbidimeter	HF Scientific	DRT-15CE
ICP	Perkin Elmer	Optima 8300 RL
ICP-MS	Perkin Elmer	ELAN DRC IIe
Oven	VWR	1380FM

ELEMENT 16: INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Field Instrumentation

Laboratory field technicians and the TBWQC are responsible for ensuring the inspection, maintenance, and when appropriate, the calibration of field instruments and equipment.

Field instruments are calibrated (or verified as being in calibration) prior to the beginning of the sampling event, and rechecked in the field using known standards. Instruments that require calibration checks include the EC, pH, and DO meters listed above. Calibration procedures will be conducted according to the contract laboratory SOPs and consistent with manufacturer recommendations.

See Element 15 for a listing of equipment requiring calibration.

Laboratory Instrumentation

Laboratory analysts and technicians are responsible for the inspection, maintenance, operation and, where appropriate, calibration of their assigned laboratory instrumentation.

Calibration at the laboratory is conducted according to method requirements. Specific schedules are outlined in the laboratory specific SOPs provided in Appendix B (Proprietary copy only). Checks include initial and continuing calibration verifications to demonstrate the instrumentation remains in calibration and operating normally. The laboratory will run a calibration point or a calibration verification check at or below the equivalent of the project reporting limit. This ensures that the instrumentation has adequate sensitivity to achieve the levels needed for the project.

All calibration runs are documented and maintained by the laboratory in a manner consistent with its standard record retention requirements. Any deficiencies will be addressed according to the laboratory standard operating procedures. Corrective actions and additional details will be maintained in the laboratory's log books and raw data. Where applicable, these deficiencies will also be documented in the report Case Narrative should they have any material impact on data usability.

See Element 15 for a listing of the equipment requiring calibration.

ELEMENT 17: INSPECTION / ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The contract laboratory will be solely responsible for the procurement, inspection and acceptance of supplies and consumables. Given the substantial volume of samples processed and the requirements of the ISO-17025 based quality system, the laboratory has policies and procedures in place to qualify and determine the suitability of each material for use. Suppliers of reagents, standards, consumables, parts and other supplies are limited by the laboratory purchasing system to ensure that the laboratory always receives supplies it has determined are suitable for use. A single person within the contract laboratory is responsible for the ordering and receiving of supplies.

Standards and reagents are tracked within the laboratory using a system of identification numbers. This system allows the laboratory to be able to trace the source of all measurements to a specific lot for any given critical supply. This is especially true of all standard and reference materials that serve as the basis for all laboratory calibrations. Certificates of Analysis for analytical standards and reagents are collected and retained by the Laboratory Quality Assurance Manager according to the Laboratory's record retention requirements.

Bottles and sampling supplies are included in this tracking system. Reagents used for preservatives are tracked and each bottle includes a lot number that can be traced to the day it was produced, the person who added the preservative where applicable, and the identity of the preservative used on that day. This allows the lab to trace any potential problems with a sample container back to the production source, permitting a retraction of sample container by lot number if required.

ELEMENT 18: NON-DIRECT MEASUREMENTS

The are no non-direct measurements used in this program. All flow rates within the system are obtained from the hydrologists or watermaster that supervises the delivery of irrigation water and monitors waterway flows. These values are derived based on the known discharges into the designated waterways and validated using flow measurements at key points within defined flow channels along the flow path. The flow rates are accurate to within 10% of the actual flows and deemed sufficiently accurate for the purposes of the program. Flow rates in the form of velocity measurements are one of the field parameters to be determined at the time of sample collection and will be the primary point of comparison when evaluating water flows at the time of collection.

ELEMENT 19: DATA MANAGEMENT

Presently, there are no *In Situ* or continuous measurements being made related to this Plan. Data production begins with field measurements and sample collection. All notes will be recorded on bound logbooks. Copies of the field documentation will be provided to the analytical laboratory for inclusion into the laboratory reports. The office where the sample crew originates will maintain the original records for a period of no less than five years, the same as the record retention policy of the laboratory.

The data generated by the laboratory will exist in both electronic and hardcopy records, each held for a minimum of five years from the date of generation. This includes the Laboratory Information Management System database that houses all the results and supporting data associated with the samples. The contracted laboratory scans all hardcopy records into an electronic archival which is also maintained consistent with the record retention policy.

Hardcopy data is held in a secure location controlled by the laboratory. Access is limited and records are disposed based on standard operating procedure. Electronic data – raw data files, scanned images, Adobe PDF reports, etc., – are held on secure company servers that are backed up daily. Backup media is rotated off site on a scheduled basis, a responsibility of the IT Department.

Data will be provided to the Coalition in electronic format. The analytical report will be an Adobe PDF that includes all results, QC, case narrative, chain of custody and sample receipt documentation. Laboratory raw data, other than the raw data for the toxicity testing, will not be included in the analytical report. However, all laboratory raw data such as chromatograms, spectra, summaries of initial and continuing calibrations, sample injection or sequence logs, prep sheets, etc., will be retained by the laboratory for a minimum of five years and will be provided if specifically requested by the Coalition.

In addition, the laboratory will create a CEDEN and GeaoTracker ESI compliant electronic data deliverable (EDD) for the SWAMP and GQTMP, respectively, that includes all required data for the programs. The EDD will be verified against the CEDEN data checker (http://ceden.org/CEDEN_checker/Checker/CEDENUpload.php) or Geotracker ESI data checker (https://geotracker.waterboards.ca.gov/esi) for content and structure. A copy of the error report will be provided to the Coalition in conjunction with the file for monthly, quarterly and annual reporting. Data from both the primary laboratory and the subcontract lab (toxicity data) will be produced in separate files and sent via email to the Coalition once evaluated.

Data received by the Coalition will be given a cursory review for correct format and completeness. All data, electronic or paper copy, will be filed according to sample date and monitoring site. Electronic format data will be filed in a manner that allows for historical trends and summaries to be analyzed along with quick retrieval for quarterly and annual submittals. The Coalition will work with the contracted laboratory if any issues regarding data are encountered.

ELEMENT 20: ASSESSMENT AND RESPONSE ACTIONS

The Quality Assurance Manager, in cooperation with the Laboratory Coordinators, will review both sampling procedures and laboratory performance annually. Changes in the SOPs used by any of the contracted labs will be communicated between the QA Manager and the Laboratory Coordinators as they occur. Both the QA Manager and the Laboratory Coordinator have "stop work" authority should a situation arise that necessitates an immediate corrective action.

The Laboratory Coordinator will have the responsibility of managing the contracted laboratory. Any issues encountered during the analysis of the samples are to be resolved by the Laboratory Coordinator and then communicated to the QA Manager. Any reported issues at the laboratories will be communicated to the Regional Board as needed and discussed in detail within the Annual Report.

The Laboratory Coordinator will work directly with the Laboratory Project Manager to resolve issues as they occur on any given monitoring event. For ongoing performance issues or to address matters related to the adherence to the QAPP, the Laboratory Coordinator will work directly with the Laboratory Program Manager. These two will meet at least on an annual basis to review the contract lab performance and to address any procedural changes required to ensure ongoing success of the program.

The laboratory QAPPs contained within the attached appendices all address the issue of analyst training and performance, as well as procedures for failed tests. These procedures closely match the Regional Board guidelines for standard laboratory practices and corrective actions.

A copy of the most recent MDL study is to be obtained on at least an annual basis along with a listing of the current SOPs. Material changes in any of the quality control practices, SOPs or other significant procedures may require a revision to this QAPP.

ELEMENT 21: REPORTS TO MANAGEMENT

Activities of the sampling staff are documented and reviewed as part of the submission to the laboratory for the monthly and annual monitoring events. The Laboratory Program Manager will have the responsibility to address any performance issues with the branch office where the sample crew for surface water sampling originated. The TBWQC Technical lead shall address performance issues of groundwater sampling staff. Anomalies or other failures will trigger a Non-Conformance Report ultimately leading to a Corrective Action/Preventative Action (CAPA) event. This will include a root cause determination and a remedial corrective action where necessary. These corrective action reports will be made available to the Laboratory Coordinator on request.

As a result of the meetings between the Laboratory Coordinator and the Laboratory Program Manager, the Coordinator will prepare a summary report of the outcomes of the meeting. The report will contain details on the performance of the contract laboratory, improvements or enhancements to be made that will improve the overall success of the Plan, and any remedial measures taken to address potential performance issue leading to deficiencies in data deliverables.

Quarterly reports (CEDEN formatted data) and annual reports (GeoTracker ESI) are prepared by the Laboratory Coordinators and submitted to the QA Manager for final review. Once the review is completed, the Project Coordinator will prepare a cover letter to accompany the data for the Regional Board. The Project Coordinator is responsible for the drafting of the yearly report for submission to the Regional Board.

Reports submitted to the Regional Board will be sent to the liaison within the Fresno, CA office. Additional copies of the integrated report are kept at the Coalition office.

ELEMENT 22: DATA REVIEW, VERIFICATION AND VALIDATION

Data submitted to the Coalition has undergone a thorough review process at the contracted labs. A statement that the data has been reviewed and is acceptable is provided with the lab report linked to each chain of custody.

The laboratories follow a three tier review process. The primary analyst conducting the analysis is responsible for the generation of results. This analyst performs a double check of their work as part of the reporting process. Upon completion, the data package is then handed off to a peer review, most often the immediate supervisor or another qualified peer reviewer. The peer review consists of a check against all method requirements with documentation applied to any deficiencies. Once all results have undergone a peer or secondary review, the Laboratory Project Manager will review the report in its entirety, looking for agreement within the results and consistency with project requirements. Partial results may be provided to the Coalition on a preliminary basis, if the results have been reviewed through the three-tier review process.

For this QAPP, the report will undergo a final review by the Laboratory Program Manager or his designee. This person checks reports against the requirements of the QAPP and prepares the case narrative. This person generates the CEDEN electronic deliverable and evaluates the content using the CV RDC electronic data checker. Once complete, the report is finalized and sent to the Coalition.

Once received by the Coalition, the data is further reviewed by the QA Manager for exceedances, and the appropriate communication reports are prepared, if necessary, to the Regional Board.

ELEMENT 23: VERIFICATION AND VALIDATION METHODS

The Coalition QA Manager is responsible for the final review and determination of the validity and usability of the data. The determination of completeness is performed at both the level of the field activities and the in-house laboratory activities. Any questions or anomalies resulting from this review will be addressed directly with the laboratory prior to making the final determination. The overall completeness goal for the project is 90%.

ELEMENT 24: RECONCILIATION WITH USER REQUIREMENTS

The purpose of the sampling program is to determine if any constituents of concern exceed water quality standards in the water samples. If such detections are made, the Coalition will then open an inquiry as to the persistence of the detection (is it in more than one site, is it still present in the next sample period), review the conditions prior to the sampling event that produced the detection, and begin to research the potential sources of the detection.

The data, as reported by the lab, is considered valid if no problems are identified within the laboratory report and case narrative. In the event that the laboratory data quality indicators do not meet the criteria listed in Table 8 (or exceed other requirements listed in the cited analytical method), then the data will be annotated with data qualifiers that identify the deficiency. Laboratory reports containing notations that indicate QC failures or other issues that do not meet QAPP requirements will need to be assessed for impact. Not all failures result in the rejection of data but scrutiny will be applied to all failures or QAPP deviations. It is the responsibility of the QA Manager to make the final determination of data usability and its suitability for intended use. All QC failures or other known deficiencies will be indicated on the laboratory Certificate of Analysis, either in the form of a data qualifier and/or noted in the detailed Case Narrative provided therein. These deficiencies represent the possible limitations on the use of the data but will nonetheless be reported in order for the Coalition and Board to determine their suitability for use.

All data will be uploaded into the SWAMP Information Management System or GeoTracker ESI. At this point the Board may use the data in the overall evaluation of the surface water and groundwater quality in the Tule Basin watershed. Future decisions for water regulations will be made, in part, on the information provided under this Plan.

Questions will always arise when a toxicity level shows an exceedance, but the chemistry data taken at the same time fails to show a toxic substance that might cause the problem. Given the relatively limited list of monitoring parameters versus the number of both known and unknown potential contaminants, it is not inconceivable that a constituent could contribute to toxicity but fail to be identified from the chemistry testing. Continuing discrepancies between the outcome of the toxicity testing and the chemistry testing should be further evaluated in an attempt to determine the possible presence of a persistent, harmful parameter.

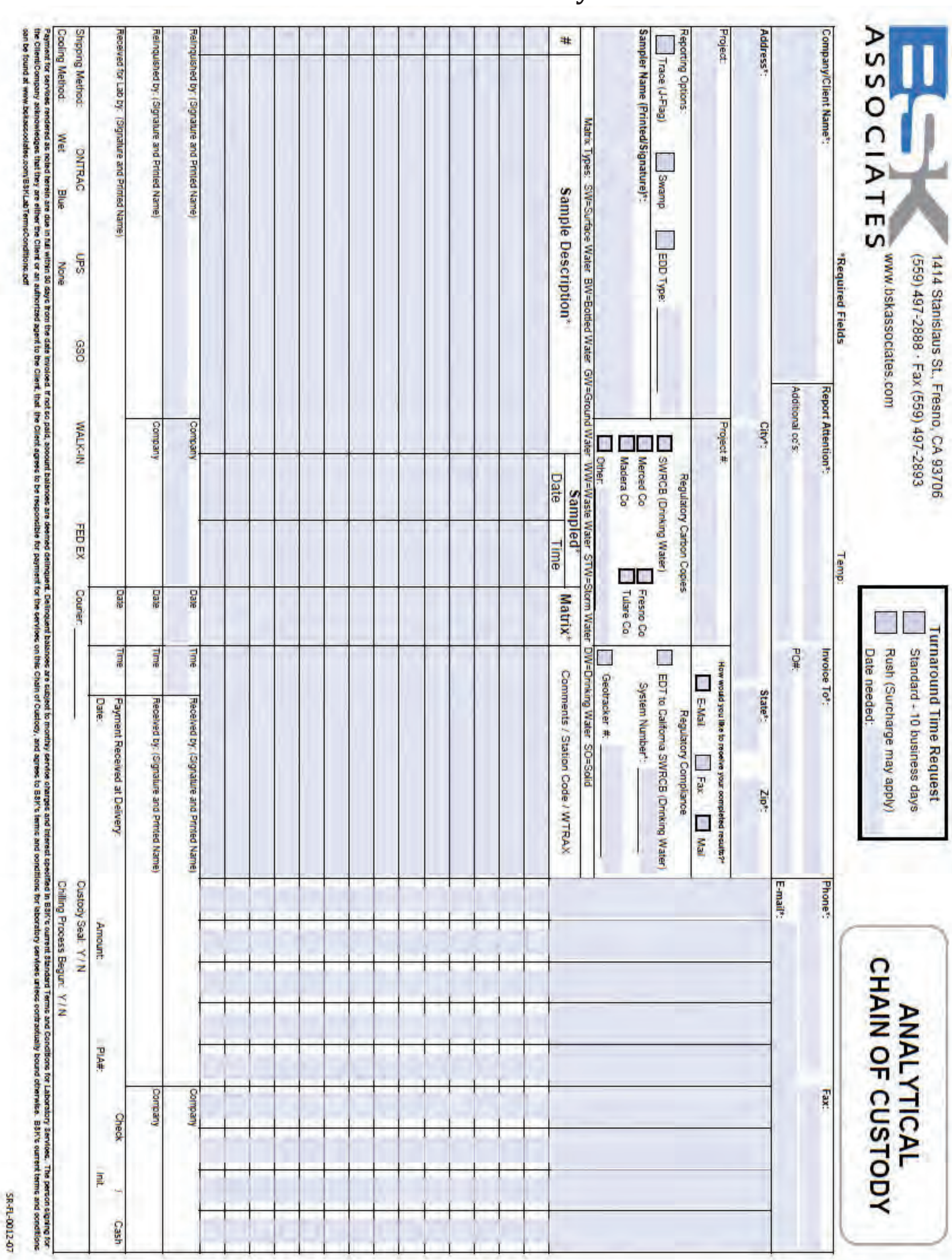
Any concerns or unanswered questions that arise from the data will be addressed as comments or footnotes within the written reports submitted to the Regional Board.

ELEMENT 25: DEFINITIONS

Term	Definition
BPO	Basin Plan Objective
BS/BSD	Blank Spike / Blank Spike Duplicate
CAPA	Corrective Action / Preventative Action
CEDEN	California Environmental Data Exchange Network
CA ELAP	California Environmental Laboratory Accreditation Program
CV RDC	Central Valley Regional Data Center
EDD	Electronic Data Deliverable
ESI	Electronic Submittal of Information
General Order (Order)	CA Central Valley Regional Board Order #R5-2013-0120 (Amended by R5-2014-0143 and R5-2015-0115)
GQTMP	Groundwater Quality Trend Monitoring Program
GQTMW	Groundwater Quality Trend Monitoring Workplan
ISO	International Organization for Standardization
IT	Information Technology
LCS/LCSD	Laboratory Control Spike / Laboratory Control Spike Duplicate. Often used interchangeably with BS/BSD.
ILRP	Irrigated Lands Regulatory Program
MDL	Method Detection Limit
MRP	Monitoring and Reporting Program
MS/MSD NTC	Matrix Spike / Matrix Spike Duplicate
PQL	Practical Quantitation Limit
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QC	Quality Control
RDC	Regional Data Center
RL	Reporting Limit
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
SSJVWQC	Southern San Joaquin Valley Water Quality Coalition
SWAMP	Surface Water Ambient Monitoring Program
SWMP (Plan)	Surface Water Monitoring Plan (Tule Basin SWMP)
TBWQC	Tule Basin Water Quality Coalition
TIE	Toxicity Identification Evaluation

APPENDIX A.1

Chain of Custody



BSK ASSOCIATES
1414 Stanislaus St., Fresno, CA 93706
(559) 497-2888 · Fax (559) 497-2893
www.bskassociates.com

Turnaround Time Request
☐ Standard - 10 business days
☐ Rush (Surcharge may apply)
Date needed:

ANALYTICAL CHAIN OF CUSTODY

*Required Fields Temp:

Company/Client Name*:	Report Attention*: Additional cc's:	Invoice To*: PO#:	Phone*: E-mail*:	Fax:
Address*:	City*:	State*: Zip*:		
Project:	Project #:	How would you like to receive your completed results?* ☐ E-Mail ☐ Fax ☐ Mail		
Reporting Options: ☐ Trace (J-Flag) ☐ Swamp ☐ EDD Type: ______	Regulatory Carbon Copies: ☐ SWRCB (Drinking Water) ☐ Merced Co ☐ Fresno Co ☐ Madera Co ☐ Tulare Co ☐ Other:	Regulatory Compliance: ☐ EDT to California SWRCB (Drinking Water) System Number*: ______ ☐ Geotracker #: ______		
Sampler Name (Printed/Signature)*:				

Matrix Types: SW=Surface Water BW=Bottled Water GW=Ground Water WW=Waste Water STW=Storm Water DW=Drinking Water SO=Solid

#	Sample Description*	Sampled* Date	Sampled* Time	Matrix*	Comments / Station Code / WTRAX

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Received for Lab by: (Signature and Printed Name)		Date	Time	Payment Received at Delivery: Date: Amount: PIA#:	Check / Cash Init.

Shipping Method: ONTRAC UPS GSO WALK-IN FED EX Courier: ______ Custody Seal: Y / N
Cooling Method: Wet Blue None Chilling Process Begun: Y / N

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in BSK's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for laboratory services unless contractually bound otherwise. BSK's current terms and conditions can be found at www.bskassociates.com/BSKLabTermsConditions.pdf

SR-FL-0012-07

APPENDIX A.2

Field Sample Collection Logs

ILRP/SWAMP 2.5 Field Data Sheet - Water Sample Collection			Pg of Pgs	
Coalition Name:			DATE (mm/dd/yyyy):	
StationID & Name:			FIRST SAMPLE TIME:	
ProjectID:	Arrival Time:	Departure Time:	Target Lat. & Long.:	
Sampling Crew (and Agency):			Actual Lat & Long:	
			Datum:	Accuracy (ft / m):

OBSERVATIONS	WADEABLE: YES / NO	PICTURE NAME/S:
DOMINANT SUBSTRATE: Concrete, Cobble, Gravel, Sand, Mud, Unk., Other		
SITE ODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other	SKY CODE: clear, partly cloudy, overcast, fog, hazy	
OTHER PRESENCE: Vascular, Nonvascular, OilySheen, Foam, Trash, None, Other	PRECIPITATION: None, Foggy, Drizzle, Rain, Snow	
WATER ODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other	PRECIPITATION (last 24 hrs): Unknown, <1", >1", None	
WATER CLARITY: Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)	WATERCOLOR: colorless, green, yellow, brown, other	
OBSERVED FLOW: NA, Dry Waterbody Bed, No Observed Flow, Isolated Pool, 0.1 - 1cfs, 1 - 5 cfs, 5 - 20 cfs, 20 - 50 cfs, 50 - 200 cfs, >200cfs		

Comments:

PHYSICAL PARAMETERS	SAMPLE COLLECTION	Sample Depth (circle one): 0.1 m (subsurface grab) -88 (integrated)
Water Temp (Celsius):	STARTING BANK:	LB / RB/ NA
Air Temp (Celsius):	OCCUPATION METHOD:	Walk-in, Bridge, Other
*pH>8.5 or <6.5 pH:	SAMPLING EQUIPMENT:	Indiv bottle by hand, By pole, Other
*EC>700 EC (uS/cm):	SAMPLE LOCATION:	Bank, Near Bank, Thalweg, Midchannel, Open Water
*DO<7.0 DO (mg/L)	HYDRO-MODIFICATION:	None, Bridge, Pipes, Concrete Channel, Grade Control, Culvert, Other
TDS:	HYDROMODLOC:	US / DS / NA

CALCULATED SITE DISCHARGE (cfs):		Wet Channel Width (m):	Wet Channel Width (m):
Transfer Calculated Value From Discharge Worksheet		Midchannel depth (m):	Stage:

√	Sample ID	Analyte	Container	Number	Notes

APPENDIX A.2

Field Sample Collection Logs

ILRP/SWAMP 2.5 Discharge Worksheet

Coalition Name:		DATE (mm/dd/yyyy):
StationID & Name :		FIRST SAMPLE TIME:
ProjectID:	Method: USGS (bridge), USGS (wading), culvert, other:	
Left Edge Water (LEW):	Start Time (24 hr):	Discharge (cfs):
Right Edge Water (REW):	End Time (24 hr):	Discharge calculated by:

#	Angle (if from bridge)	Interval Midpoint (meters or feet)	Interval Depth (meters or feet)	% Depth (from surface)*	Revolutions/Velocity (m/s or f/s)	Notes
1				0.2 / 0.8 or 0.6		
2				0.2 / 0.8 or 0.6		
3				0.2 / 0.8 or 0.6		
4				0.2 / 0.8 or 0.6		
5				0.2 / 0.8 or 0.6		
6				0.2 / 0.8 or 0.6		
7				0.2 / 0.8 or 0.6		
8				0.2 / 0.8 or 0.6		
9				0.2 / 0.8 or 0.6		
10				0.2 / 0.8 or 0.6		
11				0.2 / 0.8 or 0.6		
12				0.2 / 0.8 or 0.6		
13				0.2 / 0.8 or 0.6		
14				0.2 / 0.8 or 0.6		
15				0.2 / 0.8 or 0.6		
16				0.2 / 0.8 or 0.6		
17				0.2 / 0.8 or 0.6		
18				0.2 / 0.8 or 0.6		
19				0.2 / 0.8 or 0.6		
20				0.2 / 0.8 or 0.6		
21				0.2 / 0.8 or 0.6		
22				0.2 / 0.8 or 0.6		
23				0.2 / 0.8 or 0.6		
24				0.2 / 0.8 or 0.6		
25				0.2 / 0.8 or 0.6		
26				0.2 / 0.8 or 0.6		
27				0.2 / 0.8 or 0.6		
28				0.2 / 0.8 or 0.6		
29				0.2 / 0.8 or 0.6		

*two measurement should be taken (0.2 and 0.8 from the surface of the water) if the depth is greater than 0.76m (2.5ft).

APPENDIX A.2

Field Sample Collection Logs

ILRP/SWAMP 2.5 Field Data Sheet - Sediment Sample Collection Pg of Pgs

Coalition Name:			DATE (mm/dd/yyyy):
StationID & Name :			FIRST SAMPLE TIME:
ProjectID:	Arrival Time:	Departure Time:	Target Lat. & Long.:
Sampling Crew (and Agency):			Actual Lat & Long:
			Datum: / Accuracy (ft / m):

OBSERVATIONS		WADEABLE: YES / NO	PICTURE NAME/S:
DOMINANT SUBSTRATE:	Concrete, Cobble, Gravel, Sand, Mud, Unk., Other		
SITE ODOR:	None, Sulfides, Sewage, Petroleum, Mixed, Other	SKY CODE:	clear, partly cloudy, overcast, fog, hazy
OTHER PRESENCE:	Vascular, Nonvascular, OilySheen, Foam, Trash, None, Other	PRECIPITATION:	None, Foggy, Drizzle, Rain, Snow
WATER ODOR:	None, Sulfides, Sewage, Petroleum, Mixed, Other	PRECIPITATION (last 24 hrs):	Unknown, <1", >1", None
WATER CLARITY:	Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)	WATERCOLOR:	colorless, green, yellow, brown, other
OBSERVED FLOW:	NA, Dry Waterbody Bed, No Observed Flow, Isolated Pool, 0.1 - 1cfs, 1 - 5 cfs, 5 - 20 cfs, 20 - 50 cfs, 50 - 200 cfs, >200cfs		
DOMINANTSUBSTRATE:	Bedrock, Concrete, Cobble, Gravel, Sand, Mud, Unk, Other____________		
SEDODOR:	None, Sulfides, Sewage, Petroleum, Mixed, Other__________		
SEDCOLOR:	Colorless, Green, Yellow, Brown		
SEDCOMPOSITION:	Silt/Clay, Fine Sand, Coarse Sand, Gravel, Cobble, Mixed, Hard Pan Clay		

Comments:

PHYSICAL PARAMETERS		SAMPLE COLLECTION	Sample Depth (circle one): 1 cm, 2 cm, -88 (integrated depth or core)
	Water Temp (Celsius):	STARTING BANK:	LB / RB/ NA
	Air Temp (Celsius):	OCCUPATION METHOD:	Walk-in, Bridge, Other
*pH>8.5 or <6.5	pH:	SAMPLING EQUIPMENT:	Hand trowel, Eckman Sampler, Other
*EC>700	EC (uS/cm):	SAMPLE LOCATION:	Bank, Near Bank, Midchannel Bed
*DO<7.0	DO (mg/L):	HYDRO-MODIFICATION:	None, Bridge, Pipes, Concrete Channel, Grade Control, Culvert, Other
	TDS:	HYDROMODLOC:	US / DS / NA

√	Sample ID	Analyte	Container	Number	Notes

APPENDIX A.3

Example Laboratory Data Completeness Worksheet

Lab Data Completeness Worksheet															
Sampling Event	Month, Year	Sample Results		Acceptable Data Quality Indicators								Total DQIs			
Method	Analyte	Total	Adversely Impacted	Sensitivity	Contamination	Accruacy (LCS)	Precision (LCS)	Recovery (MS)	Precision (MS)	Precision (Lab Dup)	Hold Time	# Acceptable	# Performed	Percent Sample Completeness	DQI Success Rate
ASTM D422	Grain size											0			
EPA 200.7, Calc	Hardness (as CaCO3)											0			
EPA 200.8	Arsenic (Total)											0			
EPA 200.8	Boron (Total)											0			
EPA 200.8	Cadmium (Dissolved)											0			
EPA 200.8	Cadmium (Total)											0			
EPA 200.8	Copper (Dissolved)											0			
EPA 200.8	Copper (Total)											0			
EPA 200.8	Lead (Dissolved)											0			
EPA 200.8	Lead (Total)											0			
SM 2540C	Total Dissolved Solids (TDS)											0			
SM 2540D	Total Suspended Solids (TSS)											0			
SM 4500-NH3 G	Ammonia											0			
SM 4500-P E	Orthophosphate											0			
SM 5310C	Total Organic Carbon (TOC)											0			
SM 8010F	Unionized Ammonia (calculated value)											0			
SM 9221 B,F	E. Coli											0			
SM 9221 E	Fecal Coliform											0			
Walkley Black	Total Organic Carbon (TOC)											0			
	Totals	0	0	0	0	0	0	0	0	0	0	0	0		

APPENDIX A.4

Example Field and Transport Completeness Worksheet

Field Data Completeness Worksheet				
Date Sampled				
	Sampling Locations			
Activity	**Sample Point 1**	**Sample Point 2**	**Sample Point 3**	**Sample Point 4**
Field Sampling				
Water Present at Location?				
Photo documentation captured?				
Field Equipment Rinsed?				
All containers for all samples filled?				
Sample Labels Verified to COC?				
Lat. / Long. Recorded?				
Field Conditions Recorded?				
Field Measurements Collected				
Flow				
Temp				
pH				
EC				
Dissolved Oxygen				
Sample Transport				
Were samples packed on ice?				
COC signed by sampler?				
Was COC included in cooler?				
Sample Receipt				
Samples received within temperature?				
If no, received on ice on date collected?				
All bottles unbroken and intact?				
Bottle labels agree with COC?				
Were bottles correct for tests requested?				
Sufficient sample received for all tests?				
Arrived at lab within hold times?				
Passing Criteria	0	0	0	0
Total Assessments	0	0	0	0
% Complete				
% Completeness - Field Activities				

Appendix F

Groundwater Sampling Form

Groundwater Sampling

Job Name:____ Well No./ I.D.____

Job Number:____ Well Type: Monitor Extraction Other:

Recorded By:____ Well Material: PVC St. Steel Other:

(Signature)

Date: Time:

Sampled By:____

WELL PURGING

PURGE VOLUME

Casing Diameter (**D** inches): 2 4 6 Other:____

Total Depth of Casing (**TD** in feet BTOC):

Water Level Depth (**WL** in feet BTOC):

Number of well volumes to be purged (**# Vols**):

3 4 5 10 Other:

PURGE METHOD

Bailer - Type:______________________________________

Submersible ☐Centrifugal Bladder; Pump No.:

Other Type:

PUMP INTAKE SETTING

Near Bottom Near Top Other:

Depth in ft (BTOC): Screen Interval in ft (BTOC):

From_____________ To_____________

PURGE VOLUME CALCULATION:

(_________) - (___________) • _________ 2 • _________ • .0408 = _________________________gallons

TD (feet) **GW** (feet) **D** (Inches) **# Vols** *Calculated Purge Volume*

PURGE TIME

Start:______________ Stop:_______________

Elapsed:

PURGE RATE

Initial:______________ gpm

Final: ______________gpm

ACTUAL PURGE VOLUME

___________ • ____________=____________ gallons

FIELD PARAMATER MEASURMENTS:

Minutes Since Pumping Began:	pH	Cond. (μ Mhos/cm)	T C° F°	Other:
Meter Nos.:				

OBSERVATIONS DURRING PURGING (Well Condition, Turbidity, Color, Odor):

DISCHARGE WATER DISPOSAL:

Sanitary Sewer Storm Sewer

Other:____

WELL SAMPLING

SAMPLING METHOD

Same As Above

☐Bailer - Type:________________________________

Submersible ☐Centrifugal Bladder; Pump No.:________________________

Grab - Type:________________________________

Other - Type:________________________________

SAMPLE DISTRIBUTION Sample Series:__________________________

Sample No.	Volume/ Cont.	Analysis Requested	Preservatives	Lab	Comments

QUALITY CONTROL SAMPLES

Duplicate Samples		Blank Samples		Other Samples	
Original Sample No.	Duplicate Sample No.	Type	Sample No.	Type	Sample No.

Thomas Harder & Co.
Groundwater Consulting

TULE SUBBASIN COORDINATION AGREEMENT ATTACHMENT 2

Tule Subbasin Setting

January 2020

Prepared for

Tule Subbasin Technical Advisory Committee

Prepared by

Thomas Harder, P.G., CH.G.
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Thomas Harder & Co.
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D. Pixley Irrigation District GSA Water Budgets and Hydrographs
E. Tri-County Water Authority GSA Water Budgets and Hydrographs
F. Alpaugh Irrigation District GSA Water Budgets and Hydrographs

CHAPTER 2: TULE SUBBASIN SETTING §354.12

§ 354.12. Introduction to Basin Setting

This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.

The Tule Subbasin is located in the southern portion of the San Joaquin Valley Groundwater Basin in the Central Valley of California (see Figure 2-1). The area of the Tule Subbasin is defined by the latest version of CDWR Bulletin 118 (CDWR, 2016) and is shown on Figures 2-1 and 2-2. The Tule Subbasin area is approximately 744 square miles (475,895 acres) and includes the jurisdictional areas of multiple water management and service entities. The subbasin has been divided into seven individual Groundwater Sustainability Agencies (GSAs): Eastern Tule GSA, Lower Tule River GSA, Pixley GSA, Delano-Earlimart GSA, Alpaugh GSA, Tri-County Water Authority GSA, and Tulare County GSA (see Figure 2-3).

Communities within the subbasin include Porterville, Tipton, Pixley, Earlimart, Richgrove, Ducor and Terra Bella (see Figure 2-2). Neighboring CDWR Bulletin 118 subbasins include the Kern County Subbasin to the south, the Tulare Lake Subbasin to the west, and the Kaweah Subbasin to the north.

2.1 Hydrogeologic Conceptual Model §354.14

§ 354.14. Hydrogeologic Conceptual Model

(a) Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.

The hydrogeologic conceptual model is a description of the groundwater flow system of the Tule Subbasin and how it interacts with surface water and land use of the area. The conceptual model includes a description of the geologic setting, geologic structure, and boundary conditions including the principal aquifers and aquitards. The hydrogeologic conceptual model of the Tule Subbasin, as described herein, has been developed in accordance with the requirements of California Code of Regulations, Title 23, Division 2, Chapter 1.5, Subchapter 2, Article 5, Subarticle 2 (§354.14) and in consideration of California Department of Water Resources' (CDWR) Best Management Practices (BMP) for the preparation of hydrogeologic conceptual models. The hydrogeologic conceptual model forms the basis for the numerical groundwater flow model of the subbasin.

2.1.1. Sources of Data

Compilation, review and analysis of multiple types of data were necessary to develop the hydrogeologic conceptual model and water budget of the Tule Subbasin. The various types of data included geology, soils/lithology, hydrogeology, surface water hydrology, climate, crop types/land use, topography, remote sensing, and groundwater recharge and recovery. Data were obtained from multiple sources:

Geological Data including geologic maps and cross sections were obtained from the United States Geological Survey (USGS), the California Geological Survey (CGS), and Kenneth D. Schmidt & Associates (KDSA) (Schmidt, 2018). Geophysical logs were obtained from the California Division of Oil, Gas and Geothermal Resources (DOGGR), Angiola Water District, Alpaugh Irrigation District, Kern-Tulare Water District (KTWD), KDSA, and private well owners.

Soils/Lithological Data were obtained from drillers' logs and reports from the CDWR, the City of Porterville, the USGS and the United States Department of Agriculture (USDA).

Hydrogeological Data including groundwater levels and pumping tests were obtained from the California Statewide Groundwater Elevation Monitoring (CASGEM) website, the Deer Creek and Tule River Authority (DCTRA), Angiola Water District, Alpaugh Irrigation District, KTWD, Delano-Earlimart Irrigation District (DEID), the City of Porterville, Kern County Water Agency, 4Creeks Inc., Schmidt (2011) and Schmidt (2018). Additional hydrogeological information was obtained from USGS reports, Semitropic Water Storage District Groundwater Banking Project Biennial Reports, and the Tulare Lake Bed Groundwater Management Plan.

Groundwater Quality Data including nitrate and electrical conductivity (EC) data from the Tule Basin Water Quality Coalition, multiple reports and studies associated with the Tulare Lakebed Municipal Delisting program, and contaminants identified in the California State Water Resources Control Board Geotracker website (Geotracker, 2018).

Groundwater Recharge and Recovery Data including spreading basin locations and dimensions, artificial recharge, water well construction, well locations, groundwater production, surface water diversions, canal losses, and river losses were obtained from Lower Tule River Irrigation District (LTRID), CDWR, Tule River Association (TRA) annual reports, and DCTRA annual reports.

Hydrological (i.e. Surface Water) Data consisting of stream gage data along the Tule River, Deer Creek, and White River were obtained from the USGS, DCTRA reports and TRA annual reports. Imported water deliveries were obtained from the United States Bureau of Reclamation (USBR) and the individual agencies within the subbasin.

Climate Data was acquired from CDWR's California Irrigation Management Information System (CIMIS) and the Western Regional Climate Center website.

Land Use Data was obtained from the CDWR, LTRID, the Kern County Department of Agriculture and Measurement Stands, and the USGS Earth Resources Observation and Science Center. Political boundaries were obtained from the California Cal-Atlas Geospatial Clearinghouse, Kern-Tulare Water District, and the LTRID.

In addition to the various types of data, numerous historical reports on the geology, hydrogeology and groundwater management of the Tule Subbasin were reviewed and analyzed. These reports included USGS publications, CDWR reports and bulletins, consultant reports, and academic publications. Publications relied on for the hydrogeological conceptual model and water budget are summarized in the References Section (Section 2.5).

2.1.2. Geologic Setting §354.14 (b)(1)

> § 354.14. (b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:
>
> (1) The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.
>
> (2) Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.

The Tule Subbasin is located in the Tulare Lake Hydrologic Region of the Central Valley of California (see Figure 2-1). The Central Valley is a geographically significant structural depression that extends from the Cascade Range on the north to the Tehachapi Mountains on the south (Faunt, 2009). The Central Valley groundwater basin has been subdivided on a regional scale into the Sacramento Valley Groundwater Basin north of the Sacramento River Delta, and the San Joaquin Valley Groundwater Basin south of the Sacramento River Delta. The Tulare Lake Hydrologic Region is located in the southern portion of the San Joaquin Valley Groundwater Basin. The Tulare Lake Hydrologic Region is defined by a surface water drainage watershed that includes the Sierra Nevada Mountains to the east, the Tehachapi Mountains to the south and southeast, and the Coast Ranges to the west. The northern boundary of this hydrologic region is defined by the drainage divide between the San Joaquin River to the north and the Kings River to the south.

The portion of the Central Valley structural depression that is beneath the Tulare Lake Hydrologic Region is filled with marine and nonmarine sediments, which extend to depths of more than 32,000 feet in places (Planert and Williams, 1995). The deepest sediments were deposited within a marine environment associated with an inland sea that inundated the valley between 200 million years ago (Jurassic Period) and 2 million years ago (end of the Tertiary Period) (Croft, 1972). The deeper marine sediments are overlain by as much as 9,000 ft of nonmarine continental deposits associated with Quaternary (2 million years to present) lacustrine and alluvial deposition (Planert and Williams, 1995). The current depositional environment consists of multiple coalescing alluvial fans along the basin margins with localized lacustrine deposits at the terminus of the fans in the central portion of the basin.

The Tule Subbasin is located on a series of coalescing alluvial fans that extend toward the center of the valley from the Sierra Nevada Mountains (see Figure 2-4). The alluvial fans merge with lacustrine deposits of the Tulare Lake bed in the western portion of the subbasin. Land surface elevations within the Tule Subbasin range from approximately 850 ft above mean sea level (amsl) along the eastern margins of the subbasin to approximately 180 ft amsl at the western boundary (see Figure 2-4).

Geologic formations observed at the land surface and in the subsurface beneath the Tule Subbasin can be grouped into five generalized geologic units, described below in order of increasing age:

Unconsolidated Continental Deposits – These sediments consist of fluvial (i.e. streambed deposits), alluvial, flood plain, and lacustrine (i.e. lake bed) deposits (labeled "surficial deposits" on Figure 2-4). The unconsolidated continental deposits range in thickness from 0 ft at the eastern contact with the Sierra Nevada Mountains to more than 3,000 ft near the margins of Tulare Lake in the western part of the subbasin (see Figure 2-5; Lofgren and Klausing, 1969). Subsurface alluvial sediments consist of highly stratified layers of more permeable sand and gravel interbedded with lower permeability silt and clay. Clear correlation of individual sand or clay layers laterally across the Tule Subbasin is difficult due to the interbedded nature of the sediments. However, it is noted that the thickness of clay sediments in the upper 1,000 ft below ground surface (bgs) generally increases in the vicinity of Tulare Lake. The unconsolidated continental deposits form the primary groundwater reservoir in the Tule Subbasin.

The unconsolidated continental deposits range in age from recent in near-surface stream channels to Upper Pliocene (approximately 2.6 million years before present) at depth. In the eastern portion of the Tule Subbasin, Pleistocene sediments (2.6 million to 11,700 years before present) crop out at the land surface along the base of the Sierra Nevada Mountains, forming what is referred to as the dissected uplands (Lofgren and Klausing, 1969). These older continental deposits are semi-consolidated and contain a high percentage of clay. As such, they generally do not yield significant water to wells.

The lowermost portion of unconsolidated continental deposits is generally correlated with the Tulare Formation. The Tulare Formation is notable in that it includes the Corcoran Clay, a regionally extensive confining layer that has also been referred to as the "E-Clay" (see Figure 2-5) (Frink and Kues, 1954). The Corcoran Clay consists of a Pleistocene diatomaceous fine-grained lacustrine deposit (primarily clay; Faunt, 2009). In the Tule Subbasin, the Corcoran Clay is as much as 150 ft thick beneath the Tulare Lake bed but becomes progressively thinner to the east, eventually pinching out immediately east of Highway 99 (Lofgren and Klausing, 1969).

Pliocene Marine Deposits – These sediments underlie the continental deposits and consist of consolidated to loosely consolidated marine siltstone with minor interbedded sandstone beds. The marine siltstone unit thickens to the west, ranging from approximately 500 ft thick near State Highway 65 to more than 1,600 ft beneath State Highway 99 (Lofgren and Klausing, 1969; see Figures 2-5 and 2-6). The marine siltstone beds dip sharply from the base of the Sierra Nevada Mountains on the east to the central portion of the valley in the west. The Pliocene marine strata have relatively low permeability and do not yield significant water to wells.

Santa Margarita Formation – This formation occurs beneath the Pliocene marine strata and consists of Miocene (approximately 5.3 to 23 million years before present) sand and gravel that is relatively permeable and yields water to wells. The formation is approximately 150 to 520 feet thick and occurs at depths ranging from 1,200 feet near State Highway 65 to greater than 3,000 feet beneath State Highway 99. This formation is a significant source of groundwater to wells in the southeastern portion of the Tule Subbasin near the community of Richgrove.

Tertiary Sedimentary Deposits – Beneath the Santa Margarita Formation exists an interbedded assemblage of semi-consolidated to consolidated sandstone, siltstone and claystone of Tertiary age (approximately 2.6 to 66 million years before present). Some irrigation wells in the southeastern part of the Tule Subbasin are known to produce fresh water from the Olcese Sand Formation, which is in the uppermost portion of the unit (Ken Schmidt, 2019. Personal Communication). The water quality of the groundwater in the Tertiary sedimentary deposits becomes increasingly saline to the southwest and most of the groundwater in the unit is not useable for crop irrigation or municipal supply except near Highway 65.

Granitic Crystalline Basement – Sedimentary deposits beneath the Tule Subbasin are underlain by a basement consisting of Mesozoic granitic rocks that compose the Sierra Nevada batholith (Faunt, 2009). At depth, the basement rocks are assumed to be relatively impermeable.

There are no significant faults mapped in the Tule Subbasin that would form a groundwater flow barrier or affect groundwater flow.

2.1.3. Lateral Basin Boundaries §354.14 (b)(2)

The lateral boundaries of the Tule Subbasin are defined in CDWR Bulletin 118 and include both natural and political boundaries. The eastern boundary of the Tule Subbasin is defined by the surface contact between crystalline rocks of the Sierra Nevada and surficial alluvial sediments that make up the groundwater basin (see Figure 2-4). The northern boundary is defined by the LTRID and Porterville Irrigation District (PID) boundaries. The western boundary is defined by the Tulare

County/Kings County boundary, except for a portion of the Tulare Lake Basin Water Storage District that extends east across the county boundary and is excluded from the subbasin. The southern boundary is defined by the Tulare County/Kern County boundary except for the portion of the Delano-Earlimart Irrigation District (DEID) that extends south of the county boundary and is included in the subbasin. The total area of the Tule Subbasin is approximately 744 square miles (475,895 acres).

2.1.4. Bottom of Basin §354.14 (b)(3)

§ 354.14. (b) (3) The definable bottom of the basin.

The physical bottom of the Tule Subbasin is defined by the interface between the Tertiary sedimentary deposits and the relatively impermeable granitic bedrock below them. This depth ranges from zero at the eastern margins of the subbasin where the continental deposits meet the granitic bedrock to approximately 5,000 feet below ground surface in the western portion of the subbasin (Planert and Williams, 1995).

The physical bottom of the subbasin is deeper than the bottom of the fresh water aquifer. The total dissolved solids (TDS) concentration of the groundwater generally increases with increasing depth such that below a certain level, the groundwater is not suitable for municipal, irrigation or other beneficial uses. Accordingly, a better measure of the bottom of the basin is the fresh water/brackish water interface, as defined in Page (1973) by an electrical conductivity of 3,000 micromhos per centimeter (µmohs/cm), which is approximately correlative to a total dissolved solids (TDS) concentration of 2,000 milligrams per liter (mg/L).

In the Tule Subbasin, the fresh water/brackish water interface varies across the subbasin but is generally 1,500 to 3,000 feet below land surface (Page, 1973; Planert and Williams, 1995). The deepest fresh water occurs in the western portion of the Tule Subbasin. Agricultural irrigation wells in the western Tule Subbasin are as deep as 1,500 feet and some agricultural wells west of the Tulare/Kings County boundary are as deep as 2,200 feet. The bottom of the effective groundwater basin, based on the fresh water/brackish water interface, is shown on Figures 2-5 and 2-6.

2.1.5. Surface Water Features §354.14 (d)(5)

§ 354.14. (d) (5) Surface water bodies that are significant to the management of the basin.

2.1.5.1. Tulare Lake

Although now largely a dry lake bed, prior to the mid-1800s Tulare Lake was the largest fresh water lake, by area, west of the Mississippi River. The original area of the lake was approximately 570 square miles and was fed from surface water discharges at the terminus of the Kern River, Tule River, Kaweah River, and Kings River. Beginning in the mid-1800s, surface water from the rivers feeding the lake was diverted for agricultural irrigation and municipal supply. By 1900, the lake was dry except for residual marshes and wetlands and occasional flooding. This condition continues to the present.

2.1.5.2. Lake Success

Lake Success is a manmade reservoir created by the construction of Success Dam that was completed in 1961 and serves as a flood control and water conservation project for the Tule River. Success dam and reservoir are managed by the United States Army Corps of Engineers (ACOE). Water storage in Lake Success is subject to the ACOE's flood control diagram and released as directed by the ACOE and downstream water rights holders as administered by the Tule River Association (TRA), in accordance with the Tule River Water Diversion Schedule and Storage Agreement (TRA, 1966).

2.1.5.3. Tule River

The Tule River is the largest natural drainage feature in the Tule Subbasin. From its headwaters in the Sierra Nevada Mountains, the Tule River flows first into Lake Success and then, through controlled releases at the dam, flows through the City of Porterville where it is diverted at various points before flowing into the LTRID. A significant diversion point is the Porter Slough, which flows to the north and semi-parallel to the main river channel and is used to convey surface water to various recharge facilities and canals. Downstream of Porterville, the Tule River ultimately discharges onto the Tulare Lakebed during periods of above-normal precipitation. Stream flow is measured via gages located below Success Dam, at Rockford Station downstream of Porterville, and at Turnbull Weir (see Figure 2-7). From water years 1986/87 to 2016/17, releases from Lake Success to the Tule River, quantified in TRA annual reports as the sum of Pioneer Water Company diversion and stream flow at the Below Success Dam gage, has ranged from 8,820 acre-ft in water year 2014/15 to 439,125 acre-ft in water year 1997/98 with an annual average during this time period of approximately 118,300 acre-ft.

Releases of water below Lake Success dam are diverted from the Tule River channel at various locations in accordance with TRA (1966). Diversion points along the river are located at the Porter Slough headgate, Campbell and Moreland Ditch Company, Vandalia Water District, Poplar Irrigation Company, Hubbs and Miner Ditch Company, and Woods-Central Ditch Company. The lower portion of the Tule River channel is also used as a conveyance mechanism to convey imported water from the Friant-Kern Canal to the PID and LTRID. Within the PID and LTRID, a combination of natural stream flow and imported water are further diverted into unlined canals for distribution to artificial recharge basins and farmers. Any residual stream flow left in the Tule River after diversions is measured at the Turnbull Weir, located at the west end of the LTRID (see Figure 2-7).

2.1.5.4. Deer Creek

Deer Creek is a natural drainage that originates in the Sierra Nevada Mountains, flowing in a westerly direction north of Terra Bella and into Pixley (see Figure 2-7). Although the Deer Creek channel extends past Pixley, discharges rarely reach the historical Tulare Lakebed. Stream flow in Deer Creek has been measured at the USGS gaging station at Fountain Springs from 1968 to present time. Average annual flow at this gage between water year 1986/87 and 2016/17 was approximately 17,800 acre-ft/yr with a low of approximately 2,000 acre-ft in water year 2014/15 and a high of approximately 88,000 acre-ft in water year 1997/98. Stream flow has also been measured at a second USGS gaging station on Deer Creek at Terra Bella although the period of record (1971 through 1987) is not as complete as the station at Fountain Springs. Friant-Kern Canal water is also diverted and monitored into Deer Creek and again measured at Trenton Weir before being delivered to riparian lands via unlined canals (see Figure 2-7). During wet years, water that reaches the terminus of Deer Creek is discharged into the Homeland Canal.

2.1.5.5. White River

The White River drains out of the Sierra Nevada Mountains east of the community of Richgrove in the southern portion of the Tule Subbasin (see Figure 2-7). Stream flow in the White River has been measured at the USGS gaging station near Ducor from 1972 to 2005. Data after 2005 has been interpolated. Average annual flow between water year 1986/87 and 2016/17 was approximately 5,800 acre-ft/yr with a low of approximately 250 acre-ft in water year 2014/15 and a high of approximately 37,000 acre-ft in 1997/98. The White River channel extends as far as State Highway 99 but does not reach the historical Tulare Lakebed.

2.1.5.6. *Imported Water §354.14 (d)(6)*

> § 354.14. (d) (6) The source and point of delivery for imported water supplies.

Most of the water imported into the Tule Subbasin is from the Central Valley Project (CVP) and delivered via the Friant-Kern Canal (see Figure 2-7). Angiola Water District also imports water from other various sources including the King's River and State Water Project. The water is delivered to farmers and recharge basins via the Tule River and Deer Creek channels, unlined canals, and pipeline distribution systems of PID, LTRID, Terra Bella Irrigation District, Teapot Dome Water District, DEID, and Saucelito Irrigation District.

Distribution of stream flow diversions and imported water occur via a system of manmade canals and pipeline distribution systems that extend throughout the Tule Subbasin. The largest of these is the Friant-Kern Canal, which supplies imported water through the Federal Central Valley Project (CVP). The Friant-Kern Canal is concrete lined and trends approximately north-south through the eastern part of the Tule Subbasin (see Figure 2-7). Numerous other canals and pipeline distribution systems are located within the Tule Subbasin to convey surface water from the Friant-Kern Canal, Tule River and Deer Creek to various recharge facilities and agricultural areas. The canals are unlined and occur primarily in the LTRID, Pixley Irrigation District, PID, Alpaugh Irrigation District, and Atwell Island Water District. The Angiola Water District receives deliveries from the Tule River and Kings River via the Homeland Canal and distributes that water via an internal system of unlined canals.

Many of the irrigation districts and water districts in the Tule Subbasin that receive imported water from the Friant-Kern Canal distribute the water exclusively via pipeline distribution systems. These districts include the Delano-Earlimart Irrigation District, Kern-Tulare Water District, Terra Bella Irrigation District, Saucelito Irrigation District, and Tea Pot Dome Water District.

2.1.6. Areas of Groundwater Recharge and Discharge §354.14 (d)(4)

> § 354.14. (d) (4) Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.

Groundwater recharge in the Tule Subbasin occurs within stream channels, unlined canals, in managed recharge basins, and in areas of the subbasin with irrigated agriculture. Favorable areas for deep percolation of surface water are characterized by relatively permeable surface soils (see Figure 2-8), and lack of subsurface impediments to groundwater recharge.

The University of California at Davis has developed a Soil Agricultural Groundwater Banking Index (SAGBI) that identifies favorable areas of recharge based on deep percolation potential, root zone residence time, topography, chemical limitations, and soil surface condition. The SAGBI zones for the Tule Subbasin are shown on Figure 2-9. In general, the most favorable areas for recharge are within the stream channels of the Tule River, Deer Creek and White River, in the Porterville area, and in a north-south zone in the west-central portion of the subbasin. Areas that are not favorable for deep percolation of surface water and recharge of groundwater are in the furthest east portion of the subbasin along the base of the Sierra Nevada Mountains and in the furthest west portion of the subbasin coincident with Tulare Lake lacustrine deposits. It is noted that the SAGBI zones shown on Figure 2-9 are limited to the surface deposits and any areas to be considered for additional recharge basins should be further investigated with boreholes and recharge tests to confirm the recharge potential of the location.

There are no areas of groundwater discharging at the land surface in the Tule Subbasin due to the depth of the groundwater. The primary source of groundwater discharge is pumping from wells (see Section 2.3.1.1.4), which occurs across most of the subbasin.

2.1.7. Principal Aquifers and Aquitards §354.14 (b)(4)

§ 354.14. (b) (4) Principal aquifers and aquitards, including the following information:

(A) Formation names, if defined.

(B) Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.

(C) Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.

(D) General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.

(E) Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.

2.1.7.1 Aquifer Formations §354.14 (b)(4)(A)

In general, there are five general aquifer/aquitard units in the subsurface beneath the Tule Subbasin (see Figures 2-5 and 2-6):

1. Upper Aquifer
2. The Corcoran Clay Confining Unit
3. Lower Aquifer
4. Pliocene Marine Deposits (generally considered an aquitard)
5. Santa Margarita Formation and Olcese Formation of the Southeastern Subbasin

The upper aquifer occurs across the entire Tule Subbasin area. This aquifer is generally unconfined to semi-confined. The upper aquifer occurs in the upper 450 ft of sediments on the western side of the subbasin and shallows to the east to less than approximately 100 ft of sediments in the Porterville area. In the southeastern portion of the basin, the upper aquifer is generally considered unsaturated although there may be local areas of groundwater.

The Corcoran Clay confining unit occurs beneath the upper aquifer in the western half of the Tule Subbasin (see Figures 2-4, 2-5 and 2-6). This unit consists primarily of blue or green diatomaceous clay although in places it is interbedded with sandy sediments. The Corcoran Clay is thickest in the western part of the subbasin and thins to the east, pinching out approximately two to three miles east of State Highway 99 (see Figure 2-4). It is noted that, in places, the Corcoran Clay, as formally defined in Frink and Kues (1954) and later Davis et al. (1959), is bounded above and below by fine-grained clay not specifically associated with the Corcoran Clay. As such, the thickness of the Corcoran Clay unit, as shown on Figures 2-5 and 2-6 has been defined to include these adjacent clays.

The lower aquifer extends across the entire western portion of the Tule Subbasin and beneath the northeastern portion of the subbasin. The total depth of this aquifer ranges from approximately 400 bgs in the eastern Tule Subbasin to more than 2,000 feet in the western portion of the subbasin. This aquifer is confined beneath the Corcoran Clay where this confining layer exists, and beneath other clay lenses in other parts of the subbasin. The lower aquifer system is conceptualized to be semi-confined in the northeastern portion of the subbasin east of the Corcoran Clay.

In the southeastern portion of the Tule Subbasin, the lower aquifer is separated from the underlying Santa Margarita Formation aquifer by a relatively thick (500 to 1,600 feet) layer of Pliocene marine deposits. These deposits consist primarily of siltstone with minor interbedded sandstone and are conceptualized as a confining unit that separates the deep alluvial aquifer from the Santa Margarita Formation aquifer. Some wells in the southeastern portion of the Tule Subbasin are perforated partially within this unit but the contribution of groundwater from the formation is low (Lofgren and Klausing, 1969).

The Santa Margarita Formation and Olcese Formation underlie the Pliocene marine deposits and forms a localized aquifer in the southeastern portion of the Tule Subbasin. This aquifer is a primary source of groundwater for agricultural irrigation in the southeastern portion of the subbasin. The aquifer is relatively permeable and well yields greater than 1,500 gallons per minute have been reported (Kern-Tulare Water District, 2018). Until additional data are collected, this localized aquifer is conceptualized as hydrologically separate from the deep aquifer in the rest of the subbasin.

2.1.7.2 Aquifer Physical Properties §354.14 (b)(4)(B)

Where saturated in the subsurface, the permeable sand and gravel layers form the principal aquifers in the Tule Subbasin and adjacent areas to the north, south and west. Individual aquifer layers consist of lenticular sand and gravel deposits of varying thickness and lateral extent. The aquifer layers are interbedded with low permeability silt and clay lenses. In general, shallow saturated sediments in the Tule Subbasin are unconfined to semi-confined. The aquifer beneath the Corcoran Clay unit in the western portion of the basin is confined. The hydrologic characteristics of the deeper aquifer system in the western portion of the subbasin are unknown but are expected to change with depth.

The ability of aquifer sediments to transmit and store water is described in terms of the aquifer parameters transmissivity, hydraulic conductivity, and storativity. The most reliable estimates of these parameters are obtained from long-term (e.g. 24-hr or more constant rate) controlled pumping tests in wells. In the absence of this type of test, estimates can be obtained through short-term pumping tests and/or assignment of literature values based on the soil types observed in driller's logs. Long-term pumping test data was obtained from KDSA and DEID for wells located in the southern part of the subbasin. Short-term pumping test data was obtained from driller's logs, KDSA for Angiola Water District and City of Porterville wells, and KTWD for selected wells. Where pumping test data were not available, aquifer parameters were assigned from literature values in published in Faunt (2009).

Transmissivity is a measure of the ability of groundwater to flow within an aquifer and is defined as the rate of groundwater flow through a unit width of aquifer under a unit hydraulic gradient (Fetter, 1994). Transmissivity was estimated from short-term pumping test data based on Theis et al., 1963 and the following relationship:

$$T = \frac{S_c \ x \ 2{,}000}{E}$$

Where:

T	=	Transmissivity (gpd/ft);
S_c	=	Specific Capacity (gpm/ft);
E	=	Well Efficiency (assumed to be 0.7)

Transmissivity values at individual wells were converted into hydraulic conductivity (i.e. aquifer permeability) by dividing by the aquifer thickness (in this case the perforation interval of the well). Horizontal hydraulic conductivity values for the upper aquifer are shown on Figure 2-10 and range from less than 5 ft/day to greater than 160 ft/day, the higher values indicating more permeable sediments. Hydraulic conductivity values for the lower aquifer are shown on Figure 2-11 and range from less than 5 ft/day to greater than 80 ft/day.

Storage properties of the upper aquifer are expressed in terms of specific yield since the majority of this aquifer is conceptualized as unconfined. Specific yield is the ratio of the volume of water sediment will yield by gravity drainage to the volume of the sediment. Specific yield values for the upper aquifer were assigned based on a USGS texture analysis published in Faunt (2009). Textural descriptions describe the percent coarse-grained sediment as inferred from drillers' logs from boreholes or wells drilled within or immediately outside the Tule Subbasin. Higher percent coarse-grained sediment descriptions are correlated with higher specific yield (see Figure 2-12). As shown, higher percent coarse-grained sediments are observed in the upper aquifer through most of the Tule Subbasin with the exception of the southwestern portion. Values of specific yield for the upper aquifer range from 0.05 to greater than 0.2.

The lower aquifer in the Tule Subbasin is confined to semi-confined and, as such, storage properties for this aquifer are expressed in terms of storativity. Storativity is a measure of the volume of water an aquifer can release from, or take into, storage per unit of aquifer surface area per unit change in hydraulic head. Storativity is derived from long-term pumping tests where pumping interference is measured in a monitoring well located a known distance from the pumping well. As no pumping interference data are available for the Tule Subbasin, storativity values for the lower alluvial aquifer were originally based on values published in Faunt (2009) and modified during calibration of the numerical model for the Tule Subbasin. Values for storativity in the deep aquifer range from 0.00015 to 0.001 (see Figure 2-13). These values indicate confined to semi-confined aquifer conditions.

2.1.7.3 Geologic Structures that Affect Groundwater Flow §354.14 (b)(4)(C)

There are no significant faults mapped in the Tule Subbasin that affect groundwater flow.

The Corcoran Clay unit is the most significant geologic feature that affects vertical groundwater flow in the Tule Subbasin. In general, the aquifer system above the clay unit is unconfined to semi-confined and the aquifer system below it is confined. The hydraulic head in the upper aquifer is higher than that of the lower aquifer, such that there is vertical downward hydraulic gradient between the two. Despite the low vertical hydraulic conductivity of the Corcoran Clay, the area for downward flow is large (hundreds of thousands of acres), and the vertical gradients are relatively steep (commonly 20 to 40 feet per 100 feet). This allows for significant downward flow of water through the clay on a regional basis. In addition, many wells in the subbasin are perforated across both the upper and lower aquifers (composite wells) creating communication between the two. As such, these wells facilitate some recharge of the lower aquifer from the upper aquifer. East of the Corcoran Clay, other localized confining beds are present that separate the upper aquifer from the lower aquifer.

2.1.7.4 Aquifer Water Quality §354.14 (b)(4)(D)

Groundwater quality in the Tule Subbasin varies across the subbasin and with depth in the aquifer system. Overall, the native groundwater quality is generally very good, with historical EC measurements generally less than approximately 600 µmohs/cm (Tule Basin Water Quality Coalition, 2017) (see Figure 2-14). Groundwater quality issues in the subbasin include both regional non-point sources of groundwater quality degradation and point-source contaminant issues.

On a regional level, non-point source constituents of concern for groundwater quality include nitrate, pesticides, 1,2-dibromo-3-chloropropane (DBCP), and 1,2,3, tricholoropropane (TCP) in the upper aquifer and arsenic, manganese, and, hydrogen sulfide for the lower aquifer. In the western part of the subbasin, color and methane gas are also non-point constituents of concern.

Nitrate is the primary non-point constituent of concern (Tule Basin Water Quality Coalition, 2017). Historical nitrate concentrations (reported as nitrate) in the subbasin range from non-detect to greater than 300 mg/L (see Figure 2-15). The highest nitrate concentrations have been detected in shallow groundwater in the northwest portion of the subbasin and are likely correlated with overlying land use.

Wells from which elevated EC values have been detected above the subbasin average occur in shallow groundwater in the northwest and southwest portions of the subbasin (see Figure 2-14). High EC values measured in groundwater in the northwest part of the subbasin are likely associated with overlying land use. High EC has also been detected in shallow and locally perched groundwater in the southwestern part of the subbasin. This area of the subbasin is on the historical Tulare Lakebed where the Regional Water Quality Control Board – Central Valley Region and California State Water Resources Control Board (SWRCB) has removed the municipal and agricultural beneficial use designation (SWRCB, 2017).

For point-source contaminants, there are 26 active cleanup sites in the Tule Subbasin identified on the California Geotracker website (see Figure 2-16; Table 2-1). Twelve of the point source contamination sites are associated with leaking underground storage tanks (LUSTs) for which the primary contaminant is petroleum hydrocarbons (gasoline, diesel and kerosene). There are 14 Regional Water Quality Control Board Cleanup Program or Department of Toxic Substance Control (DTSC) sites within the subbasin (see Figure 2-16). Contaminants associated with these sites include metals, volatile organic compounds (VOCs), pesticides, herbicides, cyanide, and polyaromatic hydrocarbons (PAHs). Groundwater contaminant plumes associated with these sites are highly localized.

2.1.7.5 Aquifer Primary Uses §354.14 (b)(4)(E)

The predominant beneficial use of groundwater in the Tule Subbasin is agricultural irrigation. Other beneficial uses include municipal water supply, private domestic water supply, and livestock washing and watering.

2.1.8. Uncertainty in the Hydrogeologic Conceptual Model §354.14 (b)(5)

> § 354.14. (b) (5) Identification of data gaps and uncertainty within the hydrogeologic conceptual model

The primary sources of uncertainty in the hydrogeologic conceptual model include:

- Knowledge of the hydraulic interaction between the shallow and deep aquifer
- Lack of aquifer-specific groundwater levels with adequate spatial distribution to enable preparation of representative groundwater level maps of each aquifer in parts of the subbasin
- Characteristics of the Santa Margarita Formation aquifer
- Groundwater underflow into the alluvial aquifer system from the Sierra Nevada mountain block
- Aquifer characteristics of hydraulic conductivity, transmissivity and storativity
- Agricultural groundwater pumping
- Well construction and pumping distribution between the shallow and deep aquifers
- Canal seepage
- Travel time for recharge from the land surface through the unsaturated zone to the groundwater

Uncertainty in the hydrogeologic conceptual model is being addressed through a sensitivity and uncertainty analysis of the numerical model results from the Tule Subbasin model (TH&Co, 2019) (see Section 2.3.2.7).

2.2 Groundwater Conditions §354.16

> § 354.16. Groundwater Conditions
>
> Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

2.2.1 Groundwater Occurrence and Flow §354.16 (a)

§ 354.16. (a) Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:

> (1) Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.
>
> (2) Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.

In general, groundwater in the Tule Subbasin flows from areas of natural recharge along major streams at the base of the Sierra Nevada Mountains on the eastern boundary towards a groundwater pumping depression in the west-central portion of the subbasin (see Figures 2-17 and 2-18). The pumping depression has reversed the natural groundwater flow direction in the western portion of the subbasin, inducing subsurface inflow along the southern and western boundaries.

In the upper aquifer, the pumping depression is most pronounced between the Tule River and Deer Creek west of Highway 99 and east of Highway 43. The pumping depression has persisted in this area since at least 1987, even during periods of above-normal precipitation when groundwater levels temporarily recovered. Recharge from the Tule River results in a groundwater flow divide in the upper aquifer along the northern boundary of the Tule Subbasin. As such, upper aquifer groundwater on the north side of the river flows to the north and out of the subbasin. Groundwater flow patterns in the upper aquifer have generally not changed significantly since 1990.

In the lower aquifer, groundwater flows to the southwest toward a pumping depression in the western portion of the subbasin (see Figure 2-19). This pumping depression extends from west of Corcoran in the northwest to the Alpaugh area in the southwestern Tule Subbasin west of Highway 43. There is inadequate data to prepare groundwater contour maps specific to the lower aquifer for spring and fall of 2017. The groundwater contour map provided on Figure 2-19 for 2010 is the most recent year for which data were available to prepare a contour map.

Groundwater level changes over time can be observed from hydrographs developed from wells monitored in the Tule Subbasin. Despite a relatively wet hydrologic period between 1995 and 1999 and periodic wet years (2005 and 2011), groundwater levels in upper aquifer wells show a persistent downward trend between approximately 1987 and 2017 (see Figure 2-20). Groundwater level trends in wells perforated exclusively in the lower aquifer vary depending on location in the subbasin. In the northwestern part of the subbasin, lower aquifer groundwater levels have shown a persistent downward trend from 1987 to 2017. In the southern part of the subbasin, groundwater levels were relatively stable between 1987 and 2007 but began declining after 2007 (see Figure 2-21).

Comparisons of hydrographs from wells perforated in the upper aquifer with wells perforated predominantly in the lower aquifer and in close proximity show that groundwater levels in the upper aquifer are higher than groundwater levels in the lower aquifer (see Figure 2-22). This indicates a downward hydraulic gradient and indicates that the upper aquifer is recharging the lower aquifer of the Tule Subbasin. This is corroborated by depth-specific isolated aquifer zone testing conducted by the City of Porterville in three wells in which the equilibrated groundwater level (i.e. hydraulic head) in the deepest isolated zones, which also correspond to the lower aquifer, were as much as 180 ft lower than the groundwater level in the shallowest isolated zones (Schmidt, 2009). Faunt (2009) has suggested that the recharge of the lower aquifer via wells that are perforated across both aquifers has increased with the number of deep wells constructed in the San Joaquin Valley.

2.2.2 Groundwater Storage §354.16 (b)

§ 354.16. (b) A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.

Changes in groundwater storage within the Tule Subbasin have been estimated through analysis of the water budget for the subbasin. Annual change in groundwater storage in the subbasin between 1986/87 and 2016/17 is shown in Table 2-3 and is graphically presented on Figure 2-23. Comparison of the groundwater inflow elements of the water budget with the outflow elements shows a cumulative change in groundwater storage over the 31-year period between 1986/87 and 2016/17 of approximately -4,948,000 acre-ft. The average annual change in storage resulting from the groundwater budget is approximately -160,000 acre-ft/yr over this time period.

2.2.3 Seawater Intrusion §354.16 (c)

§ 354.16. (c) Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.

Seawater intrusion cannot occur in the Tule Subbasin due to its location with respect to the Pacific Ocean. The Tule Subbasin is approximately 110 miles inland of the Pacific Ocean (see Figure 2-1) and is separated from the ocean by approximately 90 miles of sedimentary rocks that make up the Coast Ranges. These sedimentary rocks effectively separate the Pacific Ocean hydraulically from the aquifer system in the San Joaquin Valley. Further, the Coast Ranges are dissected by multiple northwest trending faults, the largest of which is the San Andreas Fault. These faults form groundwater flow barriers, which further act to separate the San Joaquin Valley aquifers from the Pacific Ocean. Accordingly, groundwater pumping in the Tule Subbasin cannot induce seawater intrusion.

2.2.4 Groundwater Quality Issues §354.16 (d)

> § 354.16. (d) Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.

The primary groundwater quality issues that could affect the beneficial uses of groundwater in the Tule Subbasin are nitrate and pesticides. Nitrate concentrations in excess of the Maximum Contaminant Level (MCL) of 45 mg/L have been detected in some wells, particularly in the northwest portion of the subbasin (see Figure 2-15). While nitrate is not an issue for agricultural irrigation or dairy supply, elevated nitrate in groundwater from small domestic supply wells could limit the beneficial use of water where these wells are impacted.

There are 26 active cleanup sites in the Tule Subbasin identified on the California Geotracker website (see Figure 2-16; Table 2-1). Twelve of the point source contamination sites are associated with LUSTs for which the primary contaminant is petroleum hydrocarbons (gasoline, diesel and kerosene). There are 14 Regional Water Quality Control Board Cleanup Program or Department of Toxic Substance Control (DTSC) sites within the subbasin (see Figure 2-16). Contaminants associated with these sites include metals, VOCs, pesticides, herbicides, cyanide, and PAHs.

2.2.5 Land Subsidence §354.16 (e)

> § 354.16. (e) The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

Land surface subsidence in the Tule Subbasin as a result of lowering the groundwater level from groundwater production has been well documented (Ireland et al., 1984; Faunt, 2009; Luhdorff and Scalmanini, 2014). Prior to 1970, as much as 12 ft of land surface subsidence was documented for the area immediately south of Pixley (Ireland et al., 1984). As groundwater levels rose in the area throughout the 1970s and early 1980s, land subsidence was largely arrested. During this time, monitoring for land subsidence that had previously been conducted along the portion of the Friant-Kern Canal that is within the Tule Subbasin was discontinued.

From the late 1980s into the 2000s, it is suspected that land subsidence in the Tule Subbasin was reactivated as groundwater levels declined. Groundwater flow model simulations of land subsidence in the Central Valley by Faunt et al. (2009), which were calibrated to historical land subsidence that occurred in the 1960s, simulated an additional two to four feet of land subsidence between 1986 and 2003.

The reactivation of land subsidence was confirmed in the late 2000s based on data from Interferometric Synthetic Aperture Radar (InSAR) satellites and one Global Positioning System (GPS) station located in Porterville, California. InSAR data showed as much as four feet of additional land subsidence occurring in the northwestern portion of the Tule Subbasin between 2007 and 2011 (see Figure 2-24) (Luhdorff and Scalmanini, 2014). Approximately 0.4 ft of land subsidence occurred in the Porterville area between 2007 and 2011. From 2015 through 2018, land subsidence in the Tule Subbasin, as observed from InSAR data, continued with as much as 2.75 ft of additional land subsidence in the northwest portion of the subbasin and as much as 0.75 ft of additional land subsidence at the Porterville GPS station (see Figure 2-25). Based on benchmarks located along the Friant-Kern Canal and monitored by the Friant Water Authority, cumulative land subsidence along the canal between 1959 and 2017 has ranged from approximately 1.7 ft in the Porterville area to 9 feet in the vicinity of Deer Creek (see Figure 2-24).

For the time period between 1987 and 2018, cumulative subsidence across the Tule Subbasin was estimated (in feet) based on model simulation results of land subsidence using a groundwater flow model equipped with a subsidence simulation package calibrated to observed land subsidence from InSAR and GPS data. The highest cumulative land subsidence for the time period was estimated for the northwestern portion of the subbasin where approximately 12 feet was simulated. The lowest rates of land subsidence were observed in the southeast portion of the subbasin between Delano and Richgrove where less than one foot of cumulative land subsidence was simulated.

The rate of land subsidence in the Tule Subbasin varies both spatially, according the geology of the subsurface sediments, and temporally with changes in groundwater levels. The average rate of change in land surface elevation between 1987 and 2018 for the area of maximum subsidence was estimated to be approximately 12 feet over the 32-year period for a rate of 0.4 ft/yr. At the Porterville GPS station, the annual rate of subsidence between 2006 and 2013 was approximately 0.09 ft/yr but increased to approximately 0.29 ft/yr between 2013 and 2019 (see Figure 2-25).

2.2.6 Interconnected Surface Water Systems §354.16 (f)

> § 354.16. (f) Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

Interconnected surface water is surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. As of January 2015, there are no areas within the Tule Subbasin where the depth to groundwater is within 25 ft of the land surface (see Figure 2-26). Based on the depth to groundwater, it is assumed that an unsaturated zone exists between surface water features and the aquifer system during average and dry periods. It is noted that there may be periods of time when the groundwater level temporarily rises to within 25 feet of the land surface in only a few relatively small areas of the Tule Subbasin, namely along the Tule River in and upstream of Porterville, and in the upper reaches of Deer Creek and White River. However, this condition, if it occurs, would be temporary and is not the normal hydrologic relationship between surface water and groundwater in these areas.

2.2.7 Groundwater Dependent Ecosystems §354.16 (g)

> § 354.16. (g) Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

Groundwater dependent ecosystems require shallow groundwater or groundwater that discharges at the land surface. Throughout the Tule Subbasin, the depth to groundwater is well below the level required to support riparian vegetation (vegetation that draws water directly from groundwater) or near surface ecosystems, except some areas along the Tule River east of Porterville. Based on the CDWR Groundwater Dependent Ecosystems database (www.groundwaterresourcehub.org), the deepest root zones for groundwater dependent plants in the Tule Subbasin are for Valley Oak, which can reach a depth of approximately 25 feet. Figure 2-26 is a depth to groundwater map based on groundwater levels in January 2015. As shown, there were no areas of the subbasin where the groundwater was within 25 feet of the land surface at that time. It is noted that there may be periods of time when the groundwater level is within 25 feet of the land surface in some areas of the subbasin. The areas most likely to support groundwater dependent ecosystems are along the Tule River in and upstream of Porterville, and in the upper reaches of Deer Creek and White River.

2.3 Water Budget §354.18

> § 354.18. Water Budget
>
> (a) Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.

2.3.1. Surface Water Budget

The surface water budget for the Tule Subbasin was developed for the 31-year period from 1986/87 to 2016/17 (see Table 2-2a for Inflow Terms and Table 2-2b for Outflow Terms). Inflow terms for the surface water budget include precipitation, stream inflow, imported water, and discharge to the land surface from wells. Outflow terms include infiltration of precipitation, evapotranspiration of precipitation from areas of native vegetation and crops, stream infiltration, canal loss, recharge in basins, return flow, and consumptive use.

Ideally, the total surface water inflow to the subbasin would equal the total surface water outflow, indicating a complete and accurate accounting of water at the surface. In reality, there is uncertainty in many of the surface water budget terms for the Tule Subbasin that does not allow for a perfect surface water accounting. These include estimates for agricultural groundwater production, crop consumptive use, precipitation recharge, surface water outflow to Homeland Canal from Deer Creek, and others. For the Tule Subbasin surface water budget, the percent difference between the average annual surface water inflow (1,477,000 acre-ft; Table 2-2a) and average annual outflow (1,474,000 acre-ft; Table 2-2b) is approximately 0.2 percent. This represents a very good match between surface water inflows and outflows and indicates that the water budget is a good representation of actual conditions. As additional data become available, it is anticipated that the surface water budget will become more accurate with time.

It is noted that many of the surface water outflow terms are also groundwater inflow (i.e. groundwater recharge) terms. Of the surface water outflow terms that become groundwater recharge, many are associated with water diverted in accordance with pre-existing water rights or purchased imported water. Sources of surface water outflow that become groundwater recharge and are associated with existing rights and/or imported water deliveries are excluded from the Sustainable Yield estimate and are indicated with magenta-colored columns in Table 2-2b. Surface water losses that become groundwater recharge and are used to estimate Sustainable Yield are indicated with blue-colored columns in Table 2-2b. Surface water losses that do not become groundwater recharge, such as through evapotranspiration, crop consumptive use, or surface water outflow are indicated with yellow-colored columns in Table 2-2b (page 2).

Details of the individual surface water budget terms are provided in the following sections.

2.3.1.1 Surface Water Inflow §354.18 (b)(1)

> § 354.18. (b) The water budget shall quantify the following, either through direct measurements or estimates based on data:
>
> (1) Total surface water entering and leaving a basin by water source type.

2.3.1.1.1. Precipitation

The annual volume of water entering the Tule Subbasin as precipitation was estimated for the surface water budget based on the long-term average annual isohyetal map shown on Figure 2-27 and the annual precipitation data reported for the Porterville precipitation station. As annual precipitation values are not available throughout the entire Tule Subbasin, it was assumed that the relative precipitation distribution for each year was the same as that shown on the isohyetal map. The magnitude of annual precipitation within each isohyetal zone was varied from year to year based on the ratio of annual precipitation at the Porterville Station (see Figure 2-28) to annual average precipitation at the Porterville isohyetal zone multiplied by the isohyetal zone average annual precipitation. Using this method, total annual precipitation in the Tule Subbasin between water years 1986/87 and 2016/17 ranged from approximately 99,000 to 728,000 acre-ft/yr with an average of 306,000 acre-ft/yr (see Column A of Table 2-2a).

2.3.1.1.2. Stream Inflow

Surface water inflow to the Tule Subbasin occurs primarily via three native streams: Tule River, Deer Creek, and the White River (see Columns B through D of Table 2-2a). Flow in the Tule River is controlled through releases from Lake Success, which are documented in TRA annual reports. For water years 1986/87 to 2016/17, annual surface water inflow to the Tule Subbasin via the Tule River, measured as releases from Lake Success, ranged from 8,820 to 439,125 acre-ft/yr with an average of 118,300 acre-ft/yr. The long-term 114-year average (1904 to 2017) inflow to Lake Success via the Tule River channels is 139,187 acre-ft/year.

Annual inflow from Deer Creek is measured at Fountain Springs by the USGS and has varied from approximately 2,000 to 88,000 acre-ft/yr with an average of 17,800 acre-ft/yr over water years 1986/87 to 2016/17. The long-term average inflow via Deer Creek for the period of record from 1920 to 2017 is 22,035 acre-ft/year. It is noted that although the Fountain Springs gage is located approximately five miles upstream of the Tule Subbasin, the creek flows over granitic bedrock between the gage and the alluvial basin boundary and losses along this reach are assumed to be limited to evapotranspiration.

Surface water inflow from the White River is based on USGS stream gage data from the White River station near Ducor. The measured data from this station is only available from 1971 to 2005. In order to estimate annual streamflow from 1986/87 to2016/17, it was assumed that the magnitude of flow in the White River is proportional to the magnitude of flow in Deer Creek. TH&Co plotted monthly White River streamflow against monthly Deer Creek streamflow for the period 1971 to 2005. A linear regression through the data resulted in a correlation coefficient of 0.91, suggesting that the relationship is applicable (see Figure 2-29). White River streamflow between 2006 and 2017 was based on the linear interpolation of measured data. Based on the measured and interpolated data, annual inflows from the White River ranged from approximately 250 to 37,000 acre-ft/yr and averaged 5,800 acre-ft/yr from water years 1986/87 to 2016/17.

2.3.1.1.3. Imported Water

Imported water is delivered to eleven water agencies within the Tule Subbasin from the Friant-Kern Canal (see Columns E through O of Table 2-2a). Data from PID, Saucelito Irrigation District, Tea Pot Dome Water District, Alpaugh Irrigation District, Atwell Island Irrigation District, and Terra Bella Irrigation District was obtained from USBR Central Valley Operation Annual Reports. Imported water data for the other agencies was provided by the respective agencies. Based on these data, an average of 345,600 acre-ft/yr was imported into the Tule Subbasin for the period from 1986/87 to 2016/17.

2.3.1.1.4. Discharge to Crops from Wells

Water applied to crops from wells is assumed to be the total applied water minus surface water deliveries from imported water and diverted streamflow (see Figure 2-30). The total crop demand was estimated based on consumptive use estimates and an assumed irrigation efficiency of 79 percent. The estimated average annual discharge to crops from wells for water years 1986/87 to 2016/17was approximately 664,000 acre-ft/yr (see Column P of Table 2-2a).

2.3.1.1.5. Municipal Deliveries from Wells

Groundwater pumping for municipal supply is conducted by the City of Porterville and small municipalities for the local communities in the Tule Subbasin. From water years 1986/87 to 2016/17, municipal pumping from wells was estimated to average approximately 20,000 acre-ft/yr (see Column Q of Table 2-2a).

It is noted that there are some households in the rural portions of the Tule Subbasin that rely on private wells to meet their domestic water supply needs. However, given the low population density of these areas, the volume of pumping from private domestic wells is considered negligible compared to the other pumping sources.

2.3.1.2 Surface Water Outflow

2.3.1.2.1 Areal Recharge from Precipitation

Areal recharge from precipitation falling on the valley floor in the Tule Subbasin was estimated based on Williamson et al., (1989). As part of a regional hydrogeological study of the California Central Valley, Williamson et al., (1989) developed a monthly soil-moisture budget for the Sacramento Valley and San Joaquin Valley areas. The soil moisture budget was based on precipitation records for the 50-yr period from 1922 to 1971. The analysis considered potential evapotranspiration, assumed plant root depth, soil moisture-holding capacity, and precipitation. Monthly precipitation that exceeded monthly potential evapotranspiration and soil-moisture storage was computed as net infiltration to the groundwater system. The results were simplified with a linear regression model that estimates net infiltration (i.e. groundwater recharge) from annual precipitation (herby referred to as the Williamson Method). The resulting relationship for the San Joaquin Valley region was:

$$PPT_{ex} = (0.64)PPT - 6.2$$

Where:

PPT_{ex} = Excess Annual Precipitation (ft/yr);
PPT = Annual Precipitation (ft/yr)

It is noted that the Williamson Method applied to the San Joaquin Valley results in no groundwater recharge if average annual precipitation is less than 9.69 inches per year. Results of the net infiltration analysis from Williamson et al., (1989) were used in the development of the Central Valley Groundwater Model developed by the USGS and documented in Faunt (2009).

For each year, annual groundwater recharge from precipitation (i.e. PPT_{ex}) was estimated for each isohyetal zone (see Section 2.3.1.1.1 and Figure 2-27) using the above equation from the Williamson Method. The resulting annual groundwater recharge from areal precipitation for the period 1986/87 to 2016/17ranged from 0 acre-ft/yr to 219,000 acre-ft/yr with an average of approximately 21,000 acre-ft/yr (see Column A of Table 2-2b) or approximately 7 percent of total precipitation.

2.3.1.2.2 Streambed Infiltration (Channel Loss)

Tule River

The Tule River is a losing stream such that infiltration of surface water within the stream channel recharges the groundwater system beneath it. Total channel loss (i.e. streambed infiltration) in the Tule River between Lake Success and Oettle Bridge is based on TRA annual reports. Streambed infiltration in the Tule River between Oettle Bridge and Turnbull Weir was estimated based on LTRID monthly water use summaries and TRA annual reports. Measured channel loss includes infiltration as well as evapotranspiration. Therefore, infiltration is equal to channel loss, as reported in TRA reports, minus evapotranspiration (described in Section 2.3.1.2.6).

It is noted that there are two sources of water in the Tule River channel: 1) native flow associated with releases from Lake Success and 2) imported water from the Friant-Kern Canal. Surface water in the Tule River channel from Lake Success to Oettle Bridge is exclusively native water (Column B of Table 2-2b). Surface water in the Tule River channel from Oettle Bridge to Turnbull Weir is primarily native flow but periodically includes imported water released to the channel from the Friant-Kern Canal.

As there is no current accounting of Tule River channel loss from Oettle Bridge to Turnbull Weir, it was necessary to estimate it based on available data and an assumed loss factor. The loss factor was based on the assumption that the ratio of streamflow to channel losses upstream of Oettle Bridge is the same as the ratio downstream. Thus, the ratio of streamflow to channel losses observed upstream of Oettle Bridge (the "loss factor") was applied to measured flow Below Oettle Bridge. The loss factor was applied separately to native Tule River water and imported water releases to develop streambed infiltration estimates specific to both. From water years 1986/87 to 2016/17, average annual streambed infiltration from Success to Oettle Bridge was approximately 16,500 acre-ft/yr (Column B of Table 2-2b). During the same time period, average annual streambed infiltration between Oettle Bridge and Turnbull Weir was approximately 3,200 acre-ft/yr (see Column C of Table 2-2b).

Deer Creek

Deer Creek is a losing stream such that infiltration of surface water within the stream channel recharges the groundwater system beneath it. Streambed infiltration (channel loss) is estimated for the stream reaches between the Fountain Springs gaging station and Trenton Weir and between Trenton Weir and Homeland Canal. The difference in streamflow between Fountain Springs station and Trenton Weir is assumed to be total channel loss along this section. Streambed and canal infiltration in the Deer Creek channel between Trenton Weir and Homeland Canal were estimated based on Pixley Irrigation District monthly water use summaries. Measured channel loss includes infiltration as well as evapotranspiration. Therefore, infiltration is channel loss minus evapotranspiration (described in Section 2.3.1.2.6).

It is noted that there are two sources of water in the Deer Creek channel: 1) native flow and 2) imported water from the Friant-Kern Canal. Imported water is introduced into the Deer Creek channel by the Friant Water Authority via controlled and measured releases from the Friant-Kern Canal upstream of Trenton Weir. Thus, until a stream gage is established upstream of the Friant-Kern Canal/Deer Creek intersection, the separate accounting of losses associated with imported water and native Deer Creek surface flow will have to be approximated.

Deer Creek channel loss from Fountain Springs to Trenton Weir was estimated based on the difference in measured flows between the two stations. The surface flow between these two stations is assumed to be, for this water budget, native Deer Creek water. Average annual infiltration from Fountain Springs to Trenton Weir was approximately 12,100 acre-ft/yr between water years 1986/87 to 2016/17 (see Column D of Table 2-2b).

Flow in the Deer Creek channel from Trenton Weir to Homeland Canal is a combination of native Deer Creek water and imported water purchased by the Pixley Irrigation District for distribution in their service area. For this water balance, it is assumed that all of the water that flows through Trenton Weir is either delivered to riparians and farmers or becomes channel or canal loss (i.e. there is no data available to document surface flow from the Deer Creek channel to Homeland Canal although it is known that this occurs during periods of above normal precipitation). The infiltration of native Deer Creek water in the Deer Creek channel downstream of Trenton Weir is estimated for each month based on Pixley Irrigation District's annual water use summaries in the following way:

1. Imported water deliveries discharged from the Friant-Kern Canal to the Deer Creek channel were subtracted from the total flow measured at Trenton Weir to estimate the volume entering Pixley Irrigation District that is attributed to native Deer Creek flow.

2. Pixley Irrigation District sales and deliveries to basins were subtracted from the total flow through Trenton Weir to determine the volume of water presumably lost as infiltration in the Deer Creek channel and canals.
3. The total loss in No. 2 was multiplied by the ratio of Deer Creek water to total water measured at Trenton Weir to estimate the total losses attributed to native Deer Creek water.
4. A ratio was developed for the length of Deer Creek channel versus the length of canals downstream of the Trenton Weir (0.21).
5. The total loss attributed to native Deer Creek flow, as estimated from No. 3, was multiplied by the ratio of Deer Creek channel length to canal length from No. 4 to estimate the volume of native Deer Creek flow loss estimated to occur in the Deer Creek channel.
6. The volume of native Deer Creek flow lost in canals was estimated as the total loss (No. 3) minus the loss estimated to occur in the Deer Creek channel (No. 5).

Using the methodologies described above, average annual native Deer Creek infiltration from Fountain Springs to Trenton Weir for water years 1986/87 to 2016/17 was 12,100 acre-ft/yr (see Column D of Table 2-2b). The average annual native Deer Creek infiltration in the Deer Creek channel between Trenton Weir and Homeland Canal was approximately 700 acre-ft/yr (see Column E of Table 2-2b).

White River

All of the surface water flow measured or interpolated at the White River stream gage, after accounting for ET losses, is assumed to become streambed infiltration. Average annual infiltration from White River flow for water year 1986/87 to 2016/17was estimated to be approximately 5,600 acre-ft/yr (see Column F of Table 2-2b).

2.3.1.2.3 Canal Losses

Canal Losses from Tule River Diversions

A portion of the native Tule River water that is diverted into unlined canals is lost through infiltration into the subsurface groundwater subbasin. For PID, Vandalia Water District, and Woods-Central Ditch Co., delivery losses in unlined canals are accounted for in the portion of the water budget that address deep percolation of applied water.

In the LTRID, canal losses attributed to Tule River diversions are estimated from the District's annual water use summaries reports. Total canal losses within the LTRID (which include both native river water and imported water) are estimated by subtracting streambed infiltration and ET from the total losses reported in the annual water use summaries. Canal losses attributed to native Tule River water are based on the ratio of native Tule River water to imported water (Table 2-2b, Column G). The average annual Tule River canal loss from water years 1986/87 to 2016/17 was approximately 22,300 acre-ft/yr.

Canal Losses from Deer Creek Diversions

It is assumed that canal losses from delivery of native Deer Creek water to riparians and farmers occur only within the Pixley Irrigation District. To estimate canal losses within the Pixley Irrigation District, the estimated infiltration and ET within the Deer Creek channel (see Section 2.3.1.2.6) was subtracted from total losses. The average annual Deer Creek canal loss for water years 1986/87 to 2016/17was approximately 2,600 acre-ft/yr (see Column H of Table 2-2b).

Canal Losses from Imported Water Deliveries

With the exception of canal losses within the Angiola Water District and PID, imported water that infiltrates into the subsurface groundwater subbasin from the Tule River channel, Deer Creek channel, and unlined canals is grouped together. Within the Angiola Water District and PID, canal losses are accounted for in the portion of the water budget that addresses deep percolation of applied water.

For the LTRID GSA and Pixley Irrigation District GSA areas, imported water losses in channels and canals are estimated by subtracting infiltration losses attributed to native Tule River and Deer Creek water from the total losses estimated to occur in the LTRID and Pixley Irrigation District service areas as documented in their respective annual water use summary reports. The resulting estimate of average annual imported water canal loss for water years 1986/87 to 2016/17 was approximately 50,600 acre-ft (see Column I of Table 2-2b).

2.3.1.2.4 Managed Recharge in Basins

Managed Recharge of Tule River Diversions

Managed recharge (i.e. recharge in basins) of diverted streamflow, imported water, and recycled water is accomplished within the Tule Subbasin via multiple recharge facilities (see Figure 2-7). Native Tule River water is diverted to basins for recharge by Pioneer Water Company, Campbell and Moreland Ditch Company, Vandalia Water District, PID, and LTRID. All of the water diverted to basins by Campbell and Moreland Ditch Company and Vandalia Water District is native Tule River flow. To estimate the portion of basin recharge attributable to native Tule River water in LTRID basins downstream of Oettle Bridge, TH&Co multiplied the ratio of Tule River gaged flow below Oettle Bridge to the total water delivered to the LTRID by the total recharge in basins reported in the LTRID annual water use summaries. Using this methodology, the average annual Tule River recharge in basins from water years 1986/87 to 2016/17 was approximately 11,600 acre-ft (see Column J of Table 2-2b).

Managed Recharge of Deer Creek Diversions

Managed recharge (i.e. recharge in basins) of diverted Deer Creek streamflow is accomplished via multiple recharge facilities (see Figure 2-7). Native Deer Creek water is diverted to basins for recharge by Pixley Irrigation District and DCTRA. Artificial recharge attributed to native Deer Creek water is estimated by multiplying the total recharge in basins reported in Pixley Irrigation District annual water use summaries by the ratio of native Deer Creek water to total water flowing through the Trenton Weir. The average annual Deer Creek recharge in basins for water years 1986/87 to 2016/17was estimated to be approximately 800 acre-ft/yr (see Column K of Table 2-2b).

Managed Recharge of Imported Water

Managed recharge of imported water is accomplished via multiple recharge facilities within the LTRID, Pixley Irrigation District, PID, Teapot Dome Water District and DEID. Managed recharge attributed to imported water in the LTRID is estimated by multiplying the total recharge in basins reported in annual water use summaries by the ratio of imported water to total surface water flow available. Managed recharge attributed to imported water in the Pixley Irrigation District is estimated by multiplying the total recharge in basins reported in annual water use summaries by the ratio of imported water to total water flowing through the Trenton Weir. Volumes of imported water delivered to recharge in basins for PID, Teapot Dome Water District, and DEID were provided by the respective agencies. The resulting estimated average annual imported water recharge in basins for water years 1986/87 to 2016/17 was approximately 11,100 acre-ft (see Column L of Table 2-2b).

Recharge of Recycled Water in Basins

A portion of recycled water from the City of Porterville is discharged to basins where it infiltrates into the subsurface. Artificial recharge of recycled water was estimated as 75 percent of all available recycled water from 1990/91 to 2003/04 based on California Regional Water Quality Control Board Order No. R5-2008-0034. Artificial recharge was assumed to be 2,000 acre-ft/yr from 2004/05 to 2009/10 based on Schmidt (2009). The average annual recycled water recharge for water years 1986/87 to 2016/17was estimated to be approximately 3,200 acre-ft/yr (see Table 2-2b, Column M).

2.3.1.2.5 Deep Percolation of Applied Water

Deep Percolation of Applied Tule River Diversions

A portion of native Tule River water that is delivered and applied for agricultural irrigation is assumed to infiltrate below the root zones of plants and become deep percolation to the groundwater. Deep percolation from irrigated agriculture was applied to the various land uses in the Tule Subbasin according to the irrigation method (e.g. drip irrigation, flood irrigation, micro sprinkler, etc.) for each land use type reported in CDWR on-line land use maps. Irrigation efficiencies were applied to the different irrigation methods based on tables reported in California Energy Commission (2006).

Tule River water is diverted for agricultural irrigation by the Pioneer Water Company, Porter Slough Headgate, Porter Slough Ditch Company, Campbell and Moreland Ditch Company, Poplar Irrigation Company, Woods-Central Ditch Company, Hubbs and Miner Ditch Company, and LTRID. In the LTRID, applied water attributed to native Tule River water is based on the ratio of total native Tule River water entering the LTRID to the total water available to the district (including imports) multiplied by the volume of water delivered for irrigation. Using this methodology, the average annual deep percolation of native Tule River water for water years 1986/87 to 2016/17was approximately 14,200 acre-ft/yr (see Column N of Table 2-2b).

Deep Percolation of Applied Deer Creek Diversions

The portion of native Deer Creek water delivered for agricultural use within the Pixley Irrigation District is estimated by multiplying the total deliveries reported in Pixley Irrigation District annual water use summaries by the ratio of native Deer Creek water to total water flowing through the Trenton Weir. Deep percolation of applied Deer Creek diversions is estimated based on the irrigation method (e.g. drip irrigation, flood irrigation, micro sprinkler, etc.) for each land use type reported in DWR on-line land use maps. Irrigation efficiencies were applied to the different irrigation methods based on tables reported in California Energy Commission (2006). From water years 1986/87 to 2016/17, average annual deep percolation of native Deer Creek water was estimated to be approximately 300 acre-ft/yr (see Column O of Table 2-2b).

Deep Percolation of Applied Imported Water

The estimate of imported water delivered and applied to crops within the agencies that receive imported water is based on the total imported water delivery minus losses and recharge in basins. Deep percolation of applied imported water is estimated based on the irrigation method (e.g. drip irrigation, flood irrigation, micro sprinkler, etc.) for each land use type reported in DWR on-line land use maps. Irrigation efficiencies were applied to the different irrigation methods based on tables reported in California Energy Commission (2006). For water years 1986/87 to 2016/17, the estimated average annual deep percolation from imported water was approximately 64,300 acre-ft/yr (see Column P of Table 2-2b).

Deep Percolation of Applied Recycled Water

The estimate of recycled water delivered and applied to crops was provided by the City of Porterville. Deep percolation of applied recycled water is estimated based on the irrigation method (e.g. drip irrigation, flood irrigation, micro sprinkler, etc.) for each land use type reported in DWR on-line land use maps. Irrigation efficiencies were applied to the different irrigation methods based on tables reported in California Energy Commission (2006). For water years 1986/87 to 2016/17, the estimated average annual deep percolation from recycled water was approximately 400 acre-ft/yr (see Column Q of Table 2-2b).

Deep Percolation of Applied Native Groundwater for Agricultural Irrigation

The balance of agricultural irrigation demand not met by imported water or stream diversions is assumed to be met by groundwater pumping. Deep percolation of applied native groundwater is estimated based on the irrigation method (e.g. drip irrigation, flood irrigation, micro sprinkler, etc.) for each land use type reported in DWR on-line land use maps. Irrigation efficiencies were applied to the different irrigation methods based on tables reported in California Energy Commission (2006). For water years 1986/87 to 2016/17, average annual deep percolation from applied agricultural pumping was approximately 145,400 acre-ft/yr (see Column R of Table 2-2b).

Deep Percolation of Applied Native Groundwater for Municipal Irrigation

Deep percolation from applied landscape irrigation was estimated for the urbanized portions of the Tule Subbasin. Because the cities within the Tule Subbasin do not have surface water rights on the Tule River or Deer Creek and do not purchase imported water, 100 percent of their water demand is met from groundwater pumping. For the City of Porterville, landscape irrigation was estimated to be 47 percent of the total water delivered to each home based on an analysis of the total groundwater production and influent flows to the wastewater treatment plant (City of Porterville draft Urban Water Management Plan 2010 Update, 2014). Of the water used for irrigation, 25 percent was assumed to become return flow.

For the other smaller communities in the Tule Subbasin, wastewater discharge was assumed to be through individual septic systems. For water discharged to septic systems, it was assumed that 100 percent of the discharge became return flow. As with the City of Porterville, 47 percent of total water use was assumed to be for landscape irrigation and 25 percent of the landscape irrigation is assumed to become return flow.

For water years 1986/87 to 2016/17, average annual return flow from municipal production was estimated to be approximately 6,700 acre-f/yr (see Column S of Table 2-2b).

2.3.1.2.6 Evapotranspiration

Evapotranspiration of Precipitation from Crops and Native Vegetation

Evapotranspiration (ET) is the loss of water to the atmosphere from free-water evaporation, soil-moisture evaporation, and transpiration by plants (Fetter, 1994). Evapotranspiration of precipitation is assumed to be the balance between total precipitation and areal recharge. This value includes evapotranspiration of precipitation from crops as well as native vegetation. From water years 1986/87 to 2016/17, evapotranspiration of precipitation was estimated to average approximately 286,000 acre-ft/yr (see Column T of Table 2-2b, Page 2).

Evapotranspiration of Surface Water within the Tule River Channel

Evapotranspiration of surface water within the Tule River channel is a function of the ET rate and wetted channel surface area. The ET rate was based on published data for riparian vegetation in an intermittent stream (Leenhouts et al., 2005). As the channel width of the Tule River varies, TH&Co identified reaches with similar average channel width using aerial photographs (Google Earth). The ET rate was applied to the surface area of each reach to obtain an estimate of ET. The sum of reach by reach ET estimates between Lake Success and the western Tule Subbasin boundary represents the total Tule River ET shown in Table 2-2b, Page 2, Column U. The resulting average annual ET is approximately 700 acre-ft/yr for water years 1986/87 to 2016/17 (see Table 2-2b, Page 2, Column V).

Evapotranspiration of Surface Water within the Deer Creek Channel

Evapotranspiration within the Deer Creek channel was estimated using the same methodology as for the Tule River. Average annual ET within the Deer Creek channel was estimated to be approximately 300 acre-ft/yr for water years 1986/87 to 2016/17 (see Table 2-2b, Page 2, Column X).

Evapotranspiration of Surface Water within the White River Channel

Evapotranspiration in the White River channel was estimated using the same methodology as for the Tule River. For water year 1986/87 to 2016/17, the average annual evapotranspiration was estimated to be approximately 100 acre-ft/yr (see Column Y of Table 2-2b, Page 2).

Evapotranspiration of Recycled Water in Basins

Evapotranspiration of recycled water delivered to recharge basins was estimated to be 50 acre-ft/yr (see Column AB of Table 2-2b, Page 2) based on Schmidt (2009).

Agricultural Consumptive Use

Columns U, W, Z, AA and AC of Table 2-2b includes agricultural consumptive use of applied water, not including the portion of the consumptive use met by precipitation, which is included in Column T. Historical agricultural crop water demand (i.e. applied water demand) was estimated based on records of the types and areas of crops grown, estimates of consumptive use for each crop, and estimates of the irrigation efficiency. Information on the types and areas of crops for the LTRID and Pixley Irrigation District were obtained from annual crop surveys from each respective district. The types and areas of crops in other parts of the Tule Groundwater Subbasin within Tulare County were estimated from land use maps and associated data published by the CDWR for 1993, 1999, and 2007 (see Figure 2-31). For the portion of the Subbasin in Kern County (DEID), land use maps were obtained from CDWR (1990) and Kern County Department of Agriculture and Measurement Standards (1999 and 2007). Consumptive use estimates for the various crop types were based on crop coefficients published in ITRC (2003). In order to estimate a total agricultural irrigation water demand, the consumptive use estimates for each crop were multiplied by the area of the crop, which in turn was multiplied by a return flow factor reflecting the irrigation efficiency (see Section 2.3.1.2.5).

The estimated average annual agricultural consumptive use for the period of the groundwater budget was approximately 773,900 acre-ft/yr (sum of Columns U, W, Z, AA and AC of Table 2-2b).

Municipal Consumptive Use

Consumptive use of landscaping associated with applied municipal groundwater pumping was estimated based on an assumed applied water to landscaping and return flow factor. As presented in Section 2.3.1.2.5, it is assumed 47 percent of municipal water use is applied to landscaping. It is assumed that 75 percent of applied water to landscaping is consumptively used by the plants and 25 percent becomes return flow. For water years 1986/87 to 2016/17, estimated average annual municipal consumptive use was approximately 6,800 acre-ft/yr (see Column AD of Table 2-2b).

2.3.1.2.7 Surface Water Outflow

Tule River

Any residual stream flow in the Tule River that reaches the Turnbull Weir, located at the west (downstream) end of the Tule Subbasin, is assumed to flow out of the subbasin (see Figure 2-7). From water years 1986/87 to 2016/17, surface water outflow ranged from 0 to 121,000 acre-ft/yr and averaged 14,000 acre-ft/yr (see Table 2-2b, Page 2, Column AE).

It is noted that additional outflow may occur at smaller canal outlets at the west end of the Tule Subbasin. The data for these outflows was unavailable for this report.

Deer Creek

During periods of above-normal precipitation, residual stream flow left in the Deer Creek after diversions has historically flowed into Homeland Canal, located at the west end of the Tule Subbasin (see Figure 2-7). The data for this outflow was unavailable for this report (see Column AF of Table 2-2b, Page 2). As this data becomes available, it will be incorporated into the surface water budget.

2.3.2. Groundwater Budget §354.18 (b)(2)

The groundwater budget describes the sources and estimates the volumes of groundwater inflow and outflow within the Tule Subbasin (see Table 2-3). A fundamental premise of the groundwater budget is the following relationship:

$$\text{Inflow} - \text{Outflow} = +/- \Delta S$$

Inflow terms include groundwater recharge to the subbasin including areal recharge from precipitation, recharge in stream/river channels, artificial recharge, canal losses, return flow, release of water from compression of aquitards, and subsurface inflow. It is noted that many of the groundwater inflow terms are surface water outflow terms from Table 2-2b. Outflow terms include groundwater pumping, evapotranspiration, and subsurface outflow. The difference between the sum of inflow terms and the sum of outflow terms is the change in groundwater storage (ΔS) (see Table 2-3).

As with the surface water budget tables, the individual columns in the groundwater budget table are color coded to reflect their role in the Sustainable Yield estimate. Sources of groundwater recharge (i.e. inflow) that are associated with pre-existing water rights and/or imported water deliveries are indicated with magenta-colored columns in Table 2-3 and are not used to estimate the Sustainable Yield. Groundwater recharge elements that are used to estimate Sustainable Yield are indicated with blue-colored columns. Groundwater pumping is not used in the equation to estimate Sustainable Yield and is shown as yellow-colored columns in Table 2-3.

2.3.2.1 Sources of Groundwater Recharge §354.18 (b)(2)

> § 354.18. (b) (2) Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.

2.3.2.1.1 Areal Recharge

Groundwater recharge from precipitation falling on the valley floor in the Tule Subbasin was estimated based on Williamson et al., (1989) (see Section 2.3.1.1.1). The resulting annual groundwater recharge from areal precipitation using this method ranged from 0 acre-ft/yr to 219,000 acre-ft/yr with a 31-yr average of approximately 21,000 acre-ft/yr (see Column A, Table 2-3).

2.3.2.1.2 Groundwater Recharge from the Tule River

Groundwater recharge of native Tule River water occurs as streambed infiltration, infiltration of water in unlined canals, recharge in basins, and deep percolation of applied water. Tule River water that becomes groundwater recharge is described in Section 2.3.1.2 and summarized in Columns B through F of Table 2-3. Average annual groundwater recharge of native Tule River water was estimated to be approximately 67,800 acre-ft/yr for water years 1986/87 to 2016/17.

2.3.2.1.3 Groundwater Recharge from Deer Creek

Groundwater recharge of native Deer Creek water occurs as streambed infiltration, canal loss, recharge in basins, and deep percolation of applied water. Deer Creek water that becomes groundwater recharge is described in Section 2.3.1.2 and summarized in Columns G through K of Table 2-3. For water years 1986/87 to 2016/17 average annual groundwater recharge of native Deer Creek water was estimated to be approximately 16,500 acre-ft/yr.

2.3.2.1.4 Streambed Infiltration in the White River

Groundwater recharge of White River water occurs as streambed infiltration as described in Section 2.3.1.2 and summarized in Column L of Table 2-3. Estimated average annual groundwater recharge from White River water was approximately 5,600 acre-ft/yr for water years 1986/87 to 2016/17.

2.3.2.1.5 Groundwater Recharge from Imported Water Deliveries

Groundwater recharge of imported water occurs as canal loss, recharge in basins, and deep percolation of applied water as described in Section 2.3.1.2 and summarized in Columns M through O of Table 2-3. For water years 1986/87 to 2016/17 average annual groundwater recharge from imported water was estimated to be approximately 126,000 acre-ft/yr.

2.3.2.1.6 Recycled Water

Groundwater recharge of recycled water occurs as artificial recharge and return flow of applied water as described in Section 2.3.1.2 and summarized in Columns R and S of Table 2-3. For water years 1986/87 to 2016/17 average annual groundwater recharge from recycled water was estimated to be approximately 3,600 acre-ft/yr.

2.3.2.1.7 Deep Percolation of Applied Water from Groundwater Pumping

A portion of irrigated agriculture and municipal applied water from groundwater pumping becomes deep percolation and groundwater recharge as described in Section 2.3.1.2.5 and summarized in Columns P and Q of Table 2-3. For water years 1986/87 to 2016/17 average annual groundwater recharge associated with return flow from groundwater pumping was estimated to be approximately 152,100 acre-ft/yr.

2.3.2.1.8 Release of Water from Compression of Aquitards

Prolonged lowering of groundwater levels in the Tule Subbasin results in the drainage of water from low permeability subsurface aquitards that occur beneath the potentiometric groundwater surface. Aquitards are low permeability layers with relatively high silt and clay content. As the aquitards are compressible, the release of pore pressure caused by the lowering of groundwater levels also results in compression of the low permeability layers. Within a limited range of groundwater level fluctuation, the compressed aquitard can accept water back into its structure when groundwater levels rise resulting in elastic rebound. However, if groundwater levels are maintained at low elevations for long enough periods of time as a result of groundwater pumping, the compression of aquitards becomes permanent. This permanent compression of subsurface layers results in land surface subsidence, which has been observed in the Tule Subbasin prior to 1970 (Ireland et al., 1984) and between 2007 and 2011 (Luhdorff and Scalmanini, 2014). The slow release of water from the permanent compaction of subsurface aquitards also results in a one-time contribution of water to the aquifer system. However, it is noted that this is not a renewable source of water to the aquifer.

The estimate of the volume of water contributed to the aquifer through compression of aquitards between 1986 and 2017 was based on groundwater flow model analysis and output using the subsidence package in MODFLOW. The total volume of water contributed to the aquifer from aquitard compression during this time period is estimated to be approximately 2,400,000 acre-ft with an annual average of approximately 77,000 acre-ft/yr (see Column T of Table 2-3).

2.3.2.1.9 Subsurface Inflow

The Tule Subbasin is not a closed basin and the aquifer is in hydrologic connection with adjacent subbasins to the north, west and south. Groundwater flow into and out of the Tule Subbasin along these boundaries varies over time in accordance with the groundwater level conditions and flow patterns within and outside the subbasin. The only source of subsurface inflow to the Tule Subbasin along the eastern boundary is mountain-front inflow resulting from infiltration of precipitation in the secondary porosity features (joints and fractures) of the bedrock east of the basin and along the mountain front. This recharge enters the alluvial groundwater basin where the alluvium is in hydrologic connection with the fractures in the bedrock in the subsurface.

A summary of subsurface inflow values estimated for 1986/87 to 2016/17 is provided in Table 2-3 (Column U). As shown, inflow through the southern and western boundary across both the shallow and deep aquifers ranges from 83,000 acre-ft in 2009/10 to 144,000 acre-ft in 1990/91 with an average over the years of interest of 118,000 acre-ft/yr. The average net inflow into the

Tule Subbasin along the south and west boundaries for the time period is approximately 53,000 acre-ft/yr after accounting for outflow (see Section 2.3.2.3.4).

2.3.2.1.10 Mountain Front Recharge

Mountain front recharge represents the infiltration of precipitation into the fractures in the bedrock east of the Tule Subbasin, which eventually flows into the alluvial aquifer system of the Tule Subbasin in the subsurface where the fractured rock aquifer system in in hydrologic communication with the alluvial aquifer system. Subsurface inflow along the eastern Tule Subbasin boundary was estimated through a parameter estimation calibration process of the groundwater flow model of the subbasin. In this calibration method, the model was given a wide range of potential recharge along the eastern Tule Subbasin. The model automatically varied aquifer parameters and mountain-front recharge through an iteration process until it arrived at an optimum fit of measured and model-generated groundwater levels. Tule Subbasin mountain-front recharge that resulted in the best model calibration was approximately 29,000 acre-ft/yr (see Column V of Table 2-3 and Column J of Table 2-4).

2.3.2.2 Sources of Groundwater Discharge §354.18 (b)(3)

> § 354.18. (b) (3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.

2.3.2.2.1 Municipal Groundwater Pumping

Groundwater pumping for municipal supply is conducted by the City of Porterville and small municipalities for the local communities in the Tule Subbasin as described in Section 2.3.1.1.5. For water years 1986/87 to 2016/17, municipal groundwater production was estimated to average approximately 19,400 acre-ft/yr (see Column W of Table 2-3, Page 2).

2.3.2.2.2 Agricultural Groundwater Pumping

Agricultural groundwater production is estimated as the total applied water demand for crops minus surface deliveries. The estimated average annual discharge to crops from wells for water years 1986/87 to 2016/17 is approximately 664,000 acre-ft/yr (see Column X of Table 2-3, Page 2).

2.3.2.2.3 Groundwater Pumping for Export Out of the Tule Subbasin

Some of the groundwater pumping that occurs on the west side of the Tule Subbasin is exported out of the subbasin for use elsewhere. Angiola Water District and the Boswell/Creighton Ranch have historically exported pumped groundwater out of the Tule Subbasin. Annual groundwater exports have ranged from 0 between 1995 and 1999 to 63,640 acre-ft in the 2012/13 water year (see Column Y of Table 2-3, Page 2) with the average for water years 1986/87 to 2016/17 of 28,200 acre-ft/yr. This water is accounted for separately because the water is not applied within the subbasin and there is no associated return flow.

2.3.2.2.4 Subsurface Outflow

Outflow estimates (Table 2-3; Column AA) range from 51,000 acre-ft in 1988/89 to 92,000 acre-ft in 2009/10, with an average of 65,000 acre-ft/yr.

2.3.2.3 Changes in Groundwater Storage §354.18 (b)(4)

> § 354.18. (b) (4) The change in the annual volume of groundwater in storage between seasonal high conditions.

Comparison of the groundwater inflow elements of the water budget with the outflow elements shows a cumulative change in groundwater storage over the period between 1986/87 to 2016/17 of approximately -4,948,000 acre-ft (see Table 2-3). The average annual change in storage resulting from the groundwater budget is approximately -160,000 acre-ft/yr. It is noted that this time period was used as it matches the calibration period for the Tule Subbasin groundwater flow model used to evaluate future projects and management actions for the subbasin. However, the average hydrology over the time period is relatively dry (see Figure 2-28) and the resulting change in storage is not representative of long-term average conditions. A groundwater change in storage value representative of average hydrological conditions is provided in Section 2.3.2.5 for the period 1990/91 to 2009/10.

2.3.2.4 Overdraft §354.18 (b)(5)

> § 354.18. (b) (5) If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.

The average annual change in groundwater storage over the period from 1990/91 to 2009/10, which represents average hydrologic conditions within the Tule Subbasin, was approximately -115,300 acre-ft/yr. This value represents the average annual historical overdraft of the subbasin.

2.3.2.5 Water Year Type §354.18 (b)(6)

> § 354.18. (b) (6) The water year type associated with the annual supply, demand, and change in groundwater stored.

All water budget elements and change in groundwater storage presented herein are based on a water year, which begins October 1 and ends September 30. Water year types with respect to hydrologic conditions (i.e. above average, average or below average precipitation conditions based on Figure 2-28) are shown in the historical water budget tables (Tables 2-2a, 2-2b, and 2-3).

2.3.2.6 Sustainable Yield §354.18 (b)(7)

§ 354.18. (b) (7) An estimate of sustainable yield for the basin.

Sustainable yield is defined in the Sustainable Groundwater Management Act (SGMA) Chapter 2, §10721 (v) as:

The maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.

The Sustainable Yield of the Tule Subbasin is a function of the overall water balance of the area. Changes in surface water/groundwater inflow to the basin and surface water/groundwater outflow from the basin impact the Sustainable Yield. As groundwater management and land use changes impact the water balance, they also impact the Sustainable Yield. A generalized expression of the water balance is as follows:

$$\text{Inflow} - \text{Outflow} = +/- \text{ Change in Storage} \qquad (1)$$

The water balance equation for pre-developed conditions (prior to human occupation) can be further expressed as:

$$(I_{pr} + I_{str} + I_{ss} + I_{mb}) - (O_{ss} + O_{et}) = \Delta S \qquad (2)$$

Where:

I_{pr} = Inflow from Areal Recharge of Precipitation

I_{str} = Inflow from Infiltration of Runoff in Stream Beds

I_{ss} = Inflow from Subsurface Underflow

I_{mb} = Inflow from Mountain-Block Recharge

O_{ss} = Subsurface Outflow

O_{et} = Evapotranspiration

ΔS = Change in Groundwater Storage

Under pre-developed conditions, the groundwater basin would be in a state of equilibrium such that the inflow and outflow would balance and there would be no significant long-term change in storage assuming a static climatic condition. Under this condition, groundwater levels would be relatively stable.

Under developed land use conditions, the water balance changes as groundwater is pumped from the basin for irrigation and municipal supply. Lowering of the groundwater table resulting from pumping reduces the amount of groundwater that would otherwise leave the basin and reduces evapotranspiration losses in areas of shallow groundwater (e.g. Tulare Lake). Some of the pumped groundwater used for irrigation infiltrates past the roots of the plants and returns to the groundwater as return flow. Water imported into the area is applied to crops but some is lost as infiltration in unlined canals and as return flow. Groundwater return flow also occurs as a result of discharges from individual septic systems. Other sources of recharge to the groundwater under developed land use include wastewater treatment plant discharges and artificial recharge in spreading basins.

The water balance equation for developed land use conditions can be modified as follows:

$$(I_{pr} + I_{str} + \mathbf{I_{can}} + \mathbf{I_{ar}} + \mathbf{I_{rfgw}} + \mathbf{I_{rfimp}} + \mathbf{I_{com}} + I_{ss} + I_{mb}) - (O_{ss} + O_{et} + \mathbf{O_p}) = \Delta S \qquad (3)$$

Where:

I_{can} = Inflow from Canal Losses

I_{ar} = Inflow from Artificial Recharge

I_{rfgw} = Inflow from Return Flow of Applied Water from Groundwater Pumping

I_{rfimp} = Inflow from Return Flow of Applied Water from Imported Water

I_{com} = Inflow of Water Released from Compression of Aquitards

O_p= Outflow from Groundwater Pumping

If the inflow terms exceed the outflow terms, then the groundwater in storage increases (become positive) and groundwater levels rise. If the outflow terms exceed the inflow, then the groundwater in storage decreases (become negative) and groundwater levels drop. It is assumed that the Sustainable Yield of the Tule Subbasin is the long-term average groundwater pumping rate, under projected land use conditions, that results in no significant long-term net negative change in groundwater storage in the basin. Based on this premise, the water balance equation can be rearranged and simplified to estimate Sustainable Yield:

$$\text{Sustainable Yield} = \Delta S + O_p - \mathbf{I_{can}} - \mathbf{I_{ar}} - \mathbf{I_{rfimp}} - \mathbf{I_{com}} \qquad (4)$$

Thus, if the change in groundwater storage over the planning period is zero and there is no imported water or release of water from compression of aquitards, then the Sustainable Yield is equal to the pumping. This relationship is valid if the following conditions are met:

1. The Sustainable Yield incorporates a hydrology that is representative of a relatively long period of record that includes multiple wet and dry hydrologic cycles.
2. The land use conditions are representative of the time period.

The Sustainable Yield can also be expressed as all of the components of the water balance not explicitly expressed in Equation 4:

$$\text{Sustainable Yield} = I_{pr} + I_{str} + I_{rfgw} + I_{ss} + I_{mb} - O_{ss} \qquad (5)$$

It is noted that the Tule Subbasin Technical Advisory Committee has determined that recharge to the Tule Subbasin associated with the delivery of imported water and the diversion of water from the Tule River and Deer Creek associated with Pre-1914 water rights will not be included in the Sustainable Yield of the subbasin. This includes canal losses from delivery of imported water and diverted stream flow, deep percolation of applied imported water and diverted stream flow, and managed recharge in basins.

Applying Equations 4 and 5 to the historical water budget of the Tule Subbasin does not result in a representative Sustainable Yield because the subbasin was in overdraft during the historical water budget period. Groundwater pumping depressions that have developed in the western portion of the subbasin have historically captured groundwater that would have otherwise left the subbasin. This increase in groundwater inflow and subsequent decrease in groundwater outflow increased the apparent Sustainable Yield, which was reported to be approximately 257,725 acre-ft/yr based on the water budget from water year 1990/91 to 2009/10 (TH&Co, 2017). However, since the downward groundwater trends that resulted in this condition are not sustainable, the associated Sustainable Yield from this water budget is not representative.

The Sustainable Yield of the Tule Subbasin will change in the future as a result of changes in groundwater levels and flow associated with planned projects and management actions and changes in deep percolation of applied water (i.e. return flow) from reduced groundwater pumping. Most of the GSAs in the subbasin plan management actions that include a reduction in irrigated acreage to address the need to reduce groundwater production. This necessary action will change the water budget by not only decreasing outflow from groundwater pumping but also reducing deep percolation of applied water (return flow) and changing the dynamics of inflow and outflow at the subbasin boundaries. This new water budget regime will result in a Sustainable Yield that is different from what was realized historically. Thus, the Sustainable Yield of the Tule Subbasin presented herein was estimated based on the projected future water budget (see Section 2.3.5), which is more representative than the Sustainable Yield from the historical water budget.

The projected water budget that was the basis for the Sustainable Yield estimate was developed using a calibrated groundwater flow model of the Tule Subbasin (TH&Co, 2019). The projected water budgets incorporated all planned projects and management actions of the Tule Subbasin GSAs as well as adjustments to hydrology and water deliveries from climate change guidelines provided by the CDWR (see Section 2.3.5). In order to address uncertainty in the model results, the projected water budget was initially analyzed with 240 realizations of the groundwater flow model. In each realization, aquifer parameters, consumptive use, and mountain front recharge were varied within acceptable ranges that produced acceptable overall model calibrations. The resulting water budgets were processed, based on Equation 5 above, to produce Sustainable Yield estimates for each year of the 50-yr implementation and planning horizon (2020 to 2070). Of the original 240 model realizations, 175 resulted in a projected average annual change in groundwater storage greater than -5,000 acre-ft/yr. The average Sustainable Yield for the time period from 2040 to 2050 was used as the Sustainable Yield for the 175 model realizations resulting in greater than -5,000 acre-ft/yr of annual storage change. The 175 estimates of Sustainable Yield formed a normal distribution when plotted (see Figure 2-32). The time period from 2040 to 2050 was selected because it occurs after all planned projects and management actions have been implemented but before the time when long-term climate change adjustments to hydrology and water deliveries are applied to the projected water budget (2050). The long-term climate change adjustments were not considered as reliable as the near-term adjustments.

The projected future Sustainable Yield of the Tule Subbasin, which is the 50th percentile of the distribution of estimates derived from the uncertainty analysis, is estimated to be approximately 130,000 acre-ft/yr (see Table 2-4). The plausible range of Sustainable Yield was selected as the values between the 20th and 80th percentile, resulting in a range of approximately 108,000 to 162,000 acre-ft/yr (see Figure 2-32). The projected Sustainable Yield does not include:

- Water released to the aquifer system from the compression of aquitards,
- Diverted Tule River water canal losses, recharge in basins, and deep percolation of applied water,
- Diverted Deer Creek water canal losses, recharge in basins, and deep percolation of applied water,
- Imported water canal losses, recharge in basins, and deep percolation of applied water, and
- Deep percolation of applied recycled water and recycled water recharge in basins.

Each GSA will determine their allowable groundwater pumping by multiplying that GSA's proportionate areal coverage of the Tule Subbasin times the total Sustainable Yield of the subbasin (130,000 acre-ft/yr), as described in the Coordination Agreement. The estimated consumptive use rate that can be sustained under the Subbasin-wide Sustainable Yield is 65,000 acre-ft/yr. When applied across the entire 475,895 acres of the subbasin, this consumptive use rate is approximately 0.14 acre-ft/acre. This consumptive use rate incorporates consumptive use from both agriculture and municipal demand. This "sustainable" consumptive use rate does not equal the Sustainable Yield on an acre-ft/acre basis because it does not account for irrigation return flow and changes to subbasin inflow and outflow caused by changes in pumping stress within the subbasin. It is noted that the consumptive use rate of 0.14 acre-ft/acre is for irrigation water only (i.e. does not include consumptive use of precipitation) and is the baseline sustainable consumptive use as applied across the entire subbasin. Each GSA will individually estimate their total allowable consumptive use as the sum of the baseline sustainable consumptive use, available precipitation, and surface water supplies.

As additional data become available and as projects and management plans are implemented, the groundwater flow model used to estimate the Sustainable Yield of the Tule Subbasin will be updated and the Sustainable Yield may be adjusted to reflect the new data.

2.3.3. Current Water Budget §354.18 (c)(1)

> § 354.18. (c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:
>
> (1) Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.

The surface water and groundwater budget for the Tule Subbasin in 2017 is shown in Tables 2-2a, 2-2b, and 2-3. Total groundwater inflow to the subbasin for water year 2016/17 was approximately 855,000 acre-ft. Total groundwater outflow from the subbasin for water year 2016/17 was approximately 550,000 acre-ft. The net change in storage during the water year was approximately 305,000 acre-ft.

2.3.4. Historical Water Budget §354.18 (c)(2)

> § 354.18. (c) (2) Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:
>
> (A) A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.
>
> (B) A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.
>
> (C) A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.

The historical surface water and groundwater budgets for the Tule Subbasin are shown in Tables 2-2a, 2-2b, and 2-3 and described in Sections 2.3.1 and 2.3.2. Historical surface water and groundwater budgets for each of the six GSAs in the subbasin are provided in:

- Appendix A - LTRID GSA.
- Appendix B – ETGSA
- Appendix C – DEID GSA
- Appendix D – Pixley GSA
- Appendix E – Tri-County Water Authority GSA
- Appendix F – Alpaugh GSA

Sources of surface water supply to agriculture in the Tule Subbasin include diverted stream flow from the Tule River and Deer Creek and imported supplies delivered via the Friant-Kern Canal, State Water Project, and other diverted streamflow from streams located outside the subbasin (i.e. King's River). A comparison of water rights and annual water deliveries for the 10-yr period from 2007/08 to 2016/17 is provided for the Tule River and Friant-Kern Canal in Table 2-5. As shown, total Tule River water diversions during the 10-yr period are approximately 90 percent of the sum of diversion rights over that period. The primary reason for this is that the 10-yr period from 2007/08 to 2016/17 was relatively dry with precipitation approximately 69 percent of long-term average (see Figure 2-28). Friant-Kern Canal deliveries to agencies with contracts within the Tule Subbasin have also been below the sum of Class I and Class II contract amounts for most of the 10-yr period. However, many contractors sell a portion of their available supply from the canal to other agencies. Likewise, some contractors (e.g. Kern-Tulare Water District) purchase additional supplies from the canal from other contractors. Thus, while precipitation trends do effect the volume of water available to Friant-Kern Canal contractors (the precipitation amounts during the 10-yr period from 2007/08 to 2016/17 are below average), it is difficult to compare planned versus actual deliveries based on these data.

The primary surface water supply issue affecting the ability of agencies to operate within the Sustainable Yield of the subbasin is reduced delivery capacity in the Friant-Kern Canal due to land subsidence. Land subsidence has lowered the canal elevation in certain areas resulting in a reduction in downstream canal delivery capacity. Reduced deliveries due to land subsidence can result in greater groundwater pumping to meet agricultural water demand. While the reduced supply capacity of the Friant-Kern Canal is not the primary reason for the overdraft observed in the Tule Subbasin from 1986/87 to 2016/17, it is a contributing factor.

2.3.5. Projected Water Budget §354.18 (c)(3)

A projected water budget for the Tule Subbasin has been developed to incorporate the planned projects and management actions of each of the six GSAs for achieving sustainability (see Tables

2-6 and 2-7). The projects and management actions were incorporated into the groundwater flow model of the Tule Subbasin for the projected time period from 2020 to 2070 in order to assess the sustainability of the planned actions, assess the interaction of the planned actions on groundwater levels between the GSAs, and estimate the Sustainable Yield of the subbasin. The model projection also incorporated adjustments to the hydrology and water deliveries to account for potential climate change. The final projected water budget is the one that produced the 50th percentile Sustainable Yield estimate (see Section 2.3.2.7 herein). The projected surface water and groundwater budgets are shown in Tables 2-8a, 2-8b, and 2-9. Projected water budgets for each of the six GSAs are provided in Appendices A through F.

Baseline Tule River flows, Friant-Kern Canal deliveries, and the State Water Project's California Aqueduct deliveries used in the future projection for the model were adjusted to account for projections of future climate change. Adjustments were applied based on output from the DWR's CalSim-II model, which provided adjusted historical hydrology for major drainages and imported supplies based on scenarios recommended by the DWR Climate Change Technical Advisory Group.[1] Climate change adjustments to hydrology and surface water deliveries were applied over two time periods within the SGMA planning horizon, as defined by California Water Commission (2016)[2]:

1. A 2030 central tendency time period, which provides near-term projections of potential climate change impacts on hydrology, centered on the year 2030, and
2. A 2070 central tendency time period, which provides long-term projections of potential climate change impacts on hydrology, centered on the year 2070.

For imported water supplies from the Friant-Kern Canal, TH&Co utilized projected delivery schedules from the Friant Water Authority (Friant Water Authority, 2018). The projected water deliveries include adjustments to supplies associated with the planned San Joaquin River Restoration Project (SJRRP). Adjustments to Friant-Kern Canal supplies to account for climate change and SJRRP were applied beginning in 2025. The adjustments were applied incrementally between 2025 and 2030 such that the full adjustments were in effect in 2030. TH&Co applied the 2070 central tendency time period climate-related adjustments to imported water deliveries in the Tule Subbasin model projection for the period from 2050 to 2070.

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[1] DWR Climate Change Technical Advisory Group, 2015. Perspectives and Guidance for Climate Change Analysis. DWR Technical Information Record.

[2] California Water Commission, 2016. Technical Reference – Water Storage Investment Program. Dated November 2016.

2.4 Management Areas §354.20

§ 354.20. Management Areas

(a) Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin.

Of the six GSAs within the Tule Subbasin, four have identified separate management areas within their boundaries (see Figure 2-33). The management areas are as follows:

LTRID GSA

Tipton Management Area
Woodville Management Area
Poplar Management Area
Lower Tule Southwest Management Area

ETGSA

Porterville Community Management Area
Terra Bella Community Management Area
Ducor Community Management Area
Kern-Tulare Management Area
Greater Eastern Tule Management Area

DEID GSA

Annex Management Area

Pixley GSA

Pixley Management Area
Teviston Management Area

In addition to the management areas identified for each GSA, a separate land subsidence monitoring area has been identified for the eastern portion of the subbasin in the vicinity of the Friant-Kern Canal (see Figure 2-36). This monitoring area was developed based on the extent of historical land subsidence observed along the Friant-Kern Canal, including model results of cumulative land subsidence calibrated to historical land subsidence rates measured from InSAR satellite data. The recommended monitoring zone is approximately centered on the Friant-Kern Canal and extends from approximately two miles north of the Tule River on the north to approximately four miles south of the White River on the south. The eastern extent was based on the 1-ft subsidence contour of cumulative subsidence between 1986 and 2017 from the calibrated groundwater flow model. The western boundary of the monitoring zone is four miles from, and parallel to, the Friant-Kern Canal. Land subsidence monitoring features in this monitoring area are detailed in the Tule Subbasin Monitoring Plan, which is Attachment 1 to the Tule Subbasin Coordination Agreement.

2.4.1 Criteria for Management Areas §354.20 (b)(1)

> § 354.20. (b) A basin that includes one or more management areas shall describe the following in the Plan:
>
> (1) The reason for the creation of each management area.

The majority of the management areas are associated with communities that provide municipal water supply. These communities have been delineated separately because the beneficial use of the groundwater produced within the management areas (municipal supply) is different than the beneficial use of groundwater across the majority of the subbasin (agriculture). Other management areas were identified for portions of the subbasin with unique hydrogeology and areas where access to imported water is different than other portions of the GSA in which they are located.

Management Areas categorized under the Community Management Area Type have been created to specifically address the needs of the Tule Subbasin's population centers and communities. Future projects and management actions focused in these areas will seek to achieve the Tule Subbasin sustainability goal and improve access to safe, reliable drinking water supplies. The boundaries for each Community Management Area consider existing County and/or City adopted Urban Development Boundaries, as well as the service area boundaries of the public water suppliers providing services to residents within these areas.

In addition to community management areas, LTRID GSA has delineated a management area associated with lands outside and to the southwest of the LTRID service area that were annexed to the LTRID GSA (see Figure 2-33). The Lower Tule Southwest Management Area was formed because it does not have the same access to surface water deliveries from the Friant-Kern Canal as the LTRID service area and, therefore, will require separate management actions than the rest of the GSA.

ETGSA has delineated a separate management area for the Kern-Tulare Water District (Kern-Tulare Management Area). Wells from this area produce groundwater primarily from a deeper and separate aquifer system (i.e. Pliocene Marine and Santa Margarita Formation) than other parts of the ETGSA. Groundwater level conditions in wells in this area are different than other areas of the ETGSA. Additionally, the service area of Kern-Tulare Water District is divided between the Tule and Kern County Subbasins. Future projects and management actions in this Management Area will focus on enabling Kern-Tulare Water District to achieve the sustainability goals of both the Tule and Kern County Subbasins while minimizing the need to alter its operations. As such, Kern-Tulare Water District has developed their own monitoring plan for their service area.

DEID GSA has delineated a management area associated with lands outside and to the west of the DEID service area. These lands were annexed (Annex Management Area) to the DEID GSA. The Annex Management Area was formed because it does not have the same access to surface water deliveries from the Friant-Kern Canal as the DEID service area and, therefore, will require separate management actions than the rest of the GSA.

2.4.2 Minimum Thresholds and Measurable Objectives §354.20 (b)(2)

> § 354.20. (b) (2) The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.

Minimum thresholds and measurable objectives are provided in the individual Groundwater Sustainability Plans (GSPs) for each GSA. Model projection hydrographs for each representative monitoring site in each GSA are provided in Appendices A through F.

2.4.3 Monitoring Plan §354.20 (b)(3)

> § 354.20. (b) (3) The level of monitoring and analysis appropriate for each management area.

The Tule Subbasin Technical Advisory Committee has developed a subbasin-wide monitoring plan, which describes the monitoring network and monitoring methodologies to be used to collect the data to be included in Tule Subbasin GSPs and annual reports. The subbasin-wide monitoring plan is included as Attachment 1 to the Coordination Agreement. Separate monitoring networks have been established for groundwater levels (see Figure 2-34), groundwater quality (see Figure 2-35), land subsidence (see Figure 2-36) and surface water (see Figure 2-7). For each monitoring network, the monitoring plan describes the monitoring features included in the plan, the monitoring procedure to be followed to collect the data, and the monitoring frequency. The monitoring plan also includes an assessment of data gaps and a data management plan.

A subset of groundwater level monitoring features in the monitoring plan have been identified as representative monitoring sites to be relied on for the purpose of assessing progress with respect to groundwater level sustainability in the subbasin. The representative groundwater level monitoring sites are shown on Figure 2-34. At least one representative groundwater level monitoring site has been identified within each management area. Where possible based on available wells, representative monitoring sites have been chosen with perforations exclusively in either the Upper or Lower Aquifer. To provide adequate spatial coverage of the subbasin, some representative monitoring sites include perforations across multiple aquifers until new monitoring features can be constructed. Representative groundwater level monitoring wells will be equipped with pressure transducers to measure groundwater levels on a daily basis.

Representative land subsidence monitoring sites are shown on Figure 2-36. All of these monitoring sites consist of GPS stations along the Friant-Kern Canal for the purpose of assessing progress with respect to arresting land subsidence along the canal. Land surface elevation measurements at the GPS stations will be monitored quarterly (every four months).

2.4.4 Coordination with Adjacent Areas §354.20 (b)(4)

> § 354.20. (b) (4) An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.

The minimum thresholds described in each GSA's GSP have been informed through an analysis of potential future groundwater levels in the subbasin using a numerical groundwater flow model that incorporates future planned projects and management actions of each of the GSAs. The minimum thresholds have been developed such that maintenance of groundwater levels above those levels should preserve beneficial uses of the groundwater and prevent undesirable results with respect to groundwater levels, groundwater storage, and land subsidence within the management area, GSA and adjacent areas. Management of the Tule Subbasin is adaptive. As management actions and projects are implemented throughout the subbasin and as additional data are collected through the Tule Subbasin Monitoring Plan, minimum threshold values and measurable objectives may change. Changes to basin management to address undesirable results will be conducted through the Tule Subbasin TAC in accordance with the Tule Subbasin Coordination Agreement.

2.5 References

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Tables

Summary of Active Cleanup Sites Within the Tule Subbasin

Geotracker Global ID	Site Type	Status	Constituent of Concern
60001606	School	Active	Metals, Pesticides, Petroleum
54360008	State Response or NPL	Active	Freon 113, Lead, VOCs
54070051	State Response or NPL	Active	Herbicides, Pesticides, Lead, VOCs
60002076	State Response or NPL	Active	Cyanide, PAHS, SVOCs
54070296	Voluntary Cleanup	Active	Pesticides
60001216	Evaluation	Active	PCE
54070288	Evaluation	Inactive - Needs Evaluation	Zinc
54280106	Evaluation	Inactive - Needs Evaluation	Pesticides/Herbicides
T10000010424	Cleanup Program Site	Open - Active	NA
T0610740454	LUST Cleanup Site	Open - Assessment & Interim Remedial Action	Gasoline
T0610700023	Cleanup Program Site	Open - Assessment & Interim Remedial Action	Gasoline, Benzene
T0610700454	LUST Cleanup Site	Open - Eligible for Closure	Gasoline
T10000010850	LUST Cleanup Site	Open - Eligible for Closure	Gasoline, MTBE, TBA, other fuel oxygenates
T0610700430	LUST Cleanup Site	Open - Eligible for Closure	Gasoline
T0610700127	LUST Cleanup Site	Open - Eligible for Closure	Gasoline
SLT5FS354453	Cleanup Program Site	Open - Inactive	Nitrate, other Petroleum
SL375384617	Cleanup Program Site	Open - Remediation	Gasoline, Diesel, other Petroleum
SL205734285	Cleanup Program Site	Open - Remediation	VOCs
T0610700216	LUST Cleanup Site	Open - Remediation	Gasoline
T0610700256	LUST Cleanup Site	Open - Site Assessment	Kerosene
T0610700058	LUST Cleanup Site	Open - Site Assessment	Gasoline
SLT5FU104564	Cleanup Program Site	Open - Site Assessment	Pesticides/Herbicides
T0610793749	LUST Cleanup Site	Open - Site Assessment	Gasoline

Table 2-1

Summary of Active Cleanup Sites Within the Tule Subbasin

Geotracker Global ID	Site Type	Status	Constituent of Concern
T0610700064	LUST Cleanup Site	Open - Site Assessment	Gasoline
T0610700099	LUST Cleanup Site	Open - Site Assessment	Gasoline
T0610700469	LUST Cleanup Site	Open - Verification Monitoring	Gasoline

Notes:

LUST = Leaky underground storage tank
NPL = National Priorities List
VOCs = Volatile Organic Compounds
PAHS = Polynuclear aromatic hydrocarbons
SVOCs = Semi-Volatile Organics
PCE = Perchloroethylene
MTBE = Methyl tert-butyl ether
TBA = Tertiary Butyl Alcohol
Source = https://geotracker.waterboards.ca.gov
NA = Not available

Table 2-2a

Tule Subbasin Historical Surface Water Budget

Water Year	Water Year Type	A: Precipitation	B: Stream Inflow – Tule River	C: Stream Inflow – Deer Creek	D: Stream Inflow – White River	E: Imported Water – Saucelito ID	F: Imported Water – Terra Bella ID	G: Imported Water – Kern-Tulare WD	H: Imported Water – Porterville ID	I: Imported Water – Tea Pot Dome WD	J: Imported Water – LTRID	K: Imported Water – Pixley ID	L: Imported Water – Delano-Earlimart ID	M: Imported Water – Angiola WD	N: Imported Water – Alpaugh ID	O: Imported Water – Atwell Island WD	P: Discharge from Wells – Agriculture Pumping	Q: Discharge from Wells – Municipal Pumping	Total In
		Surface Water Inflow (acre-ft)																	
1986 - 1987	Below Average	219,000	70,029	8,389	2,496	23,879	13,136	10,899	15,337	5,490	89,541	9,356	114,782	7,278	794	1,109	724,000	13,500	1,329,000
1987 - 1988	Average	315,000	39,842	6,095	1,420	19,666	21,961	12,210	13,067	5,493	64,654	0	110,345	3,530	0	0	768,000	15,100	1,396,000
1988 - 1989	Below Average	254,000	49,667	7,795	1,942	22,426	22,561	11,991	13,106	6,226	63,922	5,289	105,980	6,026	0	0	728,000	15,700	1,315,000
1989 - 1990	Below Average	245,000	29,342	4,706	778	16,166	23,159	11,371	11,520	6,193	24,325	0	83,837	3,847	0	0	838,000	16,300	1,315,000
1990 - 1991	Average	331,000	51,275	7,247	1,362	19,848	18,725	9,762	11,322	5,636	71,430	0	106,877	925	0	0	799,000	16,700	1,451,000
1991 - 1992	Below Average	285,000	34,325	4,080	739	21,336	20,743	11,700	15,569	6,607	51,949	0	92,567	1,611	0	0	817,000	17,000	1,380,000
1992 - 1993	Above Average	462,000	115,640	15,422	3,623	41,261	18,180	12,357	12,310	6,968	321,973	96,890	133,359	3,420	12,219	6,423	496,000	17,200	1,775,000
1993 - 1994	Below Average	293,000	61,313	6,908	1,148	22,064	18,740	14,255	12,895	6,526	71,784	7,793	92,394	3,640	3,605	2,000	791,000	17,600	1,427,000
1994 - 1995	Above Average	610,000	218,480	32,053	10,596	37,477	16,186	11,681	9,455	6,562	229,683	55,365	124,388	8,918	8,263	5,395	574,000	17,600	1,976,000
1995 - 1996	Average	321,000	174,473	23,095	5,957	48,924	21,617	15,415	13,808	7,993	236,845	60,931	144,069	12,551	11,130	5,267	508,000	17,800	1,629,000
1996 - 1997	Above Average	450,000	353,968	58,781	12,920	40,908	20,158	15,736	13,379	7,298	192,934	37,048	153,967	12,383	0	0	567,000	18,700	1,955,000
1997 - 1998	Above Average	728,000	439,125	88,360	36,764	28,221	13,165	11,745	10,159	4,913	101,180	41,823	119,815	7,460	0	0	630,000	17,900	2,279,000
1998 - 1999	Above Average	373,000	108,466	18,410	7,469	37,062	17,567	14,527	16,107	9,218	183,971	34,736	124,051	9,778	0	0	620,000	18,000	1,592,000
1999 - 2000	Average	354,000	102,354	15,230	4,878	39,734	19,200	16,476	15,545	7,191	177,192	40,076	134,272	8,118	0	253	651,000	18,900	1,604,000
2000 - 2001	Below Average	265,000	55,249	7,016	4,695	25,252	19,194	17,550	15,436	6,456	83,405	9,098	117,746	3,824	0	0	719,000	19,100	1,368,000
2001 - 2002	Below Average	252,000	73,206	10,370	6,176	26,131	20,234	15,088	13,628	6,388	78,511	13,588	126,747	2,932	0	0	713,000	20,900	1,379,000
2002 - 2003	Below Average	247,000	125,004	15,678	5,875	33,692	18,356	14,591	14,646	5,844	131,470	32,195	121,277	4,728	104	0	610,000	20,600	1,401,000
2003 - 2004	Below Average	207,000	51,738	6,882	2,350	26,988	20,352	15,755	14,698	6,913	71,472	9,839	127,364	3,434	0	0	656,000	21,700	1,242,000
2004 - 2005	Above Average	395,000	172,558	22,758	6,502	42,840	15,266	13,495	14,748	5,217	247,595	59,211	119,847	11,741	14,490	0	479,000	20,600	1,641,000
2005 - 2006	Above Average	401,000	195,667	23,868	7,588	45,106	21,763	14,507	13,251	6,436	194,019	60,634	121,005	10,909	16,112	0	490,000	21,600	1,643,000
2006 - 2007	Below Average	170,000	38,587	6,901	1,815	16,280	20,797	15,133	9,775	5,489	33,174	7,200	79,111	6,641	0	0	746,000	22,700	1,180,000
2007 - 2008	Below Average	189,000	74,030	8,411	2,355	24,083	18,192	17,689	12,988	6,894	71,872	12,243	106,470	2,165	0	0	637,000	23,000	1,206,000
2008 - 2009	Below Average	203,000	54,737	6,620	1,751	31,282	19,701	15,524	18,000	6,165	113,189	23,620	111,556	191	2,131	0	660,000	22,500	1,290,000
2009 - 2010	Average	325,000	144,778	16,470	5,080	42,855	17,574	14,027	14,335	5,845	200,064	32,972	118,671	3,243	2,671	0	483,000	21,800	1,448,000
2010 - 2011	Above Average	479,000	266,473	44,873	14,997	46,733	16,381	13,405	9,387	6,105	229,763	48,391	127,447	6,476	10,951	0	514,000	21,800	1,856,000
2011 - 2012	Below Average	302,000	87,533	11,311	3,334	19,189	19,757	14,309	9,318	4,680	67,684	5,914	114,108	3,156	943	0	730,000	22,500	1,416,000
2012 - 2013	Below Average	139,000	30,283	4,777	1,145	14,102	20,628	14,955	10,298	4,354	37,073	5,012	87,302	1,492	0	0	790,000	22,700	1,183,000
2013 - 2014	Below Average	99,000	13,171	2,957	535	5,724	12,390	9,986	178	1,030	0	0	38,106	1,048	0	0	900,000	21,900	1,106,000
2014 - 2015	Below Average	142,000	8,820	1,994	253	1,503	12,012	5,438	114	260	0	0	18,591	575	0	0	890,000	19,700	1,101,000
2015 - 2016	Below Average	217,000	74,330	14,559	4,547	20,049	14,357	11,805	13,271	4,627	73,382	3,442	93,806	587	0	0	614,000	19,700	1,179,000
2016 - 2017	Below Average	227,000	352,963	51,145	17,241	51,137	16,089	14,203	21,651	6,694	273,151	82,363	137,773	12,146	2,367	0	429,000	20,100	1,715,000
86/87-16/17 Avg		306,000	118,300	17,800	5,800	28,800	18,300	13,500	12,600	5,900	122,200	25,600	109,900	5,300	2,800	700	664,000	19,400	1,477,000

Table 2-2b

Tule Subbasin Historical Surface Water Budget

Water Year	Water Year Type	Surface Water Outflow (acre-ft)																		
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
			Streambed Infiltration					Canal Loss			Recharge in Basins				Deep Percolation of Applied Water					
			Tule River		Native Deer Creek															
		Areal Recharge of Precipitation	Success to Oettle Bridge	Oettle Bridge to Turnbull Weir	Before Trenton Weir	Trenton Weir to Homeland Canal	White River	Tule River	Deer Creek	Imported Water	Tule River	Deer Creek	Imported Water	Recycled Water	Tule River	Deer Creek	Imported Water	Recycled Water	Agricultural Pumping	Municipal Pumping
1986 - 1987	Below Average	0	11,600	1,100	8,100	0	2,400	20,700	0	52,500	5,400	0	0	2,600	8,500	0	56,100	200	169,900	5,200
1987 - 1988	Average	4,000	8,000	900	5,800	0	1,300	8,800	0	32,700	5,000	0	0	3,200	5,500	0	48,100	200	183,200	5,400
1988 - 1989	Below Average	0	8,700	0	7,500	0	1,800	7,400	0	20,500	6,200	0	0	3,400	6,100	0	51,800	200	172,100	5,600
1989 - 1990	Below Average	0	5,000	0	4,400	0	700	2,900	0	7,400	3,700	0	0	3,600	2,700	0	36,200	200	199,700	5,700
1990 - 1991	Average	7,000	6,400	300	6,900	0	1,300	6,800	0	24,300	5,200	0	0	3,700	5,900	0	46,900	200	190,300	5,800
1991 - 1992	Below Average	1,000	4,300	0	3,800	0	700	3,100	0	16,100	3,700	0	0	3,800	3,500	0	44,700	200	194,900	5,900
1992 - 1993	Above Average	57,000	18,500	3,000	15,100	0	3,500	27,800	0	184,400	8,200	0	5,600	3,900	16,800	0	118,000	200	111,300	6,000
1993 - 1994	Below Average	2,000	6,100	200	6,600	0	1,100	14,200	0	35,600	5,000	0	700	4,000	8,700	0	51,800	200	187,400	6,100
1994 - 1995	Above Average	144,000	36,400	10,400	21,200	1,000	10,500	39,500	3,800	128,500	7,800	1,800	10,400	3,900	34,600	1,000	88,900	200	130,900	6,100
1995 - 1996	Average	5,000	20,700	4,000	13,700	700	5,800	26,200	2,800	87,600	21,200	700	39,500	3,900	31,800	1,200	119,000	200	115,700	6,200
1996 - 1997	Above Average	50,000	34,600	9,700	45,100	1,800	12,800	47,300	6,900	64,200	25,300	1,900	14,100	4,300	31,400	700	117,300	200	130,700	6,300
1997 - 1998	Above Average	219,000	41,100	9,000	14,900	12,700	36,600	79,100	48,800	54,100	32,000	900	16,200	3,900	41,100	3,100	65,200	200	143,800	6,300
1998 - 1999	Above Average	18,000	14,300	2,800	13,300	600	7,300	19,500	2,500	58,200	17,600	400	19,800	3,900	14,100	300	88,700	200	143,200	6,400
1999 - 2000	Average	12,000	16,900	2,900	10,100	600	4,800	11,100	2,400	64,400	8,900	500	13,000	4,200	15,200	300	93,200	200	152,400	6,500
2000 - 2001	Below Average	0	12,300	0	6,700	0	4,600	7,000	0	28,500	5,000	0	2,700	4,300	7,800	0	61,700	200	169,600	6,600
2001 - 2002	Below Average	0	14,800	700	10,100	0	6,100	13,400	0	24,800	5,800	0	100	4,900	9,000	0	65,200	300	169,100	6,900
2002 - 2003	Below Average	0	19,700	3,700	13,600	100	5,800	22,800	400	53,600	12,200	300	5,000	4,800	11,500	200	65,700	200	123,200	6,900
2003 - 2004	Below Average	0	9,900	300	6,600	0	2,300	7,700	0	19,600	3,900	0	0	5,100	6,200	0	57,800	200	134,000	7,100
2004 - 2005	Above Average	26,000	24,200	4,700	14,400	400	6,400	22,900	1,500	91,200	19,000	2,900	32,000	2,400	15,300	700	89,700	500	92,600	7,100
2005 - 2006	Above Average	28,000	28,100	7,200	14,400	900	7,500	40,500	3,400	78,000	23,300	3,200	26,600	2,000	29,300	400	91,000	700	95,700	7,300
2006 - 2007	Below Average	0	6,200	1,500	6,600	0	1,700	5,100	0	15,500	4,300	0	100	2,000	4,800	0	36,000	700	151,600	7,500
2007 - 2008	Below Average	0	11,700	1,100	8,100	0	2,300	15,900	0	22,100	6,900	0	1,600	2,000	7,800	0	45,500	800	129,700	7,600
2008 - 2009	Below Average	0	9,500	1,400	6,300	0	1,600	7,100	0	43,800	5,200	0	8,100	2,000	7,600	0	57,400	700	135,300	7,600
2009 - 2010	Average	6,000	25,600	4,500	16,100	0	5,000	34,600	0	72,700	14,300	0	29,900	2,000	19,200	0	77,700	600	93,900	7,500
2010 - 2011	Above Average	65,000	37,100	7,500	24,400	1,300	14,800	82,400	5,000	89,500	39,000	9,700	45,700	2,000	30,300	1,400	84,700	600	101,900	7,600
2011 - 2012	Below Average	3,000	13,600	300	11,000	0	3,200	17,800	0	23,100	8,100	0	7,000	2,000	11,900	0	46,200	700	151,300	7,700
2012 - 2013	Below Average	0	4,900	0	4,500	0	1,000	4,400	0	13,000	5,300	0	100	2,000	3,400	0	35,000	700	165,100	7,800
2013 - 2014	Below Average	0	2,300	0	2,700	0	400	0	0	0	3,800	0	0	2,000	1,000	0	13,000	600	183,400	7,700
2014 - 2015	Below Average	0	1,000	0	1,800	0	200	0	0	0	3,600	0	0	2,000	1,100	0	5,600	500	178,800	7,500
2015 - 2016	Below Average	0	16,000	5,500	14,300	0	4,400	11,400	0	28,600	6,600	0	3,700	2,000	5,900	0	35,300	400	123,500	7,600
2016 - 2017	Below Average	0	42,100	15,900	37,000	800	17,100	82,600	3,100	133,700	37,300	3,700	61,000	2,000	41,400	1,400	99,000	500	83,300	7,700
86/87-16/17 Avg		21,000	16,500	3,200	12,100	700	5,600	22,300	2,600	50,600	11,600	800	11,100	3,200	14,200	300	64,300	400	145,400	6,700

Groundwater Inflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Tule Subbasin Surface Water Budget

		Surface Water Outflow (acre-ft)													
		T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	
		Evapotranspiration											Surface Outflow		
Water Year	Water Year Type	Precipitation Crops/Native	Tule River		Deer Creek		White River	Imported Water	Ag. Cons. Use from Pumping	Recycled Water		Municipal (Landscape ET)	Tule River	Deer Creek	Total Out
			Agricultural Cons. Use	Stream Channel	Agricultural Cons. Use	Stream Channel	Stream Channel	Agricultural Cons. Use		Recharge in Basins	Agricultural Cons. Use				
1986 - 1987	Below Average	219,000	24,700	800	0	300	100	183,000	553,900	50	700	4,800	0	0	1,332,000
1987 - 1988	Average	311,000	13,800	400	0	300	100	170,100	584,700	50	900	5,300	0	0	1,399,000
1988 - 1989	Below Average	254,000	17,600	400	0	300	100	185,200	556,200	50	1,000	5,500	0	0	1,312,000
1989 - 1990	Below Average	245,000	8,800	400	0	300	100	136,700	638,100	50	1,000	5,700	0	0	1,308,000
1990 - 1991	Average	324,000	16,800	500	0	300	100	173,300	608,700	50	1,000	5,900	0	0	1,442,000
1991 - 1992	Below Average	284,000	10,800	400	0	300	100	161,300	622,000	50	1,100	6,000	0	0	1,372,000
1992 - 1993	Above Average	406,000	34,900	800	0	400	100	357,500	385,000	50	1,100	6,100	0	0	1,771,000
1993 - 1994	Below Average	291,000	21,100	500	0	300	100	167,600	603,800	50	1,100	6,200	0	0	1,421,000
1994 - 1995	Above Average	466,000	71,600	900	2,900	400	100	285,600	442,700	50	1,100	6,200	25,000	0	1,983,000
1995 - 1996	Average	316,000	62,600	1,000	3,600	400	100	332,300	392,200	50	1,100	6,300	7,000	0	1,629,000
1996 - 1997	Above Average	399,000	57,100	1,000	2,000	400	100	298,200	436,100	50	1,200	6,600	121,000	0	1,927,000
1997 - 1998	Above Average	509,000	98,000	1,000	9,100	400	200	203,000	485,800	50	1,100	6,300	132,000	0	2,274,000
1998 - 1999	Above Average	354,000	37,700	1,000	1,000	400	200	280,600	477,200	50	1,100	6,300	0	0	1,591,000
1999 - 2000	Average	342,000	39,200	700	900	400	100	286,800	498,600	50	1,200	6,600	5,000	0	1,601,000
2000 - 2001	Below Average	264,000	21,900	700	0	300	100	205,000	548,900	50	1,200	6,700	0	0	1,366,000
2001 - 2002	Below Average	252,000	22,600	700	0	300	100	213,200	543,800	50	1,400	7,400	0	0	1,373,000
2002 - 2003	Below Average	247,000	37,500	700	700	400	100	252,500	487,300	50	1,400	7,300	5,000	0	1,390,000
2003 - 2004	Below Average	207,000	18,200	600	0	300	100	219,400	522,200	50	1,500	7,700	1,000	0	1,239,000
2004 - 2005	Above Average	369,000	43,800	800	2,500	400	100	322,200	386,800	50	3,300	7,300	22,000	0	1,612,000
2005 - 2006	Above Average	373,000	58,800	800	1,300	400	100	308,200	394,100	50	4,000	7,600	11,000	0	1,647,000
2006 - 2007	Below Average	170,000	14,200	400	0	300	100	142,000	594,200	50	4,400	8,000	0	0	1,177,000
2007 - 2008	Below Average	189,000	24,300	600	0	300	100	203,400	507,600	50	4,500	8,100	1,000	0	1,202,000
2008 - 2009	Below Average	203,000	22,300	500	0	300	100	233,000	524,600	50	4,200	7,900	0	0	1,290,000
2009 - 2010	Average	320,000	45,400	800	0	400	100	275,700	388,600	50	3,900	7,700	0	0	1,452,000
2010 - 2011	Above Average	414,000	65,300	800	4,700	400	200	295,900	412,300	50	3,800	7,700	8,000	0	1,863,000
2011 - 2012	Below Average	299,000	33,800	600	0	300	100	182,700	578,500	50	4,100	7,900	10,000	0	1,424,000
2012 - 2013	Below Average	139,000	10,300	500	0	300	100	147,100	625,000	50	4,200	8,000	0	0	1,182,000
2013 - 2014	Below Average	99,000	2,400	300	0	300	100	55,500	716,500	50	3,800	7,700	0	0	1,103,000
2014 - 2015	Below Average	142,000	2,300	300	0	200	100	32,900	711,500	50	2,700	7,000	0	0	1,101,000
2015 - 2016	Below Average	217,000	19,400	500	0	300	100	167,700	490,200	50	2,700	7,000	0	0	1,170,000
2016 - 2017	Below Average	227,000	67,100	900	4,800	400	200	323,800	345,900	50	2,800	7,100	71,000	0	1,721,000
86/87-16/17 Avg		286,000	33,000	700	1,100	300	100	219,400	518,200	50	2,200	6,800	14,000	0	1,474,000

Light blue	Groundwater Inflows to be Included in Sustainable Yield Estimates
Pink	Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Yellow	Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Table 2-3

Tule Subbasin Historical Groundwater Budget

Water Year	Water Year Type	Groundwater Inflows (acre-ft)																						Total In
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
			Tule River Infiltration					Deer Creek Infiltration						Imported Water Deliveries				Municipal Pumping						
																			Recycled Water					
		Areal Recharge from Precipitation	Success to Oettle Bridge Infiltration	Oettle Bridge to Turnbull Weir Infiltration	Canal Loss	Recharge in Basins	Return Flow	Before Trenton Weir Infiltration	Trenton Weir to Homeland Canal Infiltration	Canal Loss	Recharge in Basins	Return Flow	White River Infiltration	Canal Loss	Recharge in Basins	Return Flow	Agricultural Pumping Return Flow	Return Flow	Agricultural Return Flow	Artificial Recharge	Release of Water from Compression of Aquitards	Sub-surface Inflow	Mountain-Block Recharge	
1986 - 1987	Below Average	0	11,600	1,100	20,700	5,400	8,500	8,100	0	0	0	0	2,400	52,500	0	56,100	169,900	5,200	200	2,600	120,000	113,000	28,000	605,000
1987 - 1988	Average	4,000	8,000	900	8,800	5,000	5,500	5,800	0	0	0	0	1,300	32,700	0	48,100	183,200	5,400	200	3,200	88,000	131,000	29,000	560,000
1988 - 1989	Below Average	0	8,700	0	7,400	6,200	6,100	7,500	0	0	0	0	1,800	20,500	0	51,800	172,100	5,600	200	3,400	71,000	131,000	29,000	522,000
1989 - 1990	Below Average	0	5,000	0	2,900	3,700	2,700	4,400	0	0	0	0	700	7,400	0	36,200	199,700	5,700	200	3,600	132,000	133,000	29,000	566,000
1990 - 1991	Average	7,000	6,400	300	6,800	5,200	5,900	6,900	0	0	0	0	1,300	24,300	0	46,900	190,300	5,800	200	3,700	126,000	144,000	29,000	610,000
1991 - 1992	Below Average	1,000	4,300	0	3,100	3,700	3,500	3,800	0	0	0	0	700	16,100	0	44,700	194,900	5,900	200	3,800	143,000	140,000	30,000	599,000
1992 - 1993	Above Average	57,000	18,500	3,000	27,800	8,200	16,800	15,100	0	0	0	0	3,500	184,400	5,600	118,000	111,300	6,000	200	3,900	44,000	93,000	30,000	746,000
1993 - 1994	Below Average	2,000	6,100	200	14,200	5,000	8,700	6,600	0	0	0	0	1,100	35,600	700	51,800	187,400	6,100	200	4,000	85,000	123,000	30,000	568,000
1994 - 1995	Above Average	144,000	36,400	10,400	39,500	7,800	34,600	21,200	1,000	3,800	1,800	1,000	10,500	128,500	10,400	88,900	130,900	6,100	200	3,900	33,000	101,000	30,000	845,000
1995 - 1996	Average	5,000	20,700	4,000	26,200	21,200	31,800	13,700	700	2,800	700	1,200	5,800	87,600	39,500	119,000	115,700	6,200	200	3,900	19,000	95,000	27,000	647,000
1996 - 1997	Above Average	50,000	34,600	9,700	47,300	25,300	31,400	45,100	1,800	6,900	1,900	700	12,800	64,200	14,100	117,300	130,700	6,300	200	4,300	19,000	111,000	28,000	763,000
1997 - 1998	Above Average	219,000	41,100	9,000	79,100	32,000	41,100	14,900	12,700	48,800	900	3,100	36,600	54,100	16,200	65,200	143,800	6,300	200	3,900	17,000	126,000	30,000	1,001,000
1998 - 1999	Above Average	18,000	14,300	2,800	19,500	17,600	14,100	13,300	600	2,500	400	300	7,300	58,200	19,800	88,700	143,200	6,400	200	3,900	18,000	122,000	30,000	601,000
1999 - 2000	Average	12,000	16,900	2,900	11,100	8,900	15,200	10,100	600	2,400	500	300	4,800	64,400	13,000	93,200	152,400	6,500	200	4,200	20,000	131,000	30,000	601,000
2000 - 2001	Below Average	0	12,300	0	7,000	5,000	7,800	6,700	0	0	0	0	4,600	28,500	2,700	61,700	169,600	6,600	200	4,300	42,000	142,000	30,000	531,000
2001 - 2002	Below Average	0	14,800	700	13,400	5,800	9,000	10,100	0	0	0	0	6,100	24,800	100	65,200	169,100	6,900	300	4,900	59,000	135,000	30,000	555,000
2002 - 2003	Below Average	0	19,700	3,700	22,800	12,200	11,500	13,600	100	400	300	200	5,800	53,600	5,000	65,700	123,200	6,900	200	4,800	42,000	123,000	29,000	544,000
2003 - 2004	Below Average	0	9,900	300	7,700	3,900	6,200	6,600	0	0	0	0	2,300	19,600	0	57,800	134,000	7,100	200	5,100	70,000	127,000	29,000	487,000
2004 - 2005	Above Average	26,000	24,200	4,700	22,900	19,000	15,300	14,400	400	1,500	2,900	700	6,400	91,200	32,000	89,700	92,600	7,100	500	2,400	26,000	96,000	29,000	605,000
2005 - 2006	Above Average	28,000	28,100	7,200	40,500	23,300	29,300	14,400	900	3,400	3,200	400	7,500	78,000	26,600	91,000	95,700	7,300	700	2,000	16,000	97,000	29,000	630,000
2006 - 2007	Below Average	0	6,200	1,500	5,100	4,300	4,800	6,600	0	0	0	0	1,700	15,500	100	36,000	151,600	7,500	700	2,000	78,000	125,000	29,000	476,000
2007 - 2008	Below Average	0	11,700	1,100	15,900	6,900	7,800	8,100	0	0	0	0	2,300	22,100	1,600	45,500	129,700	7,600	800	2,000	96,000	113,000	30,000	502,000
2008 - 2009	Below Average	0	9,500	1,400	7,100	5,200	7,600	6,300	0	0	0	0	1,600	43,800	8,100	57,400	135,300	7,600	700	2,000	125,000	108,000	30,000	557,000
2009 - 2010	Average	6,000	25,600	4,500	34,600	14,300	19,200	16,100	0	0	0	0	5,000	72,700	29,900	77,700	93,900	7,500	600	2,000	70,000	83,000	29,000	592,000
2010 - 2011	Above Average	65,000	37,100	7,500	82,400	39,000	30,300	24,400	1,300	5,000	9,700	1,400	14,800	89,500	45,700	84,700	101,900	7,600	600	2,000	34,000	93,000	29,000	806,000
2011 - 2012	Below Average	3,000	13,600	300	17,800	8,100	11,900	11,000	0	0	0	0	3,200	23,100	7,000	46,200	151,300	7,700	700	2,000	86,000	123,000	29,000	545,000
2012 - 2013	Below Average	0	4,900	0	4,400	5,300	3,400	4,500	0	0	0	0	1,000	13,000	100	35,000	165,100	7,800	700	2,000	145,000	130,000	29,000	551,000
2013 - 2014	Below Average	0	2,300	0	0	3,800	1,000	2,700	0	0	0	0	400	0	0	13,000	183,400	7,700	600	2,000	186,000	132,000	30,000	565,000
2014 - 2015	Below Average	0	1,000	0	0	3,600	1,100	1,800	0	0	0	0	200	0	0	5,600	178,800	7,500	500	2,000	189,000	124,000	30,000	545,000
2015 - 2016	Below Average	0	16,000	5,500	11,400	6,600	5,900	14,300	0	0	0	0	4,400	28,600	3,700	35,300	123,500	7,600	400	2,000	140,000	112,000	30,000	547,000
2016 - 2017	Below Average	0	42,100	15,900	82,600	37,300	41,400	37,000	800	3,100	3,700	1,400	17,100	133,700	61,000	99,000	83,300	7,700	500	2,000	61,000	95,000	29,000	855,000
86/87-16/17 Avg		21,000	16,500	3,200	22,300	11,600	14,200	12,100	700	2,600	800	300	5,600	50,600	11,100	64,300	145,400	6,700	400	3,200	77,000	118,000	29,000	617,000

Groundwater Inflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Tule Subbasin Groundwater Budget

Water Year	Water Year Type	Groundwater Outflows (acre-ft)					Total Out	Change in Storage (acre-ft)
		W	X	Y	Z	AA		
		Groundwater Pumping						
		Municipal	Irrigated Agriculture	Exports	Groundwater Banking Extraction	Sub-surface Outflow		
1986 - 1987	Below Average	13,500	724,000	6,550	0	61,000	805,000	-200,000
1987 - 1988	Average	15,100	768,000	34,180	0	53,000	870,000	-310,000
1988 - 1989	Below Average	15,700	728,000	38,290	0	51,000	833,000	-311,000
1989 - 1990	Below Average	16,300	838,000	50,430	0	53,000	958,000	-392,000
1990 - 1991	Average	16,700	799,000	46,300	0	61,000	923,000	-313,000
1991 - 1992	Below Average	17,000	817,000	41,250	0	52,000	927,000	-328,000
1992 - 1993	Above Average	17,200	496,000	14,550	0	73,000	601,000	145,000
1993 - 1994	Below Average	17,600	791,000	11,220	0	59,000	879,000	-311,000
1994 - 1995	Above Average	17,600	574,000	1,320	0	61,000	654,000	191,000
1995 - 1996	Average	17,800	508,000	0	0	65,000	591,000	56,000
1996 - 1997	Above Average	18,700	567,000	0	0	65,000	651,000	112,000
1997 - 1998	Above Average	17,900	630,000	0	0	62,000	710,000	291,000
1998 - 1999	Above Average	18,000	620,000	0	0	62,000	700,000	-99,000
1999 - 2000	Average	18,900	651,000	7,720	0	60,000	738,000	-137,000
2000 - 2001	Below Average	19,100	719,000	30,600	0	60,000	829,000	-298,000
2001 - 2002	Below Average	20,900	713,000	44,520	0	58,000	836,000	-281,000
2002 - 2003	Below Average	20,600	610,000	33,660	0	55,000	719,000	-175,000
2003 - 2004	Below Average	21,700	656,000	37,790	0	55,000	770,000	-283,000
2004 - 2005	Above Average	20,600	479,000	11,720	0	66,000	577,000	28,000
2005 - 2006	Above Average	21,600	490,000	150	0	64,000	576,000	54,000
2006 - 2007	Below Average	22,700	746,000	49,500	0	54,000	872,000	-396,000
2007 - 2008	Below Average	23,000	637,000	50,090	0	68,000	778,000	-276,000
2008 - 2009	Below Average	22,500	660,000	48,860	550	78,000	810,000	-253,000
2009 - 2010	Average	21,800	483,000	28,530	70	92,000	625,000	-33,000
2010 - 2011	Above Average	21,800	514,000	8,060	0	86,000	630,000	176,000
2011 - 2012	Below Average	22,500	730,000	43,570	3,860	76,000	876,000	-331,000
2012 - 2013	Below Average	22,700	790,000	63,640	5,990	68,000	950,000	-399,000
2013 - 2014	Below Average	21,900	900,000	58,030	5,590	69,000	1,055,000	-490,000
2014 - 2015	Below Average	19,700	890,000	53,270	1,150	64,000	1,028,000	-483,000
2015 - 2016	Below Average	19,700	614,000	50,000	70	70,000	754,000	-207,000
2016 - 2017	Below Average	20,100	429,000	11,330	0	90,000	550,000	305,000
		19,400	664,000	28,200	600	65,000	777,000	-160,000
							Cummulative Change in Storage	-4,948,000

Light blue	Groundwater Inflows to be Included in Sustainable Yield Estimates
Pink	Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Yellow	Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Projected Future Tule Subbasin Sustainable Yield

Water Year	Groundwater Inflows (acre-ft)										Groundwater Outflow (acre-ft)	Sustainable Yield
	A	B	C	D	E	F	G	H	I	J	K	
		Streambed Infiltration					Return Flow					
		Tule River		Deer Creek								
	Areal Recharge from Precipitation	Success to Oettle Bridge	Oettle Bridge to Turnbull Weir	Before Trenton Weir Infiltration	Trenton Weir to Homeland Canal Infiltration	White River	Irrigated Agriculture	Municipal	Sub-surface Inflow	Mountain-Block Recharge	Sub-surface Outflow	
2040 - 2041	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	51,000	32,000	90,000	127,700
2041 - 2042	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	52,000	32,000	90,000	128,700
2042 - 2043	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	52,000	32,000	90,000	128,700
2043 - 2044	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	52,000	32,000	90,000	128,700
2044 - 2045	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	52,000	32,000	90,000	128,700
2045 - 2046	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	53,000	32,000	89,000	130,700
2046 - 2047	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	53,000	32,000	89,000	130,700
2047 - 2048	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	53,000	32,000	89,000	130,700
2048 - 2049	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	53,000	32,000	89,000	130,700
2049 - 2050	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	53,000	32,000	88,000	131,700
40/41-49/50 Avg	21,000	17,900	3,900	11,600	600	6,200	64,100	9,400	52,000	32,000	89,000	129,700

Historical Planned versus Actual Water Deliveries
2007/08 - 2016/17

Water Year	Water Year Type	Tule River			Friant-Kern Canal								
					Saucelito ID			Terra Bella ID			Kern-Tulare WD		
		Total Diversion Right	Total Delivered	Percent of Diversion Right (%)	Contract Amount[1]	Total Delivered[2]	Percent of Contract (%)	Contract Amount[1]	Total Delivered[2]	Percent of Contract (%)	Contract Amount[1]	Total Delivered[2]	Percent of Contract (%)
2007 - 2008	Below Average	57,100	41,974	74%	54,300	24,083	44%	29,000	18,192	63%	5,000	17,689	354%
2008 - 2009	Below Average	57,100	32,290	57%	54,300	31,282	58%	29,000	19,701	68%	5,000	15,524	310%
2009 - 2010	Average	57,100	60,570	106%	54,300	42,855	79%	29,000	17,574	61%	5,000	14,027	281%
2010 - 2011	Above Average	57,100	106,619	187%	54,300	46,733	86%	29,000	16,381	56%	5,000	13,405	268%
2011 - 2012	Below Average	57,100	66,992	117%	54,300	19,189	35%	29,000	19,757	68%	5,000	14,309	286%
2012 - 2013	Below Average	57,100	23,406	41%	54,300	14,102	26%	29,000	20,628	71%	5,000	14,955	299%
2013 - 2014	Below Average	57,100	9,747	17%	54,300	5,724	11%	29,000	12,390	43%	5,000	9,986	200%
2014 - 2015	Below Average	57,100	6,417	11%	54,300	1,503	3%	29,000	12,012	41%	5,000	5,438	109%
2015 - 2016	Below Average	57,100	36,752	64%	54,300	20,049	37%	29,000	14,357	50%	5,000	11,805	236%
2016 - 2017	Below Average	57,100	128,361	225%	54,300	51,137	94%	29,000	16,089	55%	5,000	14,203	284%
	Total:	571,000	513,128	90%	543,000	256,657	47%	290,000	167,081	58%	50,000	131,341	263%

Water Year	Water Year Type	Friant-Kern Canal											
		LTRID			Delano-Earlimart ID			Porterville ID			Tea Pot Dome WD		
		Contract Amount[1]	Total Delivered[2]	Percent of Contract (%)	Contract Amount[1]	Total Delivered[2]	Percent of Contract (%)	Contract Amount[1]	Total Delivered[2]	Percent of Contract (%)	Contract Amount[1]	Total Delivered[2]	Percent of Contract (%)
2007 - 2008	Below Average	299,200	71,872	24%	183,300	106,470	58%	45,000	12,988	29%	7,200	6,894	96%
2008 - 2009	Below Average	299,200	113,189	38%	183,300	111,556	61%	45,000	18,000	40%	7,200	6,165	86%
2009 - 2010	Average	299,200	200,064	67%	183,300	118,671	65%	45,000	14,335	32%	7,200	5,845	81%
2010 - 2011	Above Average	299,200	229,763	77%	183,300	127,447	70%	45,000	9,387	21%	7,200	6,105	85%
2011 - 2012	Below Average	299,200	67,684	23%	183,300	114,108	62%	45,000	9,318	21%	7,200	4,680	65%
2012 - 2013	Below Average	299,200	37,073	12%	183,300	87,302	48%	45,000	10,298	23%	7,200	4,354	60%
2013 - 2014	Below Average	299,200	0	0%	183,300	38,106	21%	45,000	178	0%	7,200	1,030	14%
2014 - 2015	Below Average	299,200	0	0%	183,300	18,591	10%	45,000	114	0%	7,200	260	4%
2015 - 2016	Below Average	299,200	73,382	25%	183,300	93,806	51%	45,000	13,271	29%	7,200	4,627	64%
2016 - 2017	Below Average	299,200	273,151	91%	183,300	137,773	75%	45,000	21,651	48%	7,200	6,694	93%
	Total:	2,992,000	1,066,178	36%	1,833,000	953,830	52%	450,000	109,540	24%	72,000	46,654	65%

Notes: [1]Sum of Class 1 and Class 2 Fraint-Kern Canal Contract Amount
[2]Total delivered water may include 16B water and water purchased from other Friant-Kern Canal contractors.
Likewise, delivered water may not reflect available supplies as contractors periodically sell water under their contract.

Summary of Projects Exclusive of Transitional Pumping

Eastern Tule GSA

No.	Lead Entity	Project Name	Description	Timeframe	Annual Volume	Water Source	Confidence
1	City of Porterville	Population Increase	Increase GW Production	2.5%/yr 2020-2040	9,500 af/yr by 2040	N/A	High
2	City of Porterville	Recycling Increase	Increase RW Applied to Ag	2.5%/yr 2020-2040	1,900 af/yr by 2040	Recycled Water	High
3	City of Porterville	Recycling Increase	Increase RW Recharge	2.5%/yr 2020-2040	1,600 af/yr by 2040	Recycled Water	High
4	City of Porterville	Tule River Recharge	Recharge Project	Starting 2019/20	900 af/yr	Tule River	High
5	City of Porterville	FKC Recharge	Recharge Project	Starting 2020/21	1,100 af/yr	FKC via Porterville ID	High
6	Porterville ID	SA 1 & 2	Expand distribution system	Starting 2018/19	3,200 af/yr	Tule River and FKC	High
7	Porterville ID	Falconer Bank	Develop water bank	Starting 2020/21	3,300 af/yr of leave-behind	FKC and others	High
8	Porterville ID	Recharge Policy	On-Farm recharge	Starting 2019/20	3,000 af/yr	Tule River and FKC	High
9	Saucelito ID	Conway Bank	Develop water bank	Starting 2020/21	1,100 af/yr of leave-behind	FKC and others	High
10	Saucelito ID	Recharge Policy	On-Farm recharge	Starting 2019/20	2,000 af/yr	FKC	High
11	Kern-Tulare WD	In-District Pricing	Pricing change	Starting 2020/21	2,600 af/yr	N/A	High
12	Kern-Tulare WD	Reservoir Storage	Surface water storage	Starting 2029/30	500 af/yr	FKC and others	Medium
13	Kern-Tulare WD	CRC Pipeline	Deliver produced water	Starting 2024/25	680 af/yr	CRC Produced water	High
14	Terra Bella ID	Deer Creek Recharge	Divert and recharge DC	Starting 2017/18	800 af/yr	Deer Creek	High
15	PWC, VWD, & CMDC	SREP	Success Dam Enlargement	Starting 2024/25	400 af/yr	Tule River	High
16	Hope WD	In-District Recharge	Recharge Project	Starting 2022/23	5,000 af/yr every 3 years	FKC and others / unknown	Medium
17	Ducor ID	In-District Recharge	Pipeline and Recharge Project	Starting 2023/24	4,000 af/yr	FKC and others / unknown	High

LTRID GSA

No.	Project Name	Description	Timeframe	Annual Volume	Water Source	Confidence
1	Creighton Ranch	Groundwater exports	Unknown	Unknown	Not applicable	N/A
2	LTRID - Pixley ID FKC	Continue FKC transfers to Pixley ID	Ongoing	13,670 af/yr	FKC	N/A
3	SREP	Success Dam Enlargement	Starting 2024/25	2,600 af/yr	Tule River	N/A

Pixley GSA

No.	Project Name	Description	Timeframe	Annual Volume	Water Source	Confidence
1	LTRID - Pixley ID FKC	Continue FKC transfers from LTRID	Ongoing	13,670 af/yr	FKC	N/A

DEID GSA

No.	Project Name	Description	Timeframe	Annual Volume	Water Source	Confidence
N/A	No planned projects	N/A	N/A	N/A	N/A	N/A

Tri-County GSA

No.	Project Name	Description	Timeframe	Annual Volume	Water Source	Confidence
1	Deep Pumping Reduction	Replace deep pumping with 24 new shallow wells	Start in 2019/20, completed in 2023/24	24,000 af/yr	Not applicable	High
2	Duck Club Project	Duck Club water transferred to farms	2019/20	5,400 af every 7 years	Unknown	High
3	Liberty Project	Participation in the Liberty Project surface water storage	Start in 2019/20, completed in 2022/23	5,000 af/yr	FID, FKC, KR, TR, KW, SWP	High
4	Recharge Scenario	Confidential. Capture and recharge flood water	Unknown	1,200 to 1,800 af/yr	Unknown	N/A

Alpaugh GSA

No.	Project Name	Description	Timeframe	Annual Volume	Water Source	Confidence
1	Water Capture	Deer Creek flood capture	Starting in 2022/23	1,100 af 2.5x per yr every 2 yrs	Deer Creek	N/A
2	Cropping Changes	Install drip irrigation on 1,900 acres	Starting 2019/20	Not applicable	Not applicable	N/A

Summary of Projects Exclusive of Transitional Pumping

Notes:

N/A= Not Available
af/yr = acre-foot per year
ID = Irrigation District
GW = Groundwater
RW = Recycled water
Ag = Agricultural
DC = Deer Creek
FKC = Friant-Kern Canal
SA = Service Area
CRC = California Resources Corporation
PWC = Pioneer Water Company
VMD = Vandalia Water District
CMDC = Campbell Moreland Ditch Company
SREP = Success Reservoir Enlargement Project
WD = Water District
MA = Management Area
FID = Fresno Irrigation District (Fresno Slough)
KR = Kaweah River
TR = Tule River
KW = Kaweah River
SWP = State Water Project

Planned Transitional Pumping by GSA

<table>
<tr><th></th><th>Eastern Tule GSA</th><th>LTRID GSA</th><th>Pixley ID GSA</th><th>DEID-District Area</th><th>DEID White Lands Area</th><th>Tri-Co GSA</th><th>Alpaugh GSA</th></tr>
<tr><td>2020-2025</td><td>90% of over-pumping[1]</td><td>2.0 af/ac Over Cons. Use Target</td><td>Fallow 5,000 acres; Remaining no change</td><td rowspan="5">No Change/ Sustainable</td><td>100% of over-pumping</td><td>100% of over-pumping</td><td rowspan="2">Reduce cropped area by 880 acres; 80% of overpumping</td></tr>
<tr><td>2025-2030</td><td>80% of over-pumping</td><td>1.5 af/ac Over Cons. Use Target</td><td>Fallow 5,000 acres; Remaining 1.5 af/ac Over Cons. Use Target[2]</td><td rowspan="2">Linear Transitional Pumping</td><td rowspan="2">Reduce pumping 10,000 af/yr</td></tr>
<tr><td>2030-2035</td><td>30% of over-pumping</td><td>1.0 af/ac Over Cons. Use Target</td><td>Fallow 5,000 acres; Remaining 1.0 af/ac Over Cons. Use Target</td><td>50% of overpumping</td></tr>
<tr><td>2035-2040</td><td rowspan="2">Sustainable</td><td>0.5 af/ac Over Cons. Use Target</td><td>Fallow 5,000 acres; Remaining 0.5 af/ac Over Cons. Use Target</td><td rowspan="2">Sustainable</td><td rowspan="2">Sustainable</td><td>20% of overpumping</td></tr>
<tr><td>2040+</td><td>Sustainable</td><td>Sustainable</td><td>Sustainable</td></tr>
</table>

Notes:

[1]Over-pumping means pumping in excess of the consumptive use target
[2]Over consumptive use target means over pumping

Table 2-8a

Projected Future Tule Subbasin Surface Water Budget

	Surface Water Inflow (acre-ft)																					
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	
		Stream Inflow			Imported Water															Discharge from Wells		
Water Year	Precipitation	Tule River	Deer Creek	White River	Saucelito ID	Terra Bella ID	Kern-Tulare WD	Porterville ID	Tea Pot Dome WD	City of Porterville	Hope WD	Ducor ID	LTRID	Pixley ID	Delano-Earlimart ID	Angiola WD	Alpaugh ID	Atwell Island WD	Private	Agriculture Pumping	Municipal Pumping	Total In
2017 - 2018	306,000	131,258	19,410	6,347	34,567	18,786	15,335	19,803	6,528	0	0	0	143,186	31,763	116,902	5,911	3,680	0	0	549,000	21,700	1,430,000
2018 - 2019	306,000	131,258	19,410	6,347	34,567	18,786	15,335	19,803	6,528	0	0	0	143,186	31,763	116,902	5,911	3,680	0	0	548,000	23,400	1,431,000
2019 - 2020	306,000	131,258	19,410	6,347	34,567	18,786	15,335	23,103	6,528	0	0	0	143,186	31,763	116,902	7,961	3,680	0	0	529,000	25,000	1,419,000
2020 - 2021	306,000	131,258	19,410	6,347	35,667	18,786	17,935	23,103	6,528	1,100	0	0	143,186	31,763	116,902	9,211	3,680	0	0	526,000	25,400	1,422,000
2021 - 2022	306,000	131,258	19,410	6,347	35,667	18,786	17,935	23,103	6,528	1,100	0	0	143,186	31,763	116,902	10,461	3,680	0	0	524,000	25,700	1,422,000
2022 - 2023	306,000	131,258	19,410	6,347	35,667	18,786	17,935	23,103	6,528	1,100	1,667	0	143,186	31,763	116,902	13,590	3,680	0	0	523,000	26,100	1,426,000
2023 - 2024	306,000	131,258	19,410	6,347	35,667	18,786	17,935	23,103	6,528	1,100	1,667	4,000	143,186	31,763	116,902	18,926	3,680	0	0	522,000	26,500	1,435,000
2024 - 2025	306,000	134,258	19,410	6,347	34,893	20,304	18,229	24,339	6,594	1,100	1,667	4,000	135,513	31,763	117,661	24,261	3,680	0	1,500	494,000	26,900	1,412,000
2025 - 2026	306,000	134,258	19,410	6,347	34,118	21,823	17,843	25,575	6,661	1,100	1,667	4,000	127,841	31,763	118,420	29,597	4,813	0	1,500	487,000	27,400	1,407,000
2026 - 2027	306,000	134,258	19,410	6,347	33,343	23,341	17,458	26,812	6,727	1,100	1,667	4,000	120,168	31,763	119,180	34,933	4,751	0	1,500	481,000	27,800	1,402,000
2027 - 2028	306,000	134,258	19,410	6,347	32,568	24,860	17,072	28,048	6,793	1,100	1,667	4,000	112,496	31,763	119,939	40,268	4,689	0	1,500	474,000	28,200	1,395,000
2028 - 2029	306,000	134,258	19,410	6,347	31,794	26,378	16,687	29,285	6,860	1,100	1,667	4,000	104,823	31,763	120,698	43,725	4,627	0	1,500	468,000	28,700	1,388,000
2029 - 2030	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	4,565	0	1,500	412,000	29,200	1,328,000
2030 - 2031	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	5,737	0	1,500	413,000	29,600	1,331,000
2031 - 2032	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	5,737	0	1,500	410,000	30,100	1,328,000
2032 - 2033	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	5,737	0	1,500	407,000	30,600	1,326,000
2033 - 2034	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	5,737	0	1,500	405,000	31,100	1,324,000
2034 - 2035	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	5,737	0	1,500	345,000	31,700	1,265,000
2035 - 2036	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	6,970	0	1,500	344,000	32,200	1,266,000
2036 - 2037	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	6,970	0	1,500	344,000	32,800	1,266,000
2037 - 2038	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	6,970	0	1,500	344,000	33,300	1,267,000
2038 - 2039	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	6,970	0	1,500	344,000	33,900	1,267,000
2039 - 2040	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	6,970	0	1,500	303,000	34,500	1,227,000
2040 - 2041	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2041 - 2042	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2042 - 2043	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2043 - 2044	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2044 - 2045	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2045 - 2046	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2046 - 2047	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2047 - 2048	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2048 - 2049	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2049 - 2050	306,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,151	31,763	121,457	43,430	7,793	0	1,500	302,000	34,500	1,227,000
2050 - 2051	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2051 - 2052	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2052 - 2053	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2053 - 2054	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2054 - 2055	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2055 - 2056	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2056 - 2057	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2057 - 2058	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2058 - 2059	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2059 - 2060	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2060 - 2061	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2061 - 2062	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2062 - 2063	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2063 - 2064	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2064 - 2065	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2065 - 2066	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2066 - 2067	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2067 - 2068	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	43,209	7,793	0	1,500	297,000	34,500	1,189,000
2068 - 2069	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	45,214	7,793	0	1,500	297,000	34,500	1,191,000
2069 - 2070	306,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	84,084	31,763	112,046	24,476	7,793	0	1,500	297,000	34,500	1,170,000
17/18-69/70 Avg	306,000	132,500	19,200	6,300	31,200	25,700	17,800	28,300	6,700	1,000	1,500	3,500	100,500	31,800	117,100	37,800	6,600	0	1,300	361,000	32,000	1,268,000

Table 2-8b

Projected Future Tule Subbasin Surface Water Budget

Water Year	Surface Water Outflow (acre-ft)																		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
		Streambed Infiltration					Canal Loss			Recharge in Basins				Deep Percolation of Applied Water					
		Tule River		Native Deer Creek															
	Areal Recharge of Precipitation	Success to Oettle Bridge	Oettle Bridge to Turnbull Weir	Before Trenton Weir	Trenton Weir to Homeland Canal	White River	Tule River	Deer Creek	Imported Water	Tule River	Deer Creek	Imported Water	Recycled Water	Tule River	Deer Creek	Imported Water	Recycled Water	Agricultural Pumping	Municipal Pumping
2017 - 2018	21,000	17,900	3,900	11,600	600	6,200	17,000	2,100	65,200	12,200	1,300	15,900	2,000	15,500	800	66,900	600	110,400	7,900
2018 - 2019	21,000	17,900	3,900	11,600	600	6,200	17,000	2,100	65,200	12,200	1,300	15,900	2,000	15,500	800	66,900	700	110,300	8,100
2019 - 2020	21,000	17,900	3,900	11,600	600	6,200	17,000	2,100	65,200	13,100	1,300	19,200	2,500	15,500	800	68,100	400	106,600	8,300
2020 - 2021	21,000	17,900	3,900	11,600	600	6,200	17,000	2,100	65,200	13,100	1,300	21,400	2,600	15,500	800	68,700	400	106,000	8,300
2021 - 2022	21,000	17,900	3,900	11,600	600	6,200	17,000	2,100	65,200	13,100	1,300	21,400	2,600	15,500	800	68,900	400	105,700	8,400
2022 - 2023	21,000	17,900	3,900	11,600	600	6,200	17,000	2,100	65,200	13,100	1,300	23,000	2,700	15,500	800	69,100	500	105,400	8,400
2023 - 2024	21,000	17,900	3,900	11,600	600	6,200	17,000	2,100	65,200	13,100	1,300	27,000	2,800	15,500	800	69,100	500	105,300	8,500
2024 - 2025	21,000	17,900	3,900	11,600	600	6,200	18,200	2,100	62,400	13,700	1,300	27,900	2,800	15,800	800	69,600	500	100,200	8,500
2025 - 2026	21,000	17,900	3,900	11,600	600	6,200	18,400	2,100	59,600	13,700	1,300	27,300	2,900	15,800	1,100	70,200	500	98,900	8,600
2026 - 2027	21,000	17,900	3,900	11,600	600	6,200	18,700	2,100	56,800	13,700	1,300	26,700	3,000	15,800	1,100	70,500	500	98,000	8,600
2027 - 2028	21,000	17,900	3,900	11,600	600	6,200	19,000	2,100	53,900	13,700	1,300	26,100	3,100	15,800	1,100	70,900	500	97,000	8,700
2028 - 2029	21,000	17,900	3,900	11,600	600	6,200	19,300	2,100	51,100	13,700	1,300	25,500	3,100	15,800	1,100	71,300	500	96,000	8,700
2029 - 2030	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,200	15,500	1,100	71,800	500	86,900	8,800
2030 - 2031	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,300	15,500	1,100	72,100	600	86,900	8,800
2031 - 2032	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,400	15,500	1,100	72,100	600	86,400	8,900
2032 - 2033	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,500	15,500	1,100	72,100	600	85,900	8,900
2033 - 2034	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,500	15,500	1,100	72,100	600	85,400	9,000
2034 - 2035	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,600	15,500	1,100	72,100	600	74,000	9,100
2035 - 2036	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,700	15,500	1,100	72,400	600	73,700	9,100
2036 - 2037	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,800	15,500	1,100	72,400	700	73,700	9,200
2037 - 2038	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	3,900	15,500	1,100	72,400	700	73,700	9,300
2038 - 2039	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,000	15,500	1,100	72,400	700	73,700	9,300
2039 - 2040	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,400	700	64,300	9,400
2040 - 2041	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2041 - 2042	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2042 - 2043	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2043 - 2044	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2044 - 2045	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2045 - 2046	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2046 - 2047	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2047 - 2048	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2048 - 2049	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2049 - 2050	21,000	17,900	3,900	11,600	600	6,200	19,400	2,100	48,300	13,600	1,300	24,900	4,100	15,500	1,100	72,600	700	64,100	9,400
2050 - 2051	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2051 - 2052	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2052 - 2053	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2053 - 2054	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2054 - 2055	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2055 - 2056	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2056 - 2057	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2057 - 2058	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2058 - 2059	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2059 - 2060	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2060 - 2061	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2061 - 2062	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2062 - 2063	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2063 - 2064	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2064 - 2065	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2065 - 2066	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2066 - 2067	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2067 - 2068	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2068 - 2069	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
2069 - 2070	21,000	17,400	3,800	11,300	500	6,000	19,300	2,100	43,500	12,900	1,300	23,800	4,100	15,400	1,100	68,400	700	62,400	9,400
17/18-69/70 Avg	21,000	17,700	3,900	11,500	600	6,100	19,000	2,100	49,500	13,200	1,300	24,100	3,700	15,500	1,100	70,200	600	75,300	9,100

Table 2-8b

Projected Future Tule Subbasin Surface Water Budget

Water Year	Surface Water Outflow (acre-ft)													Total Out
	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	
	Evapotranspiration											Surface Outflow		
	Precipitation Crops/Native	Tule River		Deer Creek		White River	Imported Water	Ag. Cons. Use from Pumping	Recycled Water		Municipal (Landscape ET)	Tule River	Deer Creek	
		Agricultural Cons. Use	Stream Channel	Agricultural Cons. Use	Stream Channel	Stream Channel	Agricultural Cons. Use		Recharge in Basins	Agricultural Cons. Use				
2017 - 2018	285,000	47,400	700	2,900	300	100	250,700	438,600	50	3,500	7,700	15,000	0	1,431,000
2018 - 2019	285,000	47,400	700	2,900	300	100	250,700	437,800	50	4,300	8,200	8,000	0	1,425,000
2019 - 2020	285,000	47,400	700	2,900	300	100	254,400	420,400	50	2,600	11,200	8,000	0	1,414,000
2020 - 2021	285,000	47,400	700	2,900	300	100	257,400	417,300	50	2,600	11,400	8,000	0	1,417,000
2021 - 2022	285,000	47,400	700	2,900	300	100	258,200	416,100	50	2,700	11,600	8,000	0	1,417,000
2022 - 2023	285,000	47,400	700	2,900	300	100	259,000	414,900	50	2,800	11,800	8,000	0	1,418,000
2023 - 2024	285,000	47,400	700	2,900	300	100	259,000	414,500	50	2,800	12,000	8,000	0	1,422,000
2024 - 2025	285,000	48,500	700	2,900	300	100	262,700	392,000	50	2,900	12,200	8,000	0	1,400,000
2025 - 2026	285,000	48,500	700	3,800	300	100	266,800	385,800	50	3,000	12,400	8,000	0	1,396,000
2026 - 2027	285,000	48,500	700	3,800	300	100	269,800	380,300	50	3,000	12,600	8,000	0	1,390,000
2027 - 2028	285,000	48,500	700	3,800	300	100	272,900	374,800	50	3,100	12,800	7,000	0	1,383,000
2028 - 2029	285,000	48,600	700	3,800	300	100	276,000	369,300	50	3,200	13,100	7,000	0	1,378,000
2029 - 2030	285,000	47,400	700	3,800	300	100	280,300	322,400	50	3,300	13,300	7,000	0	1,322,000
2030 - 2031	285,000	47,400	700	3,800	300	100	281,200	323,200	50	3,400	13,600	7,000	0	1,325,000
2031 - 2032	285,000	47,400	700	3,800	300	100	281,200	321,100	50	3,400	13,800	7,000	0	1,323,000
2032 - 2033	285,000	47,400	700	3,800	300	100	281,200	319,000	50	3,500	14,100	7,000	0	1,321,000
2033 - 2034	285,000	47,400	700	3,800	300	100	281,200	316,900	50	3,600	14,300	7,000	0	1,318,000
2034 - 2035	285,000	47,400	700	3,800	300	100	281,200	268,900	50	3,700	14,600	7,000	0	1,260,000
2035 - 2036	285,000	47,400	700	3,800	300	100	282,200	267,800	50	3,800	14,900	7,000	0	1,260,000
2036 - 2037	285,000	47,400	700	3,800	300	100	282,200	267,700	50	3,900	15,200	7,000	0	1,261,000
2037 - 2038	285,000	47,400	700	3,800	300	100	282,200	267,600	50	4,000	15,500	7,000	0	1,261,000
2038 - 2039	285,000	47,400	700	3,800	300	100	282,200	267,500	50	4,100	15,800	7,000	0	1,261,000
2039 - 2040	285,000	47,400	700	3,800	300	100	282,200	236,000	50	4,200	16,100	7,000	0	1,221,000
2040 - 2041	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2041 - 2042	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2042 - 2043	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2043 - 2044	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2044 - 2045	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2045 - 2046	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2046 - 2047	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2047 - 2048	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2048 - 2049	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2049 - 2050	285,000	47,400	700	3,800	300	100	282,800	235,400	50	4,200	16,100	7,000	0	1,221,000
2050 - 2051	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2051 - 2052	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2052 - 2053	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2053 - 2054	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2054 - 2055	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2055 - 2056	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2056 - 2057	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2057 - 2058	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2058 - 2059	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2059 - 2060	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2060 - 2061	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2061 - 2062	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2062 - 2063	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2063 - 2064	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2064 - 2065	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2065 - 2066	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2066 - 2067	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2067 - 2068	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2068 - 2069	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
2069 - 2070	285,000	45,800	700	3,700	300	100	264,400	232,300	50	4,200	16,100	6,000	0	1,183,000
86/87-16/17 Avg	285,000	46,900	700	3,600	300	100	270,800	283,800	50	3,800	14,700	7,000	0	1,262,000

Table 2-9

Projected Future Tule Subbasin Groundwater Budget

Water Year	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	Total In
	Groundwater Inflows (acre-ft)																						
		Tule River Infiltration					Deer Creek Infiltration						Imported Water Deliveries				Municipal Pumping						
																		Recycled Water					
	Areal Recharge from Precipitation	Success to Oettle Bridge Infiltration	Oettle Bridge to Turnbull Weir Infiltration	Canal Loss	Recharge in Basins	Return Flow	Before Trenton Weir Infiltration	Trenton Weir to Homeland Canal Infiltration	Canal Loss	Recharge in Basins	Return Flow	White River Infiltration	Canal Loss	Recharge in Basins	Return Flow	Agricultural Pumping Return Flow	Return Flow	Agricultural Return Flow	Artificial Recharge	Release of Water from Compression of Aquitards	Sub-surface Inflow	Mountain-Block Recharge	
2017 - 2018	21,000	17,900	3,900	17,000	12,200	15,500	11,600	600	2,100	1,300	800	6,200	65,200	15,900	66,900	110,400	7,900	600	2,000	52,000	73,000	33,000	537,000
2018 - 2019	21,000	17,900	3,900	17,000	12,200	15,500	11,600	600	2,100	1,300	800	6,200	65,200	15,900	66,900	110,300	8,100	700	2,000	56,000	71,000	33,000	539,000
2019 - 2020	21,000	17,900	3,900	17,000	13,100	15,500	11,600	600	2,100	1,300	800	6,200	65,200	19,200	68,100	106,600	8,300	400	2,500	58,000	68,000	33,000	540,000
2020 - 2021	21,000	17,900	3,900	17,000	13,100	15,500	11,600	600	2,100	1,300	800	6,200	65,200	21,400	68,700	106,000	8,300	400	2,600	60,000	64,000	33,000	541,000
2021 - 2022	21,000	17,900	3,900	17,000	13,100	15,500	11,600	600	2,100	1,300	800	6,200	65,200	21,400	68,900	105,700	8,400	400	2,600	62,000	60,000	33,000	539,000
2022 - 2023	21,000	17,900	3,900	17,000	13,100	15,500	11,600	600	2,100	1,300	800	6,200	65,200	23,000	69,100	105,400	8,400	500	2,700	64,000	57,000	33,000	539,000
2023 - 2024	21,000	17,900	3,900	17,000	13,100	15,500	11,600	600	2,100	1,300	800	6,200	65,200	27,000	69,100	105,300	8,500	500	2,800	66,000	55,000	33,000	543,000
2024 - 2025	21,000	17,900	3,900	18,200	13,700	15,800	11,600	600	2,100	1,300	800	6,200	62,400	27,900	69,600	100,200	8,500	500	2,800	61,000	51,000	33,000	530,000
2025 - 2026	21,000	17,900	3,900	18,400	13,700	15,800	11,600	600	2,100	1,300	1,100	6,200	59,600	27,300	70,200	98,900	8,600	500	2,900	59,000	50,000	33,000	524,000
2026 - 2027	21,000	17,900	3,900	18,700	13,700	15,800	11,600	600	2,100	1,300	1,100	6,200	56,800	26,700	70,500	98,000	8,600	500	3,000	59,000	50,000	33,000	520,000
2027 - 2028	21,000	17,900	3,900	19,000	13,700	15,800	11,600	600	2,100	1,300	1,100	6,200	53,900	26,100	70,900	97,000	8,700	500	3,100	59,000	50,000	33,000	516,000
2028 - 2029	21,000	17,900	3,900	19,300	13,700	15,800	11,600	600	2,100	1,300	1,100	6,200	51,100	25,500	71,300	96,000	8,700	500	3,100	59,000	51,000	33,000	514,000
2029 - 2030	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	71,800	86,900	8,800	500	3,200	52,000	51,000	33,000	495,000
2030 - 2031	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,100	86,900	8,800	600	3,300	50,000	50,000	33,000	492,000
2031 - 2032	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,100	86,400	8,900	600	3,400	49,000	51,000	33,000	492,000
2032 - 2033	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,100	85,900	8,900	600	3,500	48,000	51,000	33,000	490,000
2033 - 2034	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,100	85,400	9,000	600	3,500	47,000	51,000	33,000	489,000
2034 - 2035	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,100	74,000	9,100	600	3,600	38,000	50,000	33,000	468,000
2035 - 2036	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,400	73,700	9,100	600	3,700	35,000	50,000	33,000	465,000
2036 - 2037	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,400	73,700	9,200	700	3,800	34,000	50,000	32,000	463,000
2037 - 2038	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,400	73,700	9,300	700	3,900	33,000	51,000	32,000	463,000
2038 - 2039	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,400	73,700	9,300	700	4,000	32,000	53,000	32,000	465,000
2039 - 2040	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,400	64,300	9,400	700	4,100	23,000	51,000	32,000	444,000
2040 - 2041	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	21,000	51,000	32,000	442,000
2041 - 2042	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	20,000	52,000	32,000	442,000
2042 - 2043	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	19,000	52,000	32,000	441,000
2043 - 2044	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	19,000	52,000	32,000	441,000
2044 - 2045	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	18,000	52,000	32,000	440,000
2045 - 2046	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	17,000	53,000	32,000	440,000
2046 - 2047	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	17,000	53,000	32,000	440,000
2047 - 2048	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	16,000	53,000	32,000	439,000
2048 - 2049	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	16,000	53,000	32,000	439,000
2049 - 2050	21,000	17,900	3,900	19,400	13,600	15,500	11,600	600	2,100	1,300	1,100	6,200	48,300	24,900	72,600	64,100	9,400	700	4,100	16,000	53,000	32,000	439,000
2050 - 2051	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	16,000	52,000	31,000	423,000
2051 - 2052	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	16,000	52,000	32,000	424,000
2052 - 2053	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	16,000	53,000	31,000	424,000
2053 - 2054	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	15,000	53,000	31,000	423,000
2054 - 2055	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	15,000	53,000	31,000	423,000
2055 - 2056	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	15,000	53,000	32,000	424,000
2056 - 2057	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	14,000	53,000	31,000	422,000
2057 - 2058	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	14,000	53,000	31,000	422,000
2058 - 2059	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	14,000	53,000	31,000	422,000
2059 - 2060	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	14,000	54,000	31,000	423,000
2060 - 2061	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	13,000	54,000	31,000	422,000
2061 - 2062	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	13,000	54,000	31,000	422,000
2062 - 2063	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	13,000	54,000	31,000	422,000
2063 - 2064	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	13,000	54,000	31,000	422,000
2064 - 2065	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	12,000	54,000	31,000	421,000
2065 - 2066	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	12,000	54,000	31,000	421,000
2066 - 2067	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	12,000	54,000	31,000	421,000
2067 - 2068	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	12,000	55,000	31,000	422,000
2068 - 2069	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	11,000	55,000	31,000	421,000
2069 - 2070	21,000	17,400	3,800	19,300	12,900	15,400	11,300	500	2,100	1,300	1,100	6,000	43,500	23,800	68,400	62,400	9,400	700	4,100	11,000	55,000	31,000	421,000
17/18-69/70 Avg	21,000	17,700	3,900	19,000	13,200	15,500	11,500	600	2,100	1,300	1,100	6,100	49,500	24,100	70,200	75,300	9,100	600	3,700	30,000	54,000	32,000	462,000

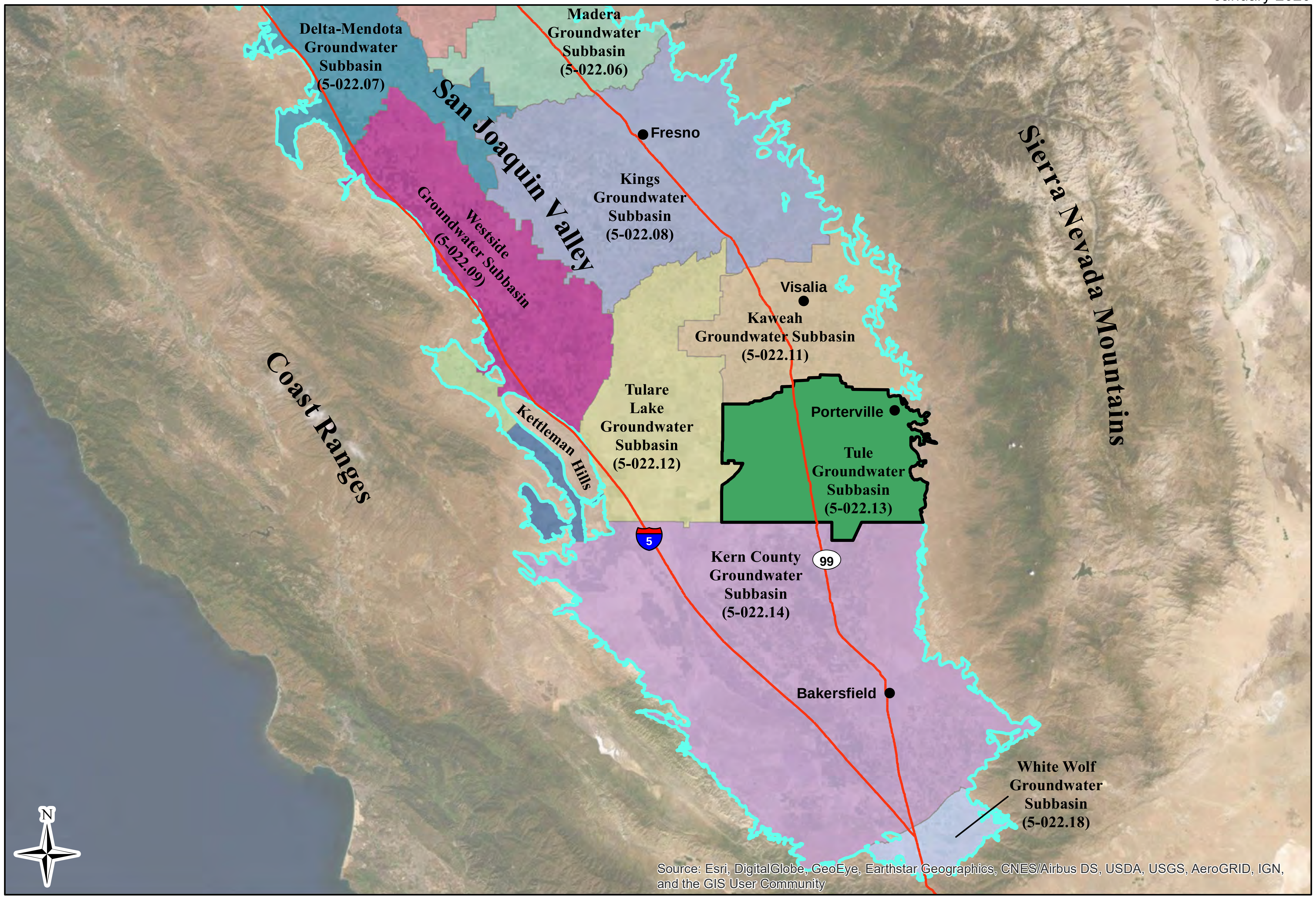
Projected Future Tule Subbasin Groundwater Budget

	Groundwater Outflows (acre-ft)						
	W	X	Y	Z	AA		
	Groundwater Pumping						
Water Year	Municipal	Irrigated Agriculture	Exports	Groundwater Banking Extraction	Sub-surface Outflow	Total Out	Change in Storage (acre-ft)
2017 - 2018	21,700	549,000	22,920	2,200	83,000	679,000	-142,000
2018 - 2019	23,400	548,000	22,920	2,200	82,000	679,000	-140,000
2019 - 2020	25,000	529,000	22,920	2,200	83,000	662,000	-122,000
2020 - 2021	25,400	526,000	22,920	2,200	83,000	660,000	-119,000
2021 - 2022	25,700	524,000	22,920	2,200	84,000	659,000	-120,000
2022 - 2023	26,100	523,000	22,920	2,200	85,000	659,000	-120,000
2023 - 2024	26,500	522,000	22,920	2,200	85,000	659,000	-116,000
2024 - 2025	26,900	494,000	22,920	2,200	86,000	632,000	-102,000
2025 - 2026	27,400	487,000	20,010	2,200	90,000	627,000	-103,000
2026 - 2027	27,800	481,000	20,010	2,200	92,000	623,000	-103,000
2027 - 2028	28,200	474,000	20,010	2,200	94,000	618,000	-102,000
2028 - 2029	28,700	468,000	20,010	2,200	96,000	615,000	-101,000
2029 - 2030	29,200	412,000	20,010	2,200	94,000	557,000	-62,000
2030 - 2031	29,600	413,000	17,100	2,200	95,000	557,000	-65,000
2031 - 2032	30,100	410,000	17,100	2,200	94,000	553,000	-61,000
2032 - 2033	30,600	407,000	17,100	2,200	93,000	550,000	-60,000
2033 - 2034	31,100	405,000	17,100	2,200	92,000	547,000	-58,000
2034 - 2035	31,700	345,000	17,100	2,200	93,000	489,000	-21,000
2035 - 2036	32,200	344,000	14,190	2,200	93,000	486,000	-21,000
2036 - 2037	32,800	344,000	14,190	2,200	91,000	484,000	-21,000
2037 - 2038	33,300	344,000	14,190	2,200	89,000	483,000	-20,000
2038 - 2039	33,900	344,000	14,190	2,200	88,000	482,000	-17,000
2039 - 2040	34,500	303,000	11,280	2,200	90,000	441,000	3,000
2040 - 2041	34,500	302,000	11,280	2,200	90,000	440,000	2,000
2041 - 2042	34,500	302,000	11,280	2,200	90,000	440,000	2,000
2042 - 2043	34,500	302,000	11,280	2,200	90,000	440,000	1,000
2043 - 2044	34,500	302,000	11,280	2,200	90,000	440,000	1,000
2044 - 2045	34,500	302,000	11,280	2,200	90,000	440,000	0
2045 - 2046	34,500	302,000	11,280	2,200	89,000	439,000	1,000
2046 - 2047	34,500	302,000	11,280	2,200	89,000	439,000	1,000
2047 - 2048	34,500	302,000	11,280	2,200	89,000	439,000	0
2048 - 2049	34,500	302,000	11,280	2,200	89,000	439,000	0
2049 - 2050	34,500	302,000	11,280	2,200	88,000	438,000	1,000
2050 - 2051	34,500	297,000	11,280	2,200	88,000	433,000	-10,000
2051 - 2052	34,500	297,000	11,280	2,200	88,000	433,000	-9,000
2052 - 2053	34,500	297,000	11,280	2,200	87,000	432,000	-8,000
2053 - 2054	34,500	297,000	11,280	2,200	87,000	432,000	-9,000
2054 - 2055	34,500	297,000	11,280	2,200	87,000	432,000	-9,000
2055 - 2056	34,500	297,000	11,280	2,200	87,000	432,000	-8,000
2056 - 2057	34,500	297,000	11,280	2,200	86,000	431,000	-9,000
2057 - 2058	34,500	297,000	11,280	2,200	86,000	431,000	-9,000
2058 - 2059	34,500	297,000	11,280	2,200	86,000	431,000	-9,000
2059 - 2060	34,500	297,000	11,280	2,200	86,000	431,000	-8,000
2060 - 2061	34,500	297,000	11,280	2,200	85,000	430,000	-8,000
2061 - 2062	34,500	297,000	11,280	2,200	85,000	430,000	-8,000
2062 - 2063	34,500	297,000	11,280	2,200	85,000	430,000	-8,000
2063 - 2064	34,500	297,000	11,280	2,200	85,000	430,000	-8,000
2064 - 2065	34,500	297,000	11,280	2,200	85,000	430,000	-9,000
2065 - 2066	34,500	297,000	11,280	2,200	84,000	429,000	-8,000
2066 - 2067	34,500	297,000	11,280	2,200	84,000	429,000	-8,000
2067 - 2068	34,500	297,000	11,280	2,200	84,000	429,000	-7,000
2068 - 2069	34,500	297,000	11,280	2,200	84,000	429,000	-8,000
2069 - 2070	34,500	297,000	11,280	2,200	84,000	429,000	-8,000
17/18-69/70 Avg	32,000	361,000	14,600	2,200	88,000	498,000	-36,000

Figures

Tule Subbasin

January 2020



0 5 10 20 Miles

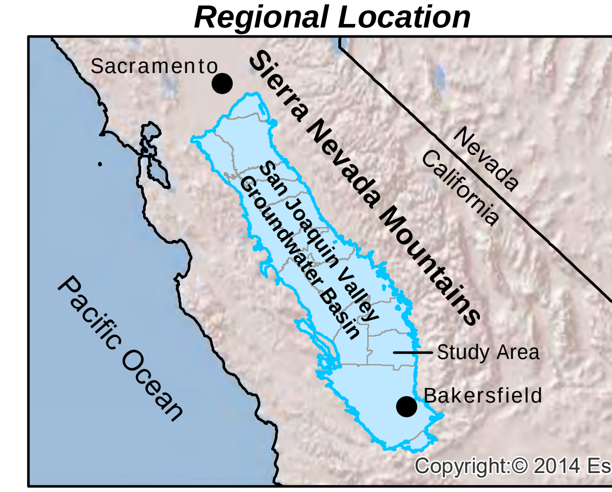
NAD 83 State Plane Zone 4

Map Features

- San Joaquin Groundwater Basin
- Major City
- Freeway/State Highway

Note: Groundwater basins from Bulletin 118, California Department of Water Resources Rev. 2016

Regional Location



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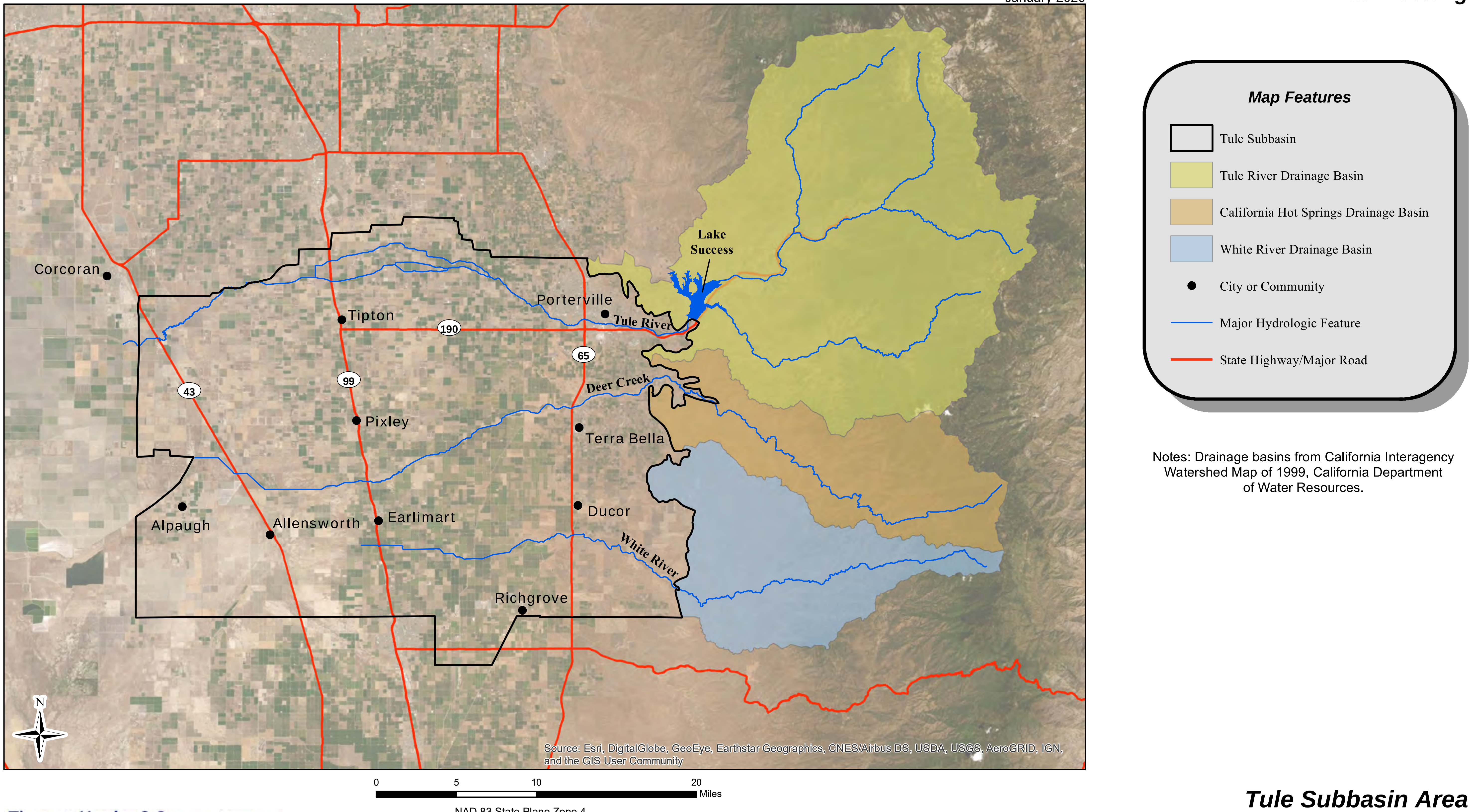
Regional Map

Figure 2-1

Tule Subbasin

January 2020



Notes: Drainage basins from California Interagency Watershed Map of 1999, California Department of Water Resources.

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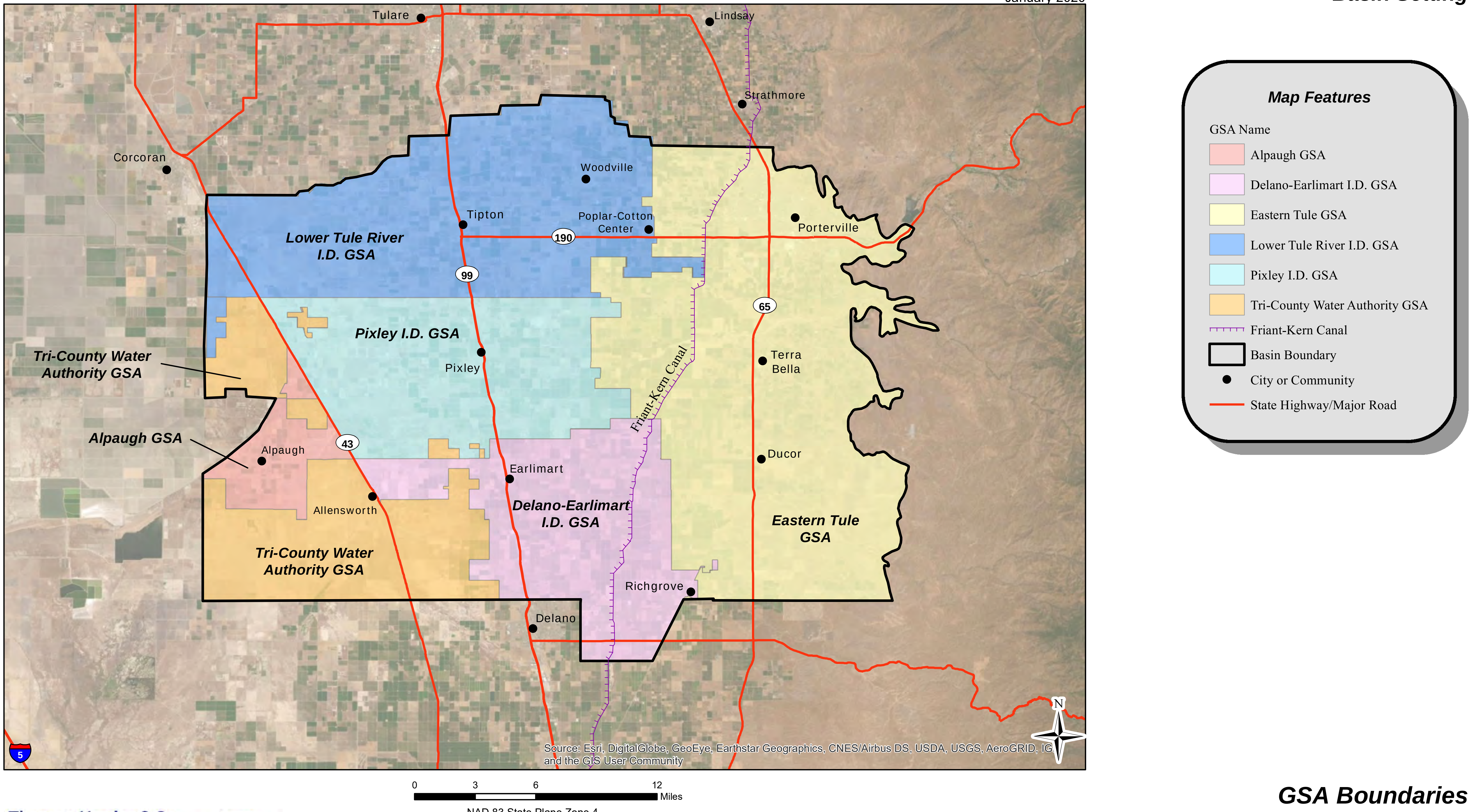
Tule Subbasin Area

Figure 2-2

Tule Subbasin

January 2020



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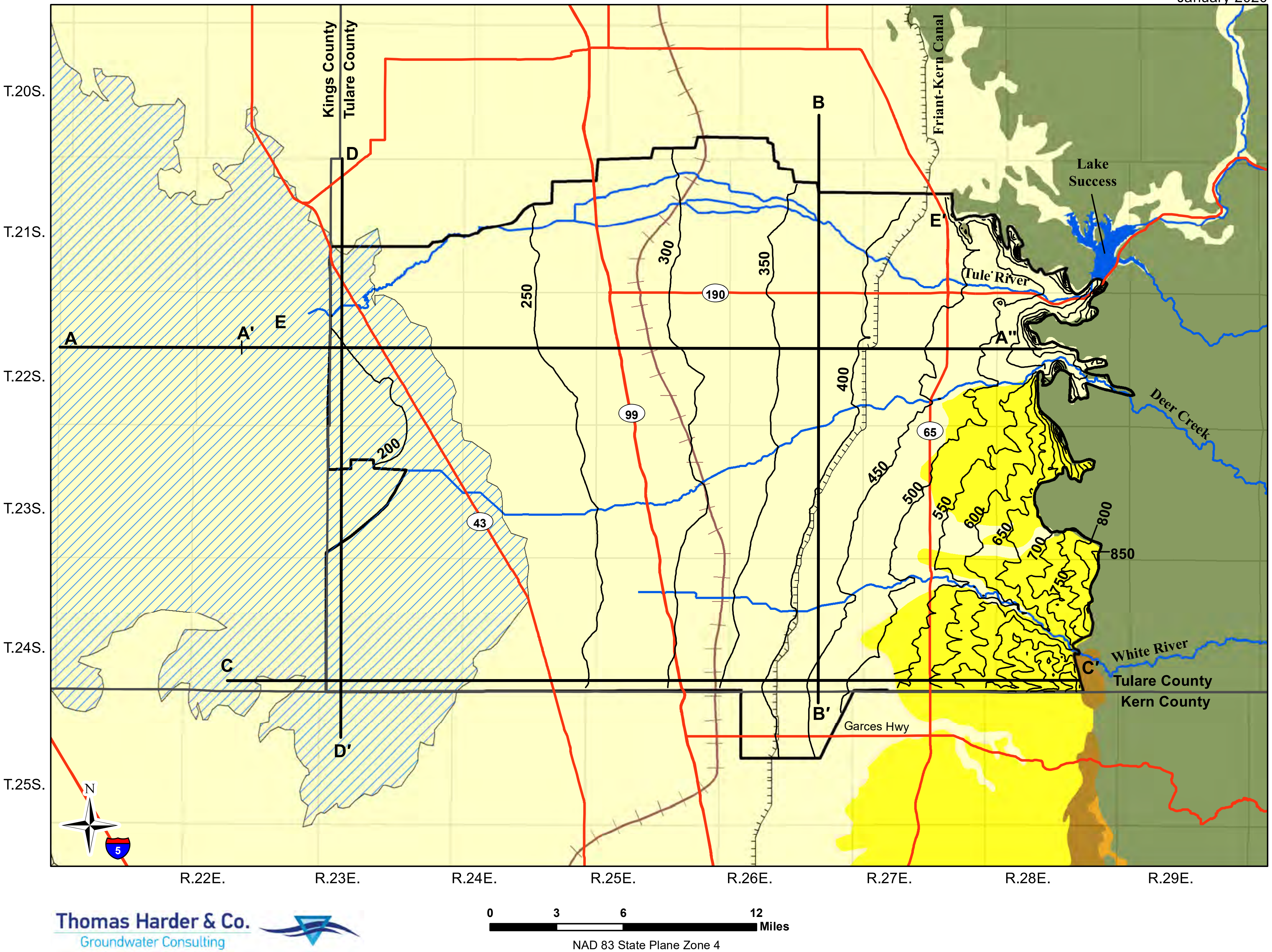
GSA Boundaries

Figure 2-3

Tule Subbasin

January 2020



Map Features

- Land Surface Elevation Contour (ft amsl)
- Cross Sections
- County Boundary
- Surficial Deposits
- Tertiary Loosely Consolidated Deposits
- Non-Marine Sedimentary Rocks
- Marine Sedimentary Rocks
- Crystalline Basement
- Approximate Eastern Extent of the Corcoran Clay
- Tulare Lake Surface Deposits
- Friant-Kern Canal
- Basin Boundary
- Major Hydrologic Feature
- State Highway/Major Road

Corcoran Clay from USGS Professional Paper 1766, http://water.usgs.gov/GIS/dsdl/pp1766_CorcoranClay.zip

Geologic units modified from USGS Open-File Report 2005-1305

Lake Deposits from California Geological Survey Geologic Atlas of California Map No. 002 1:250,000 scale, Compiled by A.R. Smith, 1964 and Geologic Atlas of California Map No. 005, 1:250,000 scale, Compiled by: R.A. Matthews and J.L. Burnett

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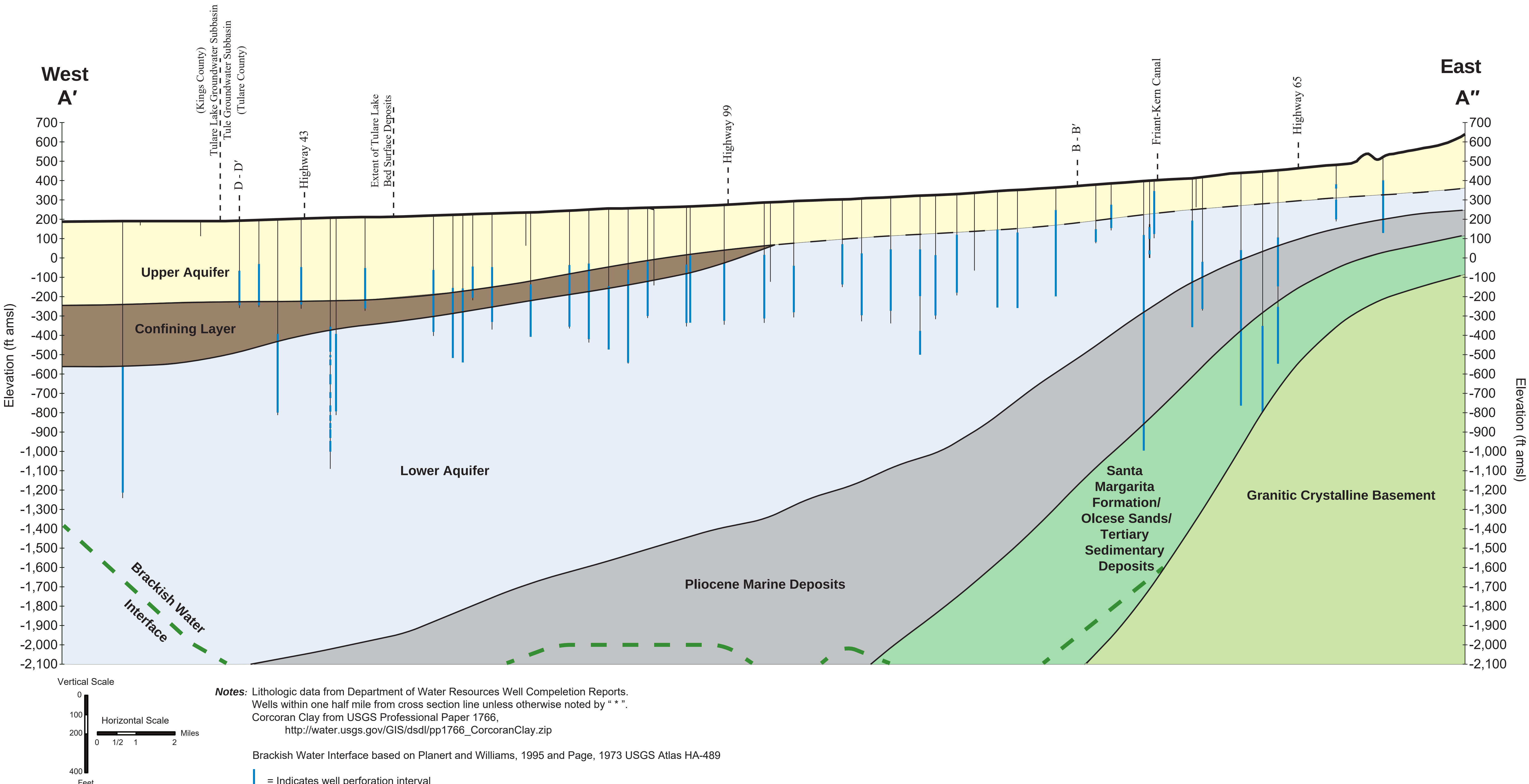
Geology and Cross Section Locations

Figure 2-4



Notes: Lithologic data from Department of Water Resources Well Compeletion Reports.
Wells within one half mile from cross section line unless otherwise noted by " * ".
Corcoran Clay from USGS Professional Paper 1766,
http://water.usgs.gov/GIS/dsdl/pp1766_CorcoranClay.zip

Brackish Water Interface based on Planert and Williams, 1995 and Page, 1973 USGS Atlas HA-489

| = Indicates well perforation interval

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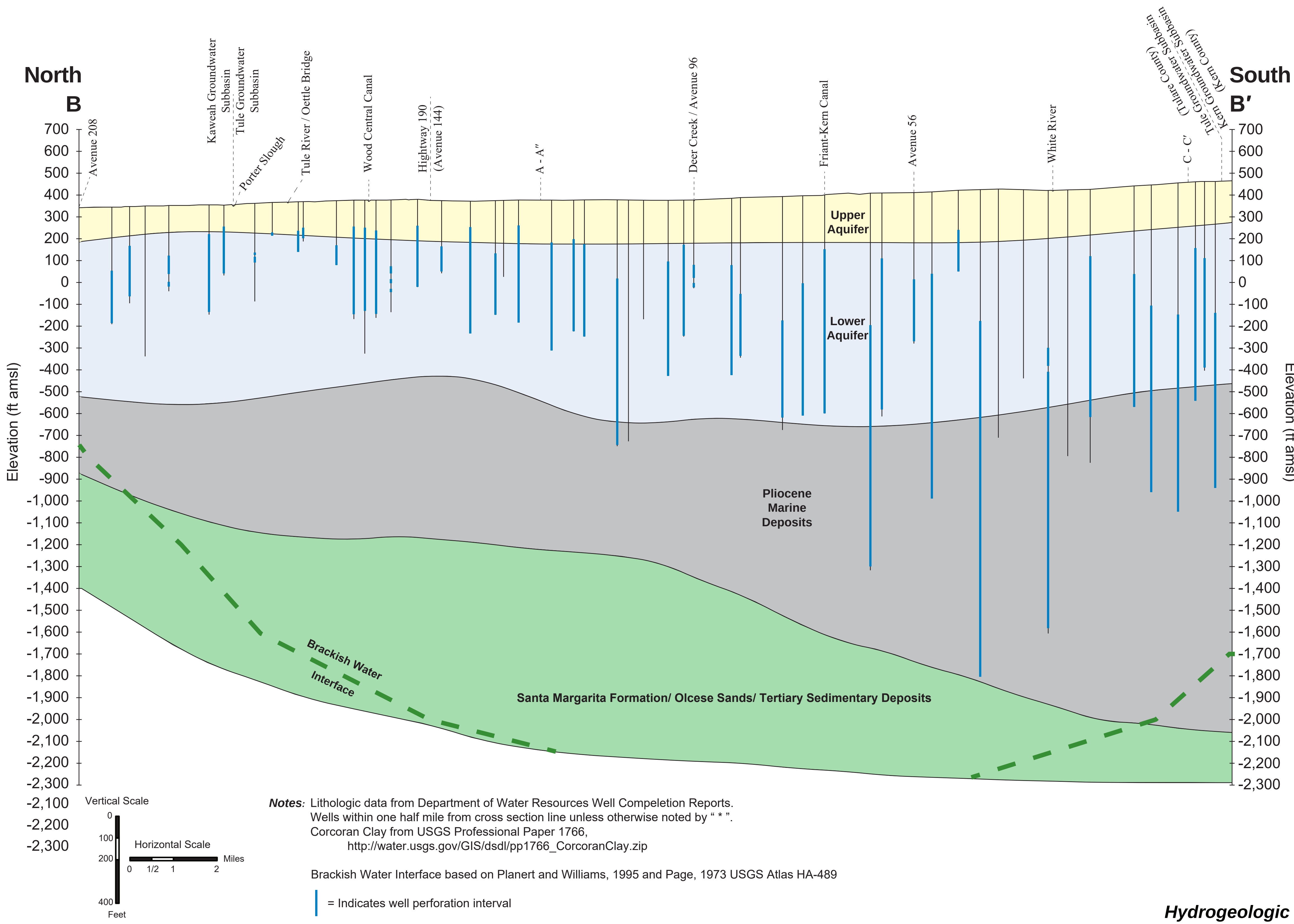
Hydrogeologic Cross Section A'-A"
Tule Groundwater Subbasin
Figure 2-5
January 2020



Notes: Lithologic data from Department of Water Resources Well Compeletion Reports.
Wells within one half mile from cross section line unless otherwise noted by " * ".
Corcoran Clay from USGS Professional Paper 1766,
http://water.usgs.gov/GIS/dsdl/pp1766_CorcoranClay.zip

Brackish Water Interface based on Planert and Williams, 1995 and Page, 1973 USGS Atlas HA-489

| = Indicates well perforation interval

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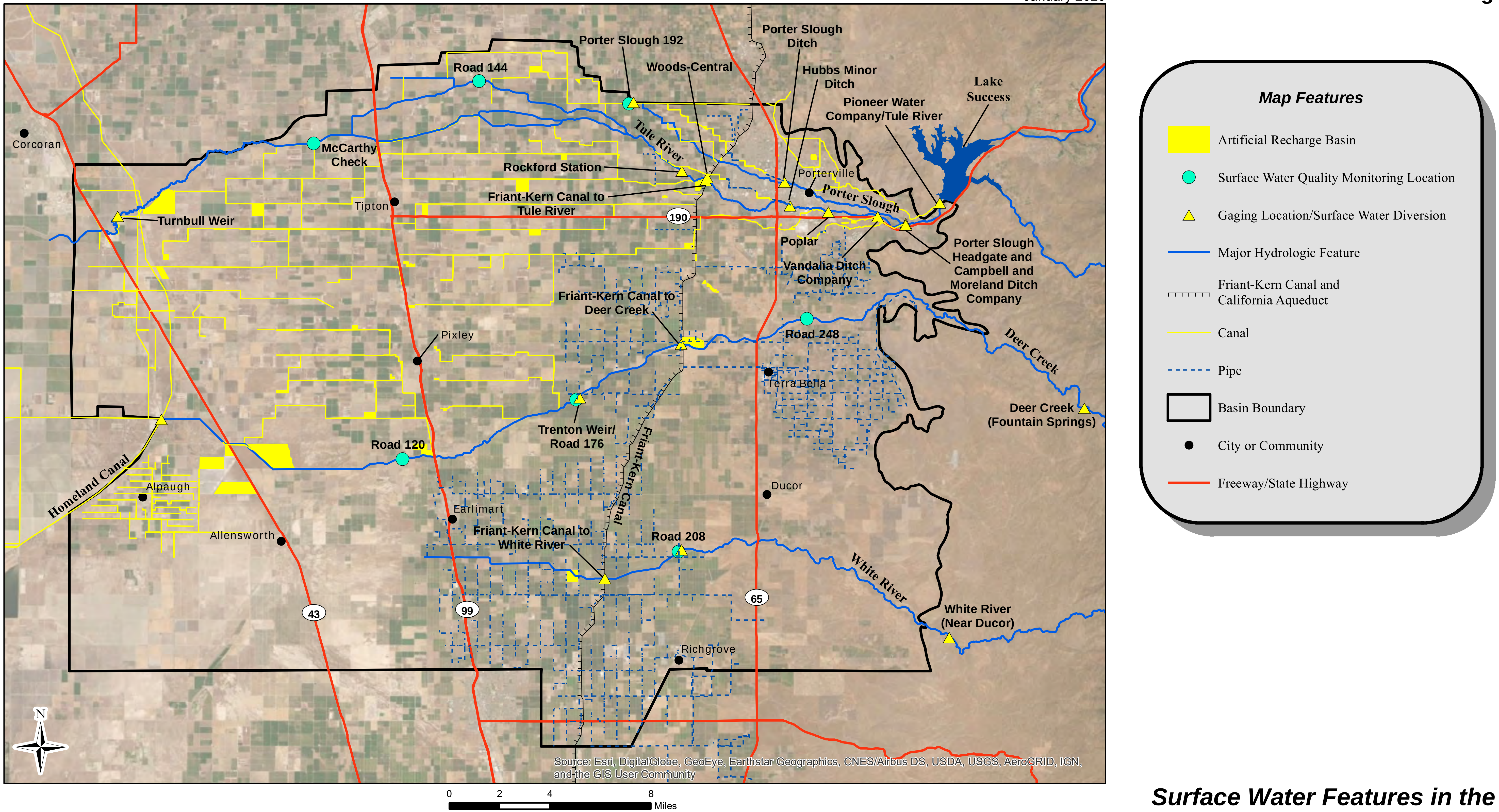
Hydrogeologic Cross Section B-B′
Tule Groundwater Subbasin
Figure 2-6
January 2020

Tule Subbasin

January 2020



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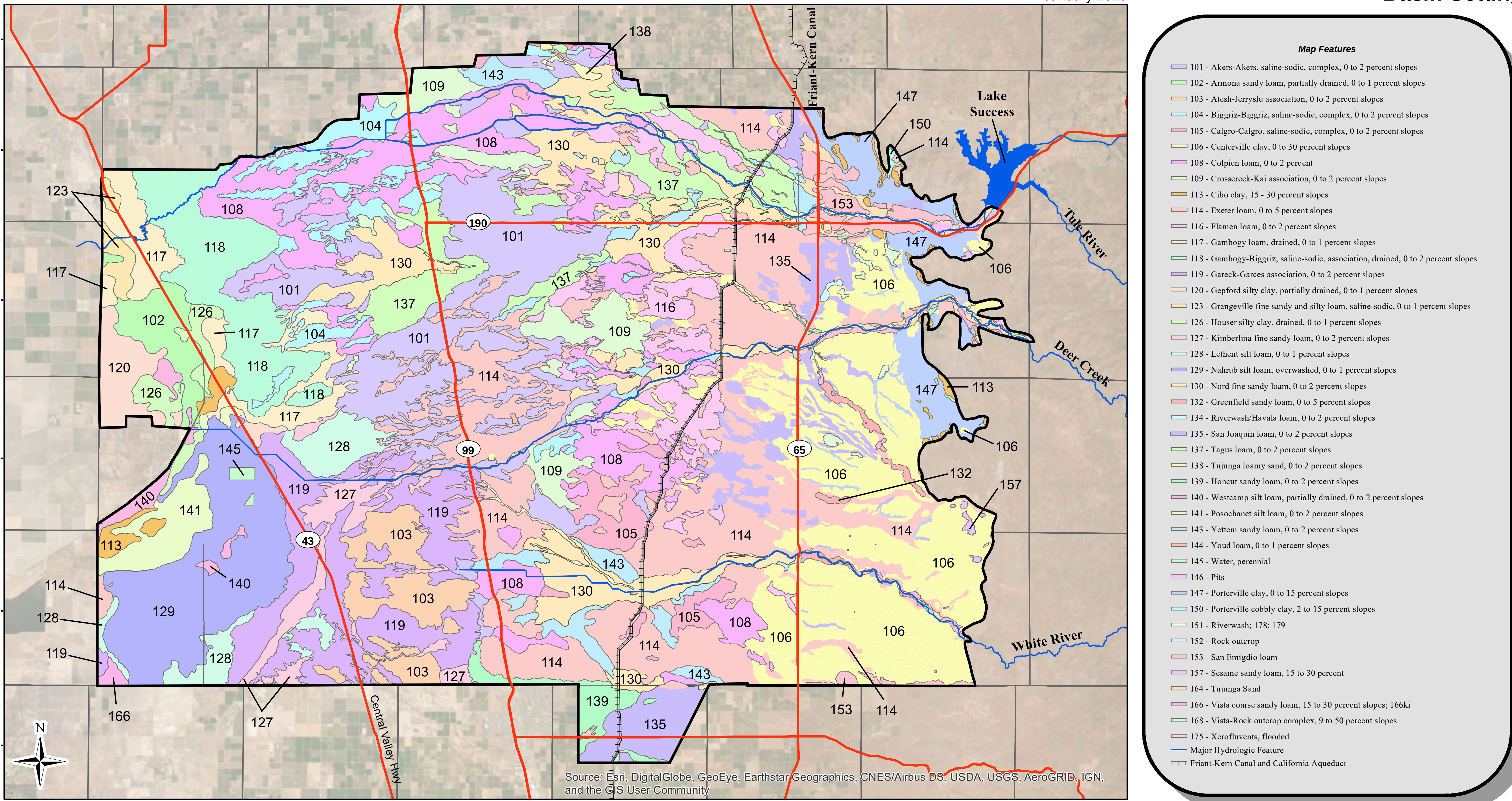
Surface Water Features in the Tule Subbasin and Vicinity

Figure 2-7

Tule Subbasin

January 2020



0 3 6 12 Miles

NAD 83 State Plane Zone 4

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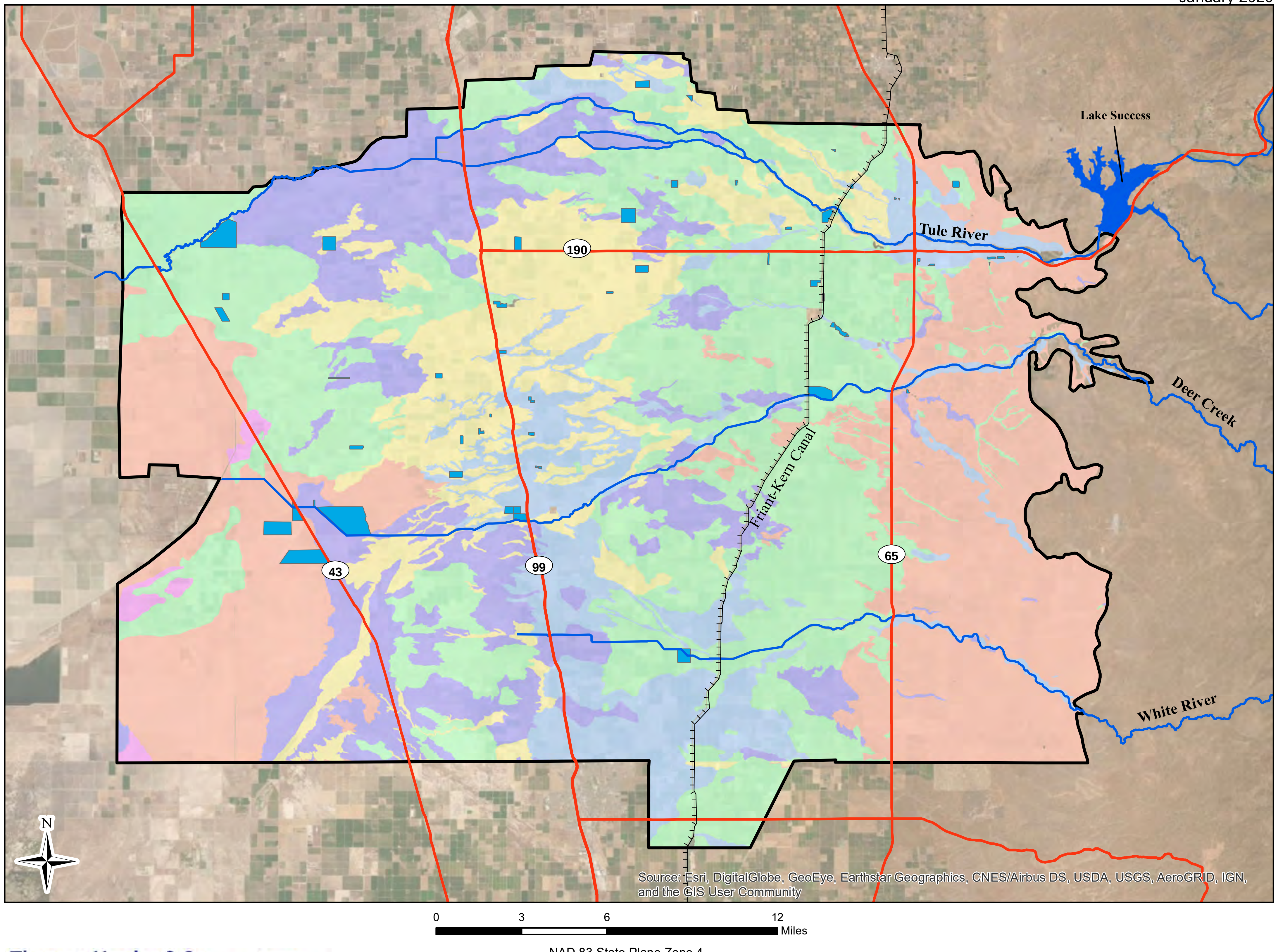
Source: USDA National Resources Conservation Service Soils - Web Soil Survey.
Associated reports inclued: USDA; Soil Survey of Tulare County, California, Western Part.
USDA; Soil Survey of Tulare County, California, Central Part.
and USDA; Soil Survey of Kern County, Northeastern Part, and Southeastern Part of Tulare County, California.

Soil Map
Figure 2-8

Tule Subbasin

January 2020



Map Features

SAGBI Index

- Excellent
- Good
- Moderately Good
- Moderately Poor
- Poor
- Very Poor
- Basin Boundary
- Artificial Recharge Basin
- Friant-Kern Canal
- Major Hydrologic Feature
- State Highway/Major Road

The Soil Agricultural Groundwater Banking Index (SAGBI) is a suitability index for groundwater recharge on agricultural land. It is based on five factors: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition.

Source: SAGBI | Soil Agricultural Groundwater Banking Index interactive map. https://casoilresource.lawr.ucdavis.edu/sagbi/

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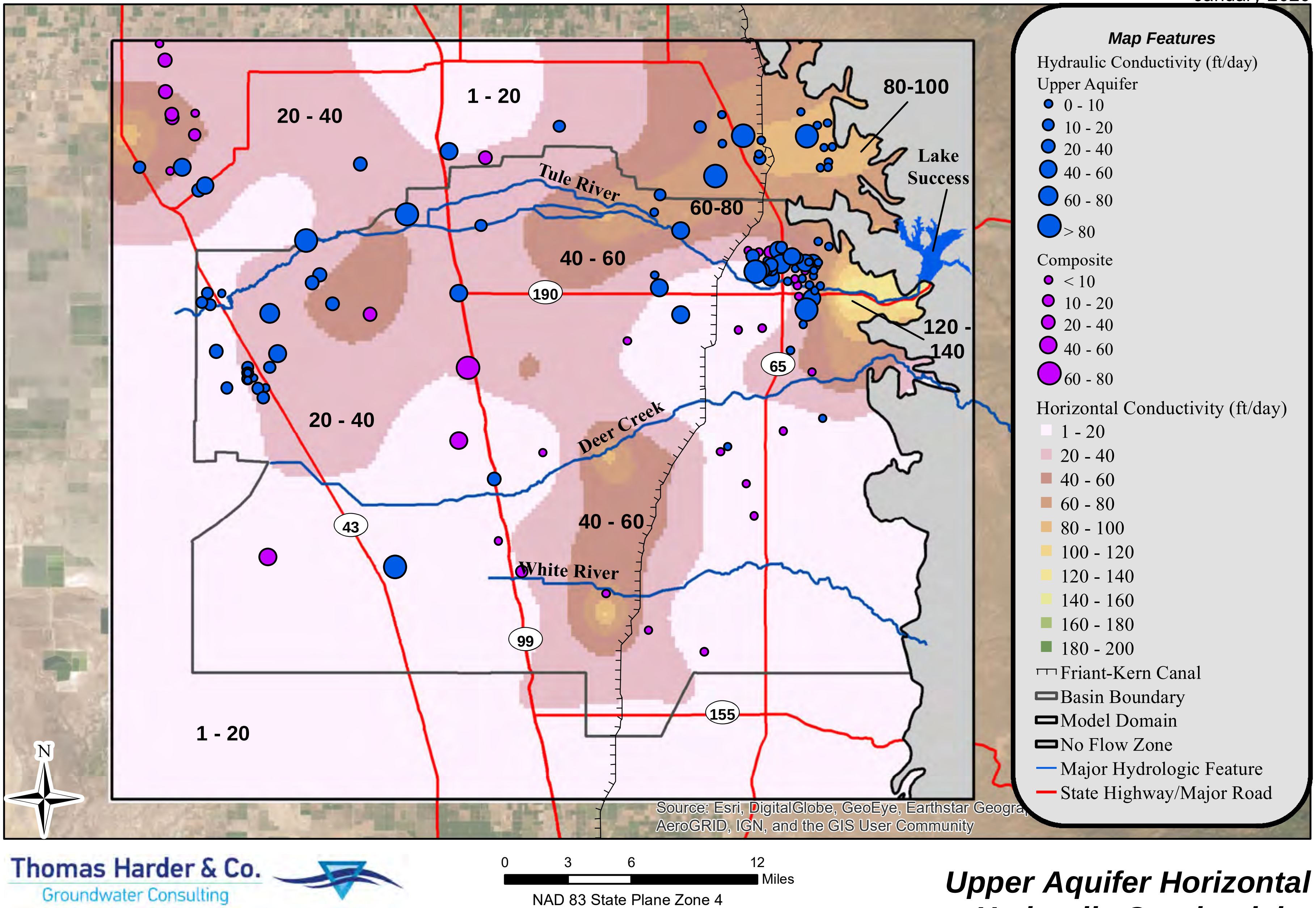
Recharge Basins and Favorable Areas for Recharge

Figure 2-9

Tule Subbasin



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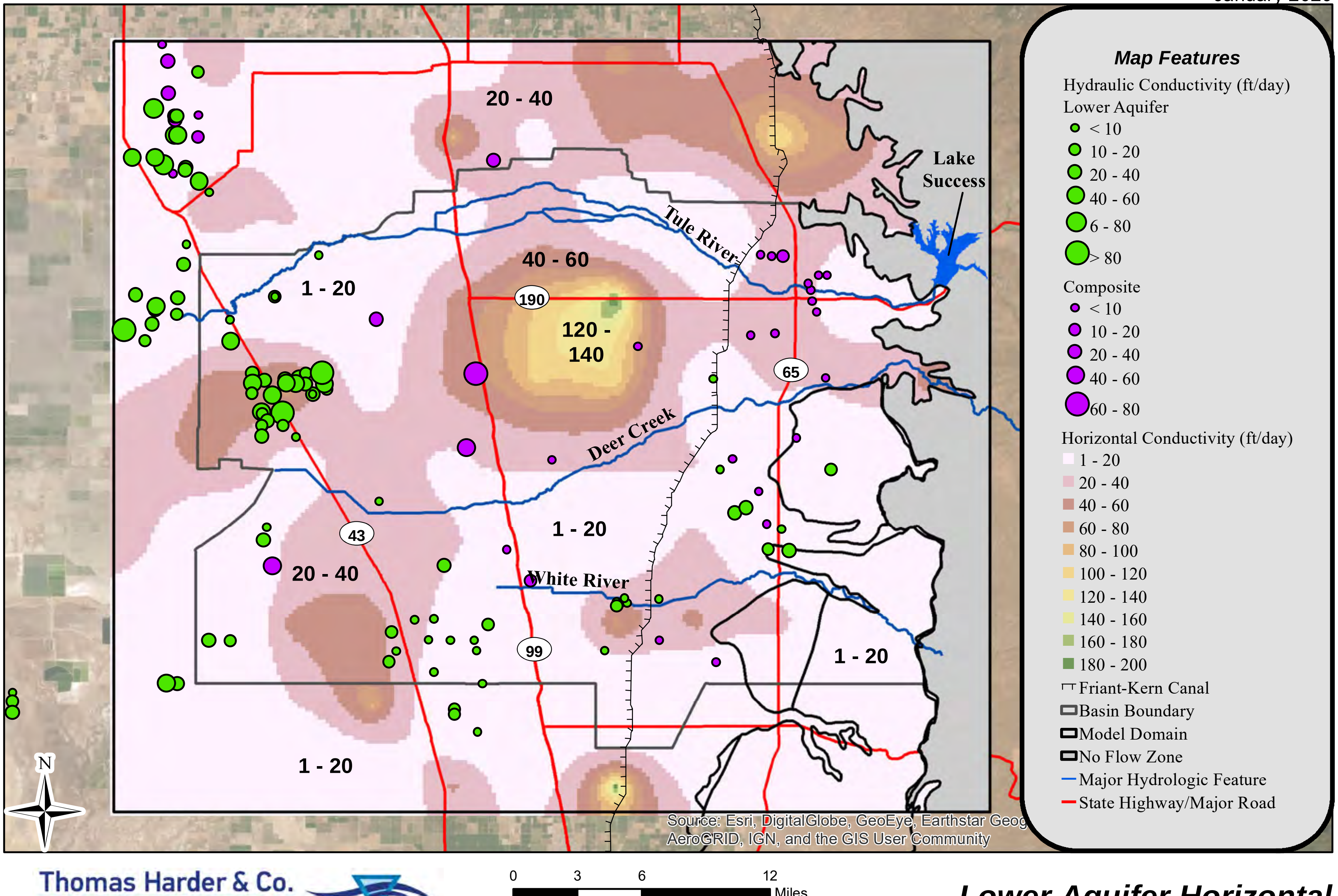
Upper Aquifer Horizontal Hydraulic Conductivity

Figure 2-10

Tule Subbasin



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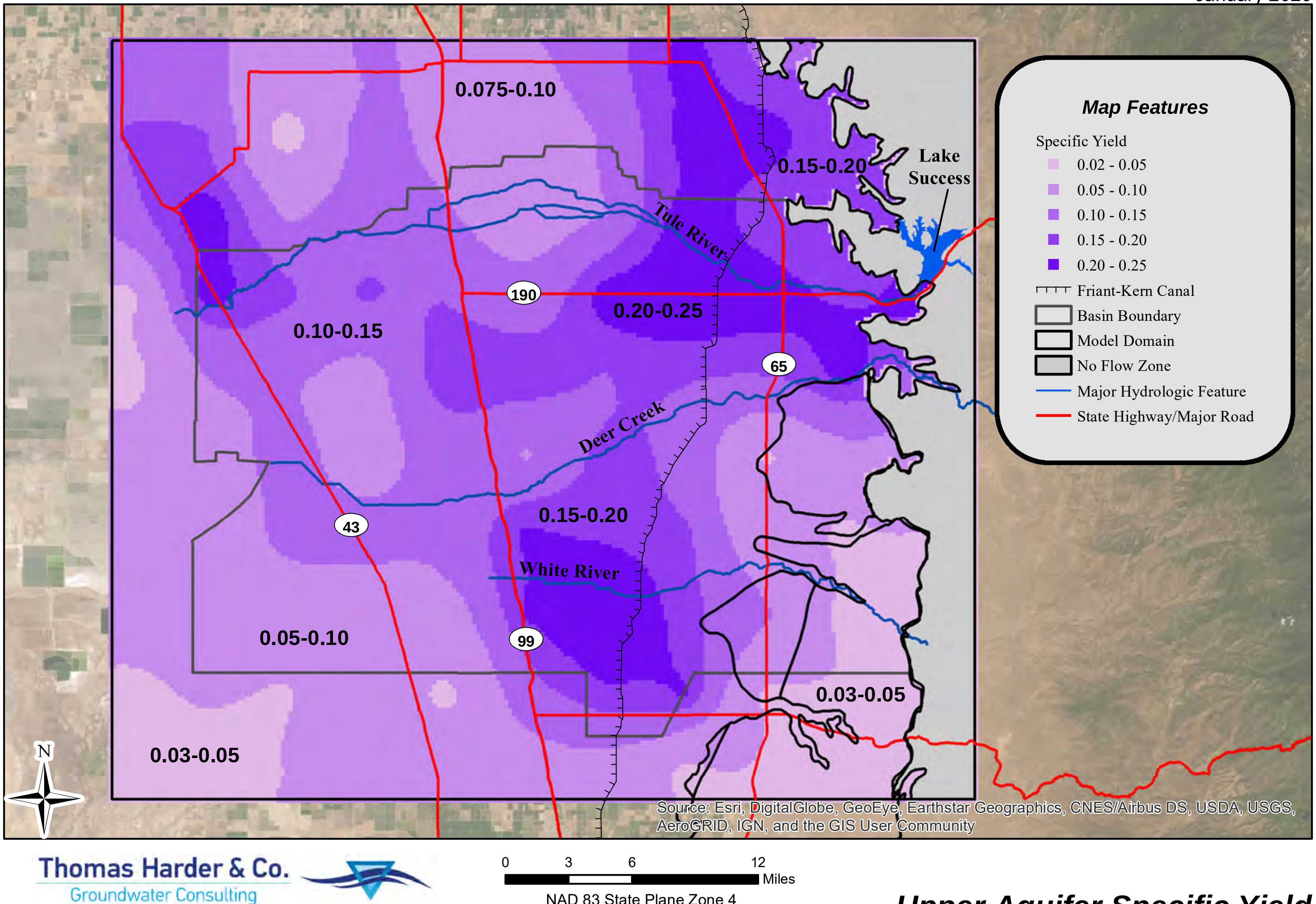
Lower Aquifer Horizontal Hydraulic Conductivity

Figure 2-11



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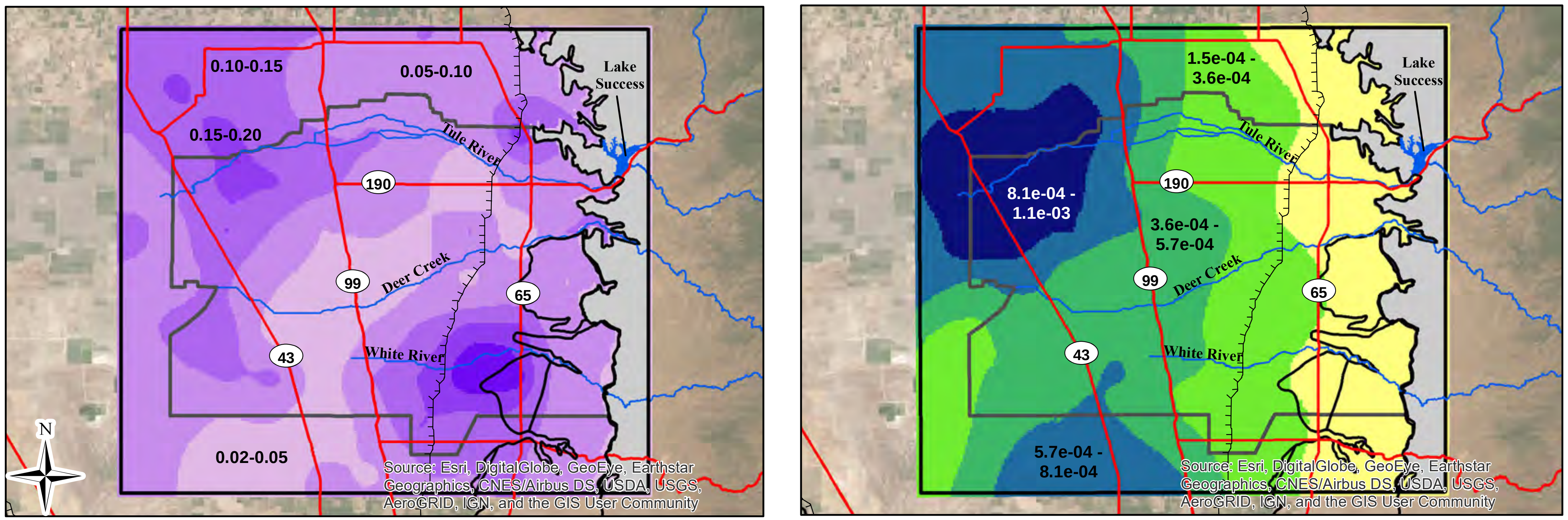
Upper Aquifer Specific Yield

Figure 2-12

Specific Yield **Storativity**



Note: Specific Yield values apply to areas of the subbasin where groundwater levels are below the top of the aquifer (primarily the east side of the subbasin).Storativity values apply to areas of the subbasin where groundwater levels are confined beneath the Corcoran clay or other confining beds.

Map Features

Specific Yield (Under Unconfined Conditions)

- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.25

Storativity (Under Confined Conditions)

- 8.0e-06 - 1.5e-04
- 1.5e-04 - 3.6e-04
- 3.6e-04 - 5.7e-04
- 5.7e-04 - 8.1e-04
- 8.1e-04 - 1.1e-03
- Friant-Kern Canal
- Basin Boundary
- Model Domain
- No Flow Zone
- State Highway/Major Road
- Major Hydrologic Feature

0 5 10 20 Miles

NAD 83 State Plane Zone 4

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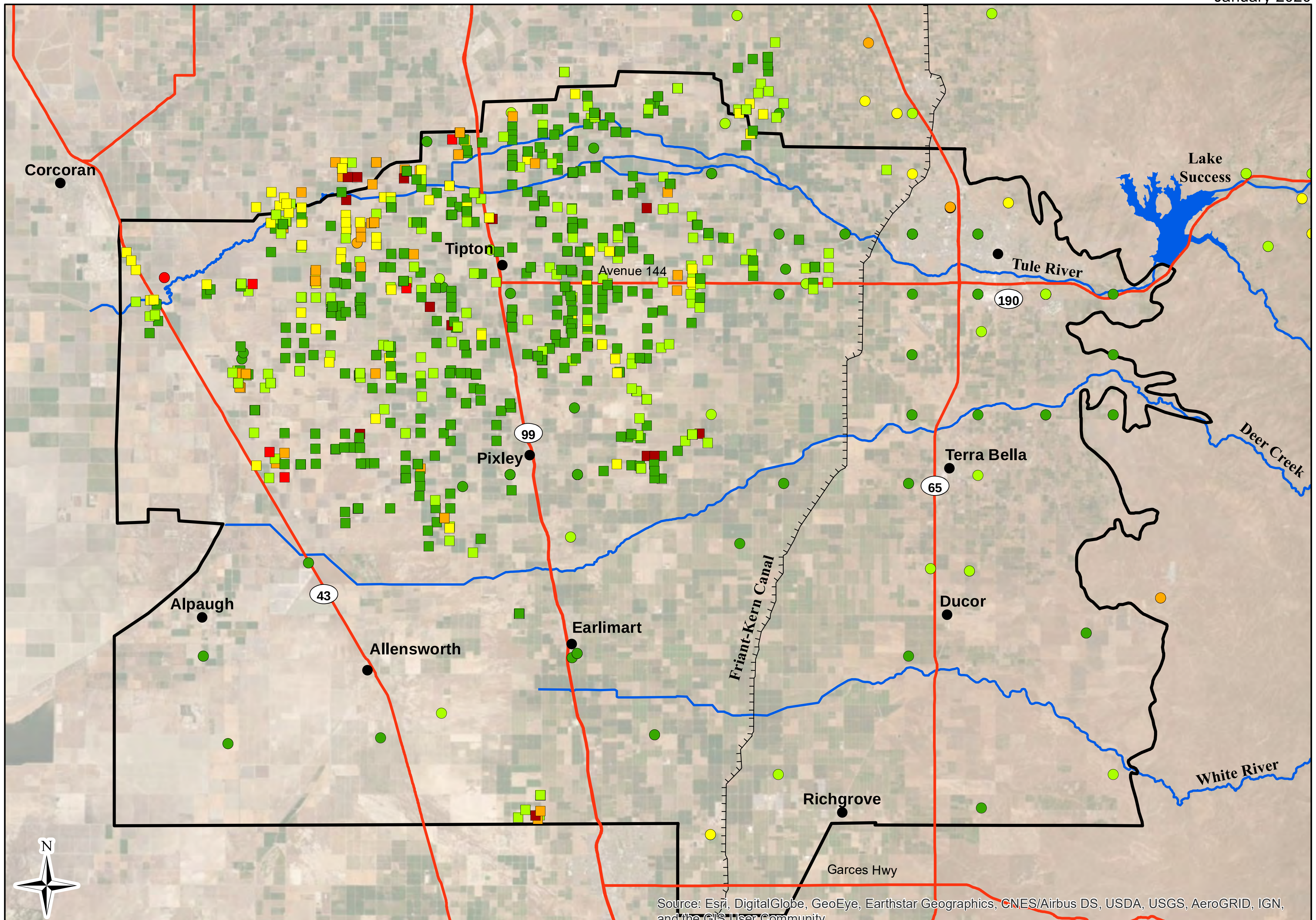
Lower Aquifer Storage Properties

Figure 2-13

Tule Subbasin

January 2020



Map Features

Dairy Well Electrical Conductivity (umhos/cm)

- 32 - 500
- 501 - 750
- 751 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 9700

Well Electrical Conductivity (umhos/cm)

- 180 - 500
- 501 - 750
- 751 - 1000
- 1001 - 1500
- 1501 - 2000
- City or Community
- Friant-Kern Canal
- Basin Boundary
- Major Hydrologic Feature
- State Highway/Major Road

Well Electrical Conductivity data from:
Tule Basin Water Quality Coalition, 2017

0 2.5 5 10 Miles
NAD 83 State Plane Zone 4

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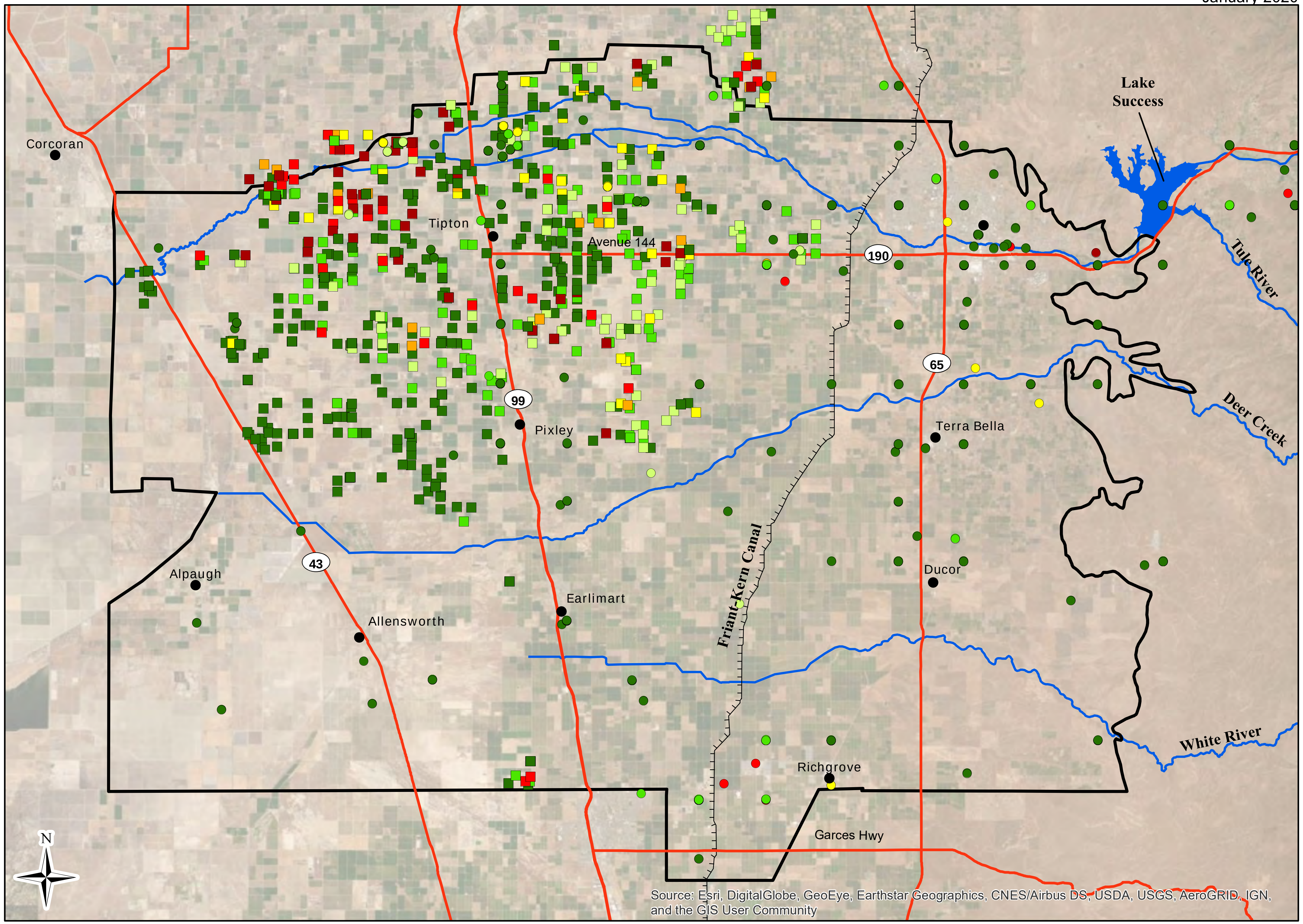
Electrical Conductivity 2010 - 2016

Figure 2-14

Tule Subbasin

January 2020



Map Features

Well Nitrate (mg/L)
- 6 - 15
- 16 - 30
- 31 - 45
- 46 - 60
- 61 - 75
- 76 - 100
- 101 - 190

Dairy Well Nitrate (mg/L)
- 0 - 15
- 16 - 30
- 31 - 45
- 46 - 60
- 61 - 75
- 76 - 100
- 101 - 325

- City or Community
- Friant-Kern Canal
- Basin Boundary
- Major Hydrologic Feature
- State Highway/Major Road

Well Nitrate data from:
Tule Basin Water Quality Coalition, 2017

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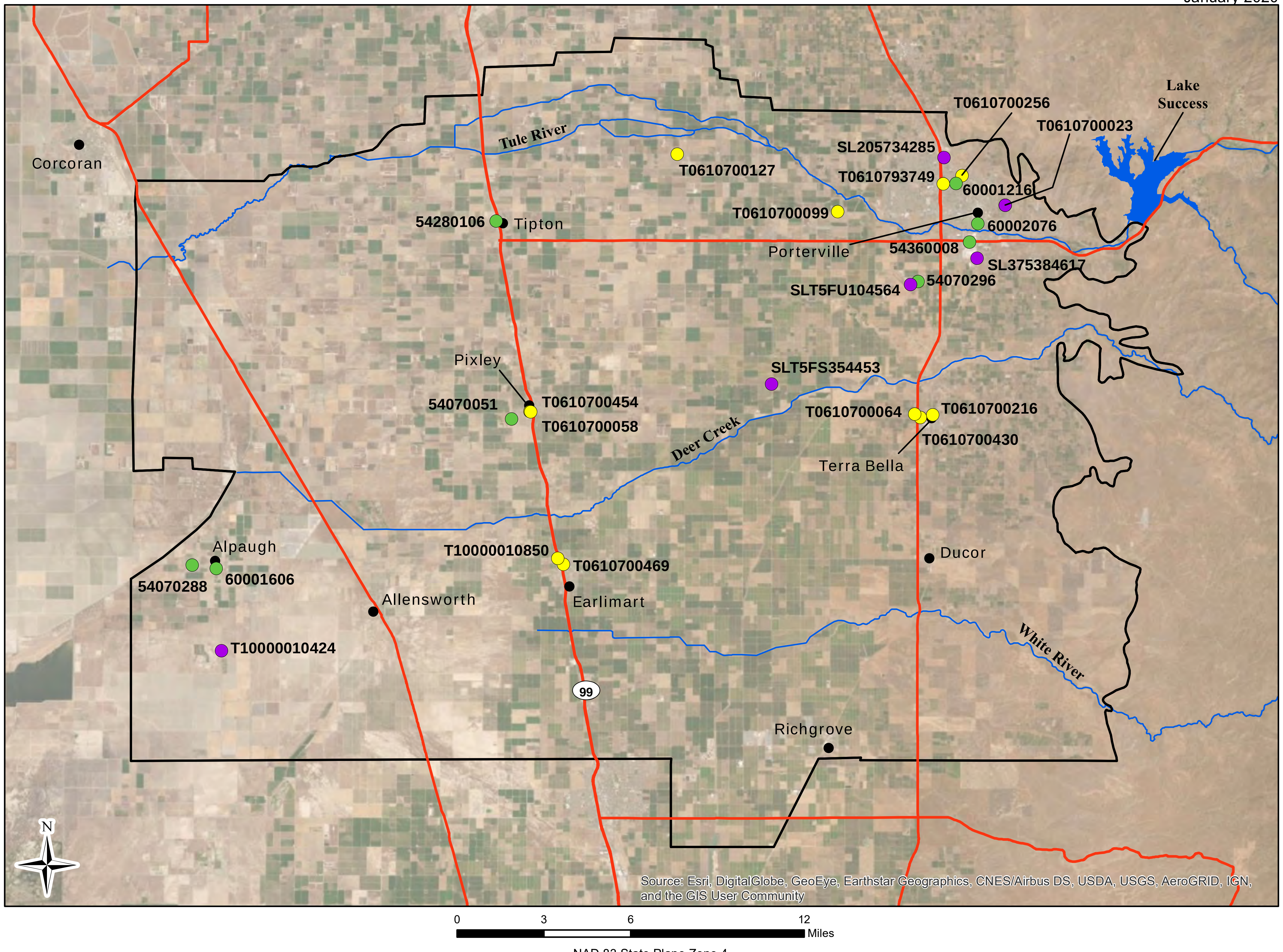
0 2.5 5 10 Miles
NAD 83 State Plane Zone 4

Nitrate (NO3) Concentration 2010 - 2016

Figure 2-15

Tule Subbasin

January 2020



Map Features

Active Cleanup Site

- Cleanup Program Site
- DTSC
- LUST Cleanup Site
- Freeway/State Highway
- Tule Subbasin
- City or Community
- Major Hydrologic Feature

Source: https://geotracker.waterboards.ca.gov

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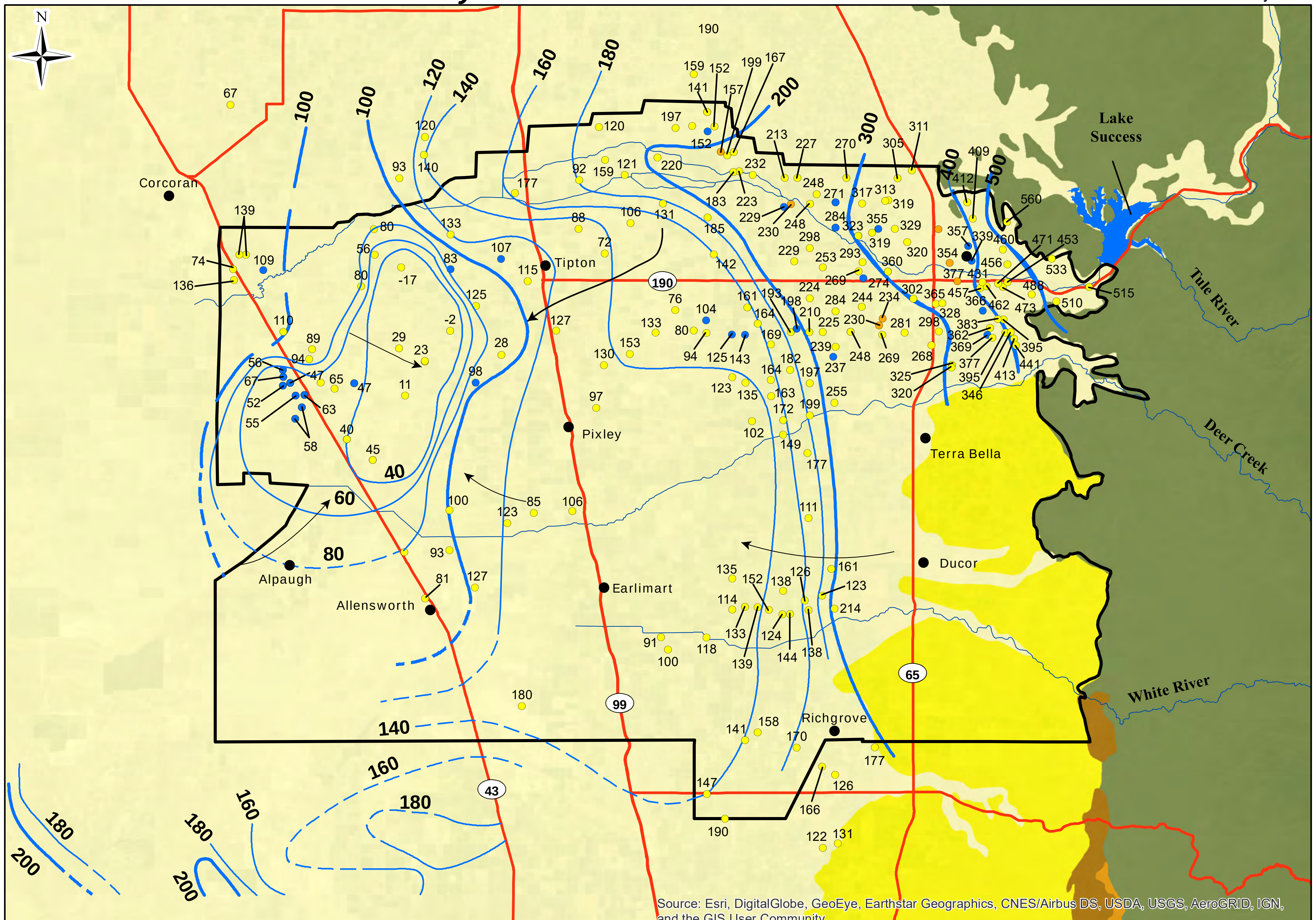
Active Cleanup Sites within the Tule Subbasin

Figure 2-16

Tule Subbasin Technical Advisory Committee

January 2020



0 3 6 12 Miles

NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Groundwater Elevations are measured from January to May.

Map Features

- 140 Groundwater Elevation Contour, dashed where approximate (ft amsl)
- Groundwater Flow Direction
- Groundwater Elevations from Well with Unknown Perforation Interval
- Groundwater Elevations from Well with Perforations in the Upper and Lower Aquifer
- Groundwater Elevations from Well with Perforations in the Upper Aquifer
- Tule Subbasin
- City or Community
- Major Hydrologic Feature
- State Highway/Major Road
- Surficial Deposits
- Tertiary Loosely Consolidated Deposits
- Non-Marine Sedimentary Rocks
- Marine Sedimentary Rocks
- Crystalline Basement

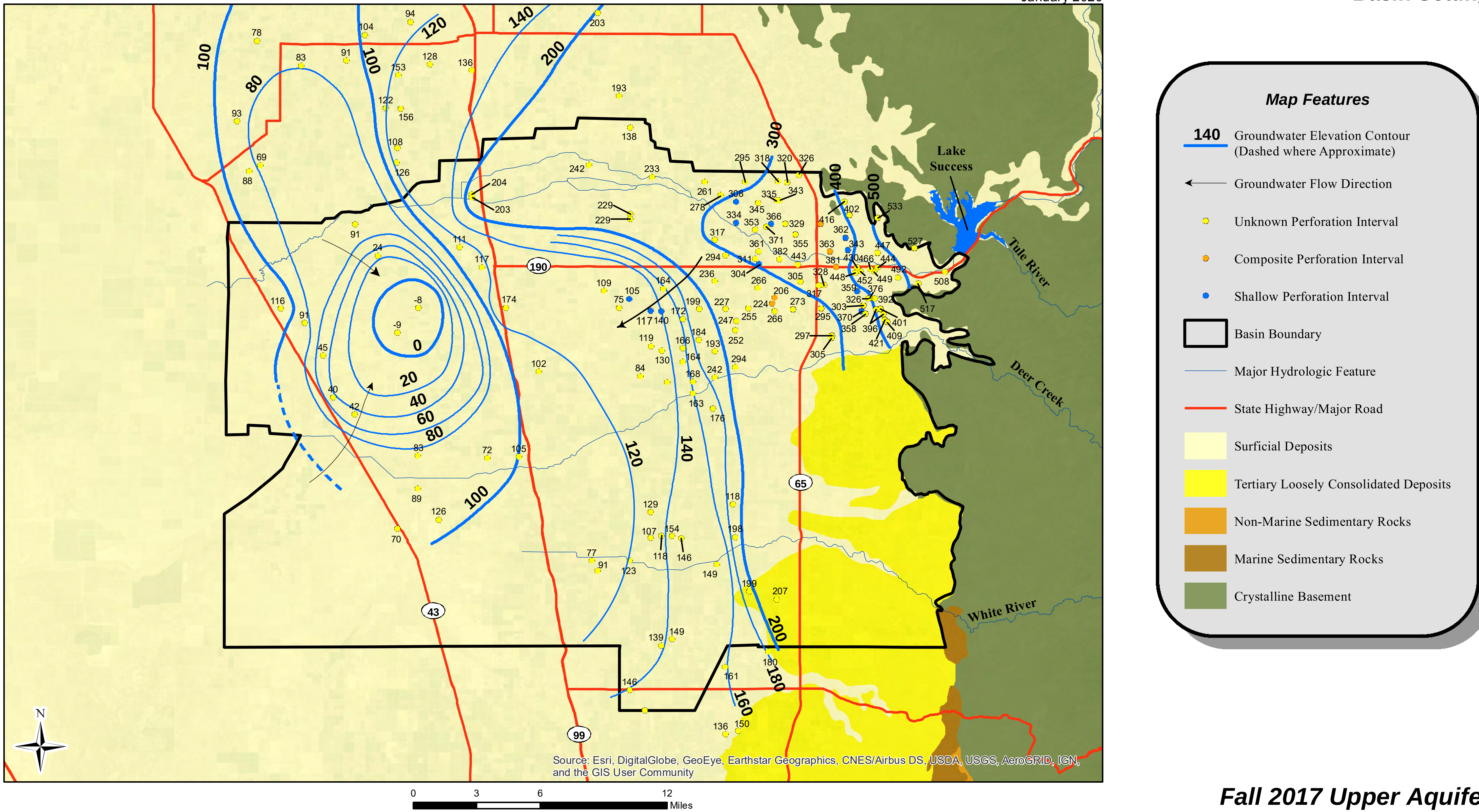
Groundwater contours shown south of the Tule Subbasin and west of Highway 43 are depicted based on Water-Level Elevations And Direction of Groundwater Flow For the Upper Zone (Spring 2017)

Spring 2017 Upper Aquifer Groundwater Elevation Contours

Figure 2-17

Tule Subbasin

January 2020



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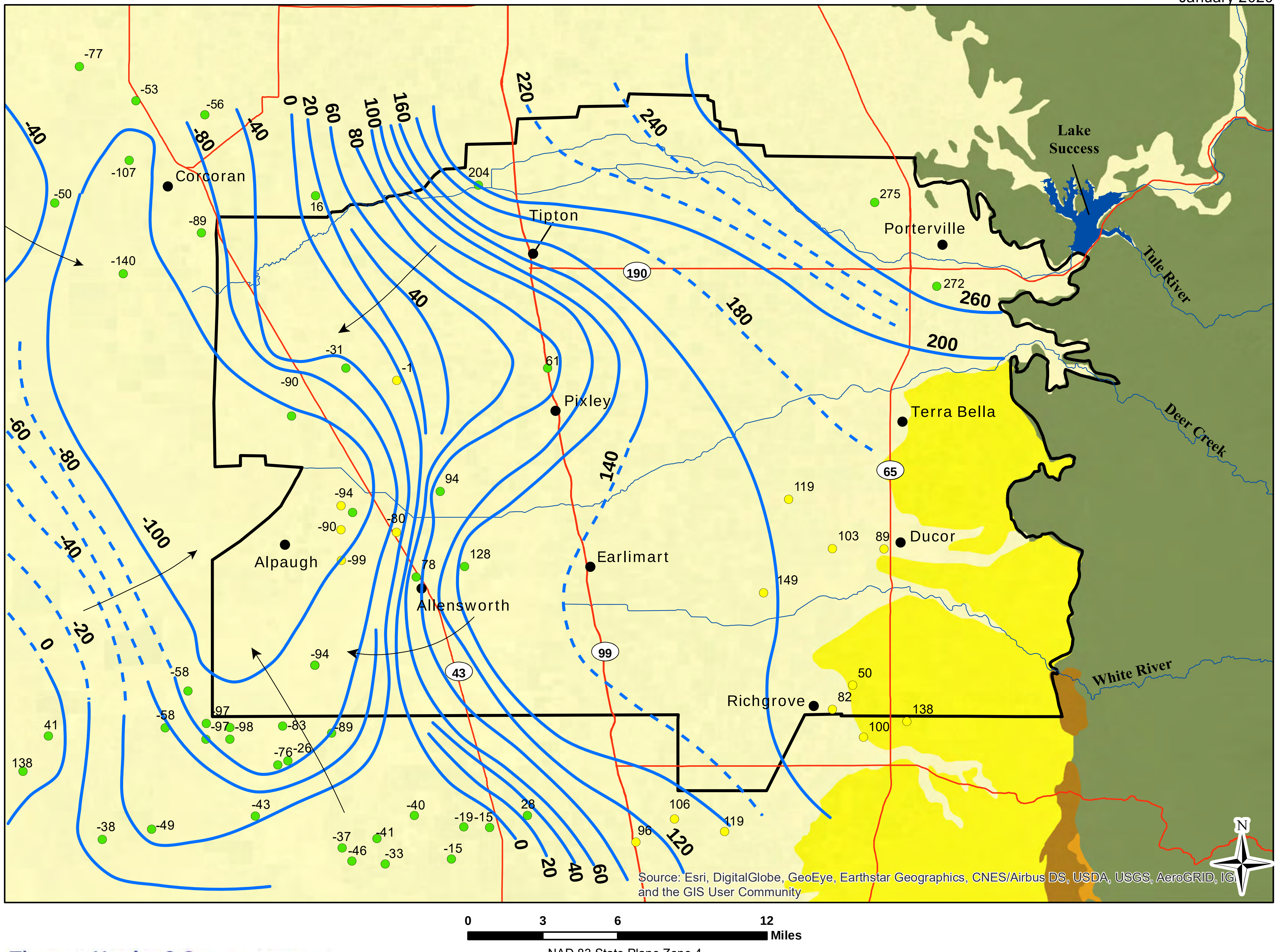
Fall 2017 Upper Aquifer Groundwater Elevation Contours

Figure 2-18

Tule Subbasin

January 2020



Map Features

- 140 — Groundwater Elevation Contour, dashed where approximate (ft amsl)
- Groundwater Flow Direction
- Groundwater Elevations from Well with Perforations in the Deep Aquifer
- Groundwater Elevations from Well with Unknown Perforation Interval
- Basin Boundary
- City or Community
- Major Hydrologic Feature
- State Highway/Major Road
- Surficial Deposits
- Tertiary loosely consolidated deposits
- Non-Marine Sedimentary Rocks
- Marine Sedimentary Rocks
- Crystalline Basement

Note: All groundwater elevations are in feet above mean sea level.

Groundwater Elevations are measured from October to December.

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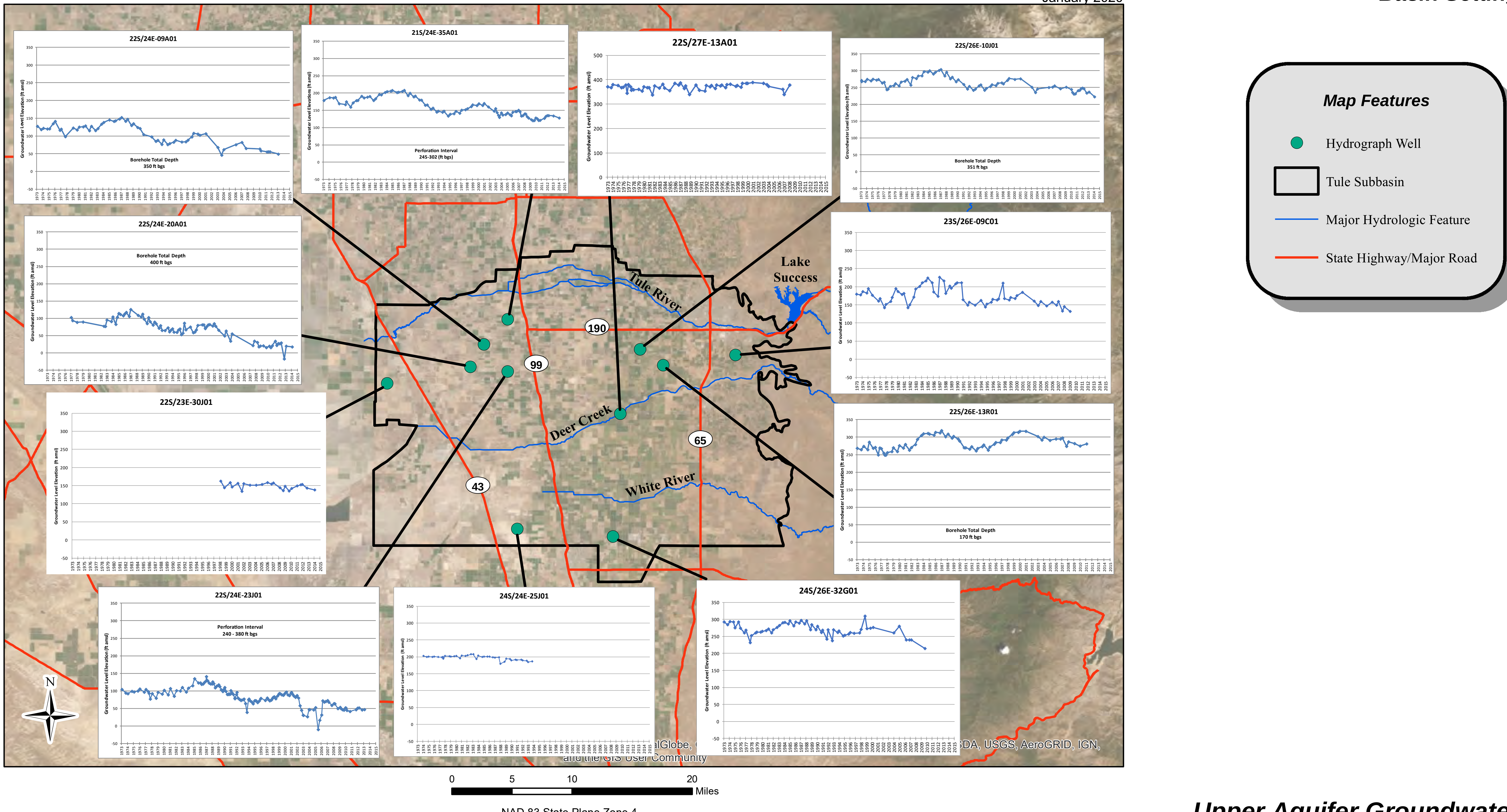
Fall 2010 Lower Groundwater Elevation Contour Map

Figure 2-19



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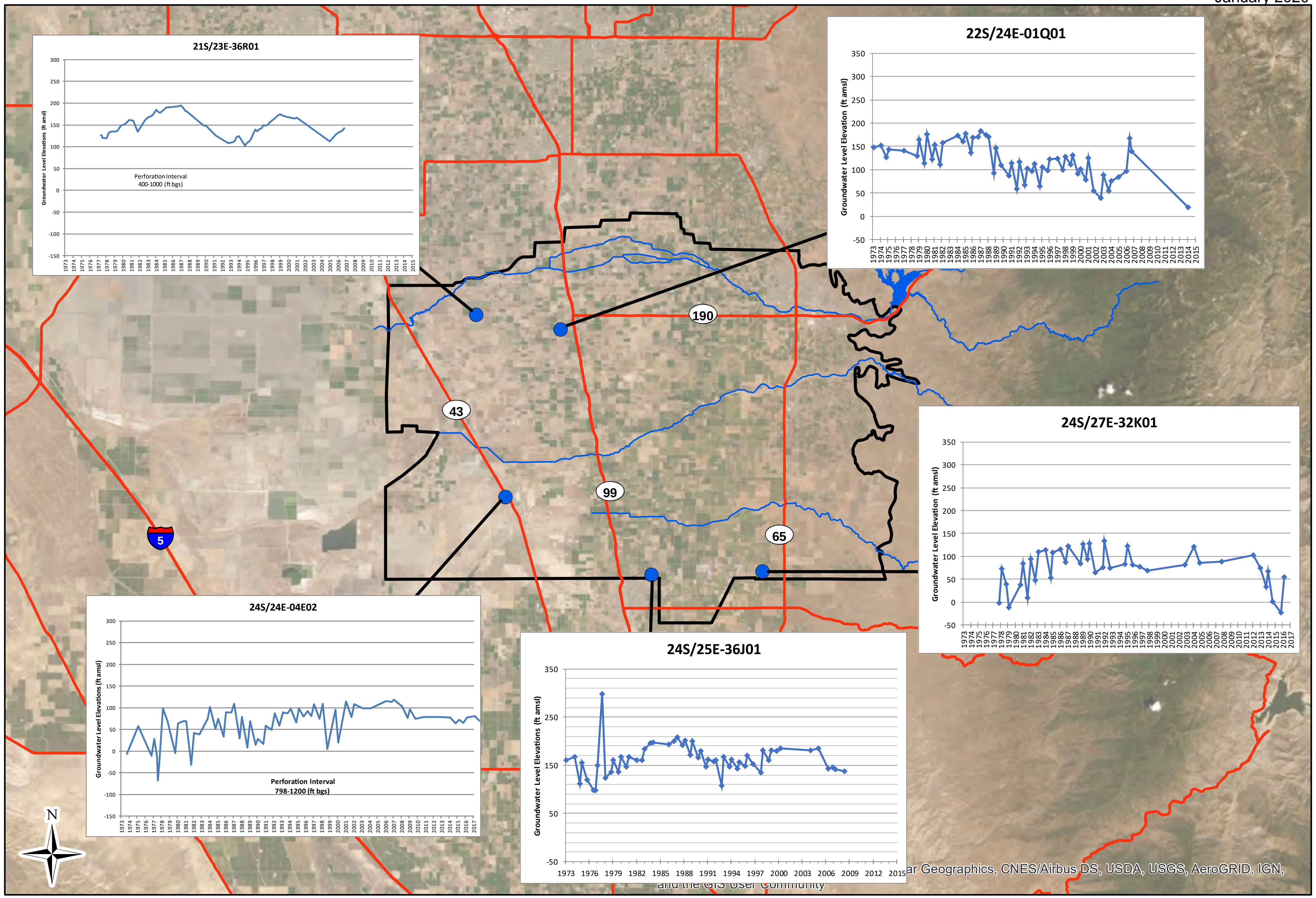
Upper Aquifer Groundwater Level Hydrographs

Figure 2 - 20

Tule Subbasin

January 2020



0 3.5 7 14 Miles

NAD 83 State Plane Zone 4

Map Features

- Hydrograph Well
- Basin Boundary
- Major Hydrologic Feature
- State Highway/Major Road

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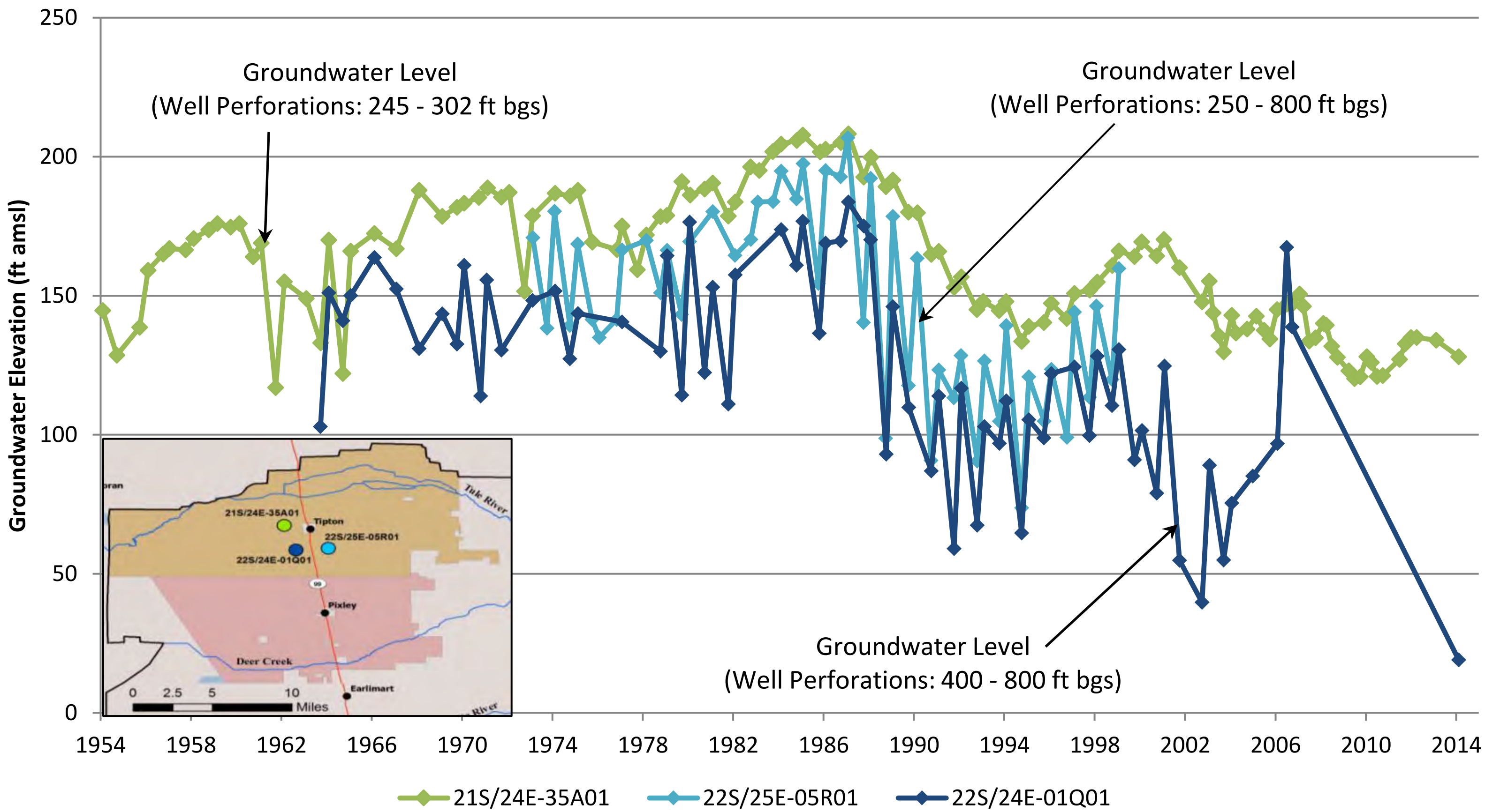
Lower Aquifer Groundwater Level Hydrographs

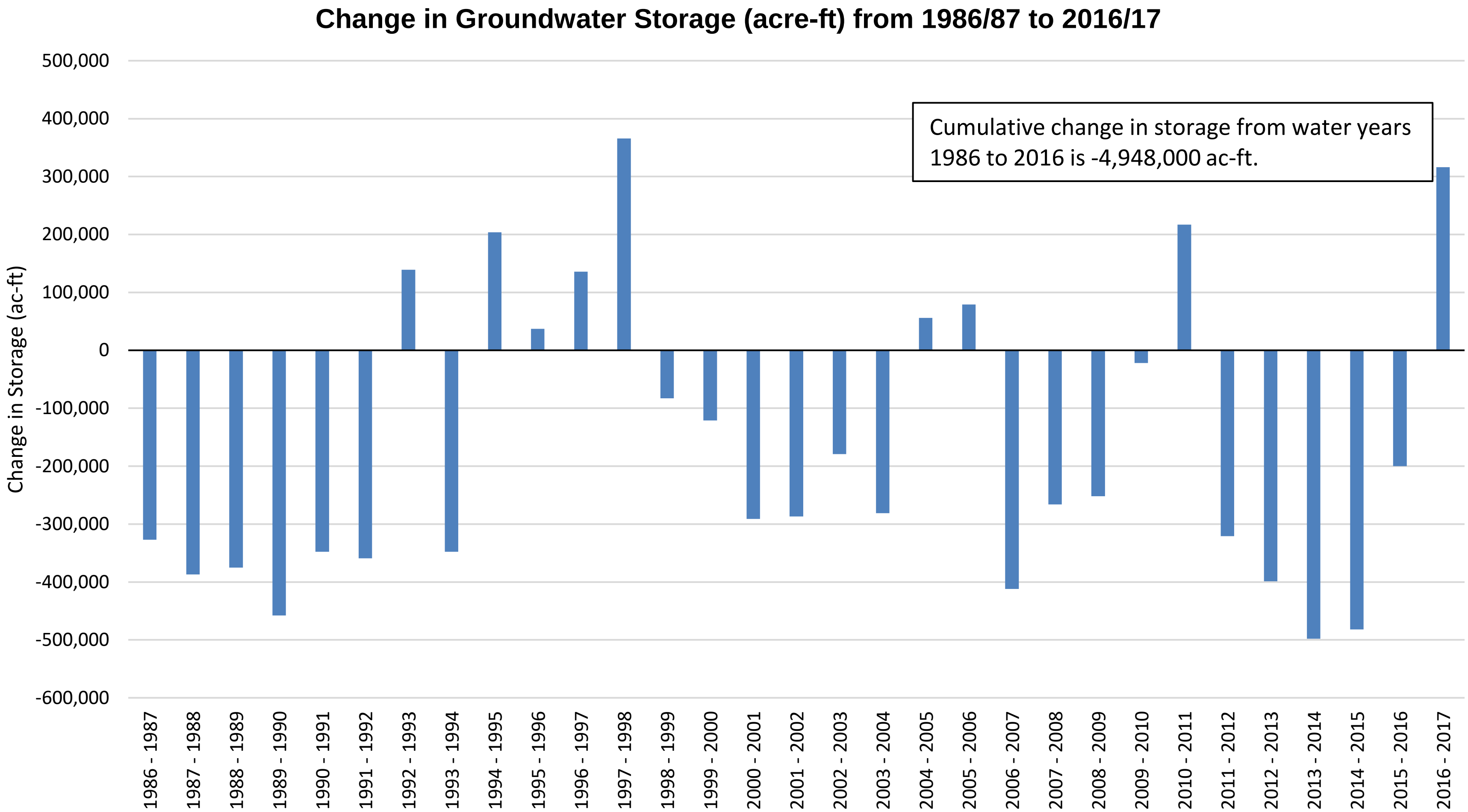
Figure 2 - 21

Groundwater Levels Near Tipton



Note:

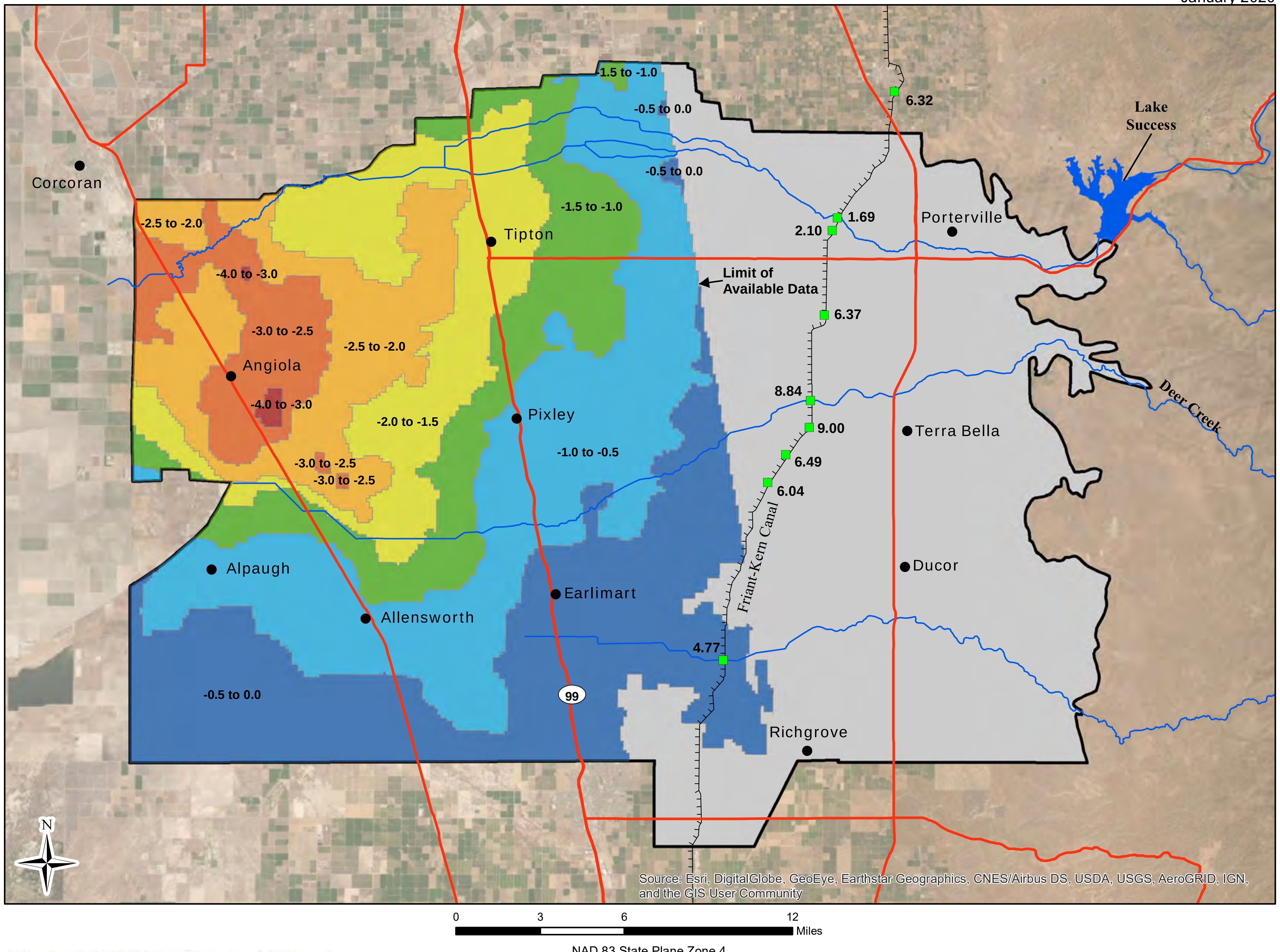
ft bgs = feet below ground surface.



Note: Data in water years (October 1 to September 30).

Tule Subbasin

January 2020



Map Features

2007 - 2011 Land Surface Subsidence* (ft)

- -4.0 to -3.0
- -3.0 to -2.5
- -2.5 to -2.0
- -2.0 to -1.5
- -1.5 to -1.0
- -1.0 to -0.5
- -0.5 to 0.0
- Measured Subsidence Points along the Friant-Kern Canal (ft) 1959-2017
- Friant-Kern Canal
- Basin Boundary
- City or Community
- Major Hydrologic Feature
- Freeway/State Highway

*From LSCE, 2014

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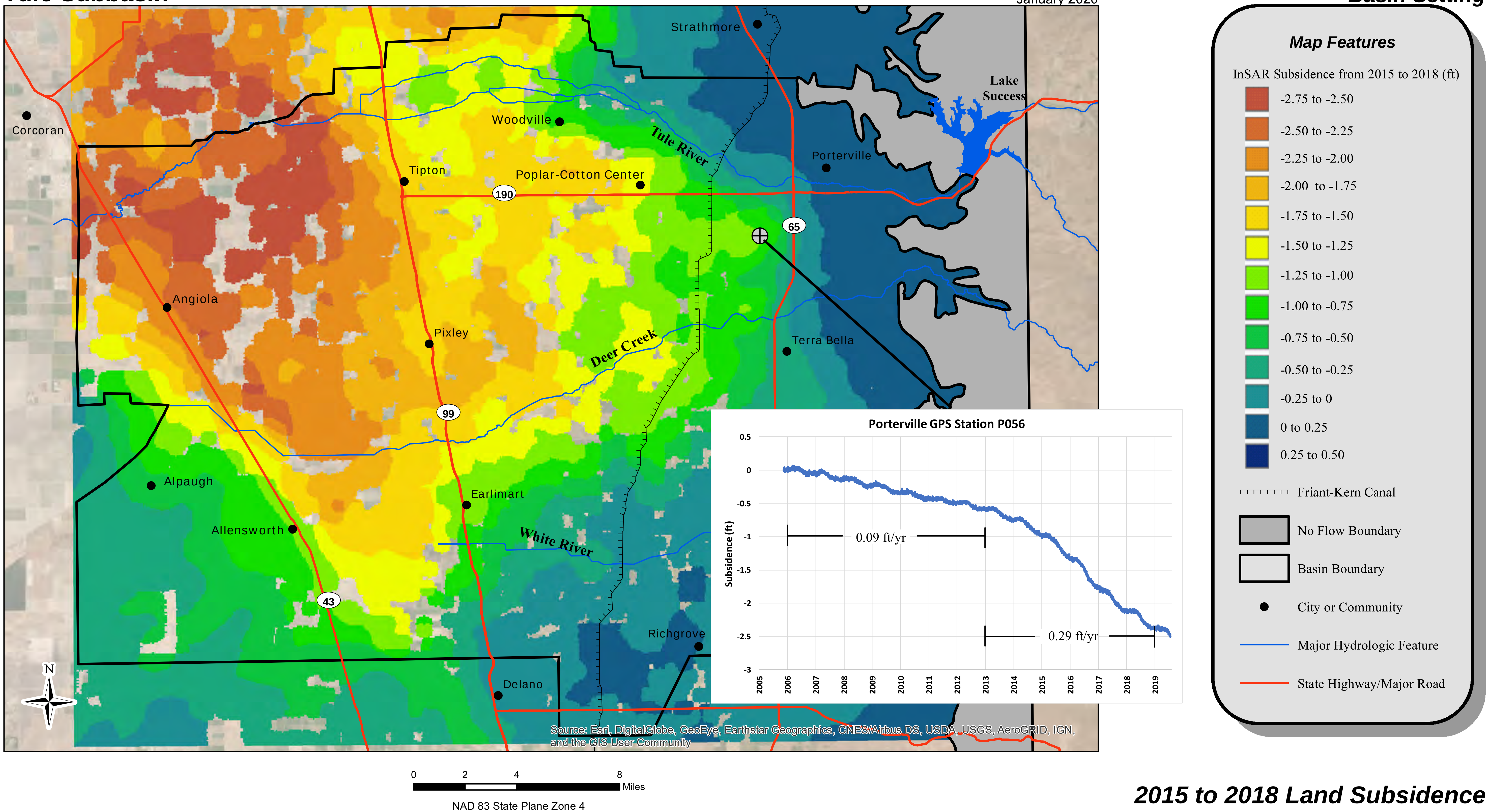
2007 to 2011 Land Subsidence

Figure 2-24

Tule Subbasin

January 2020



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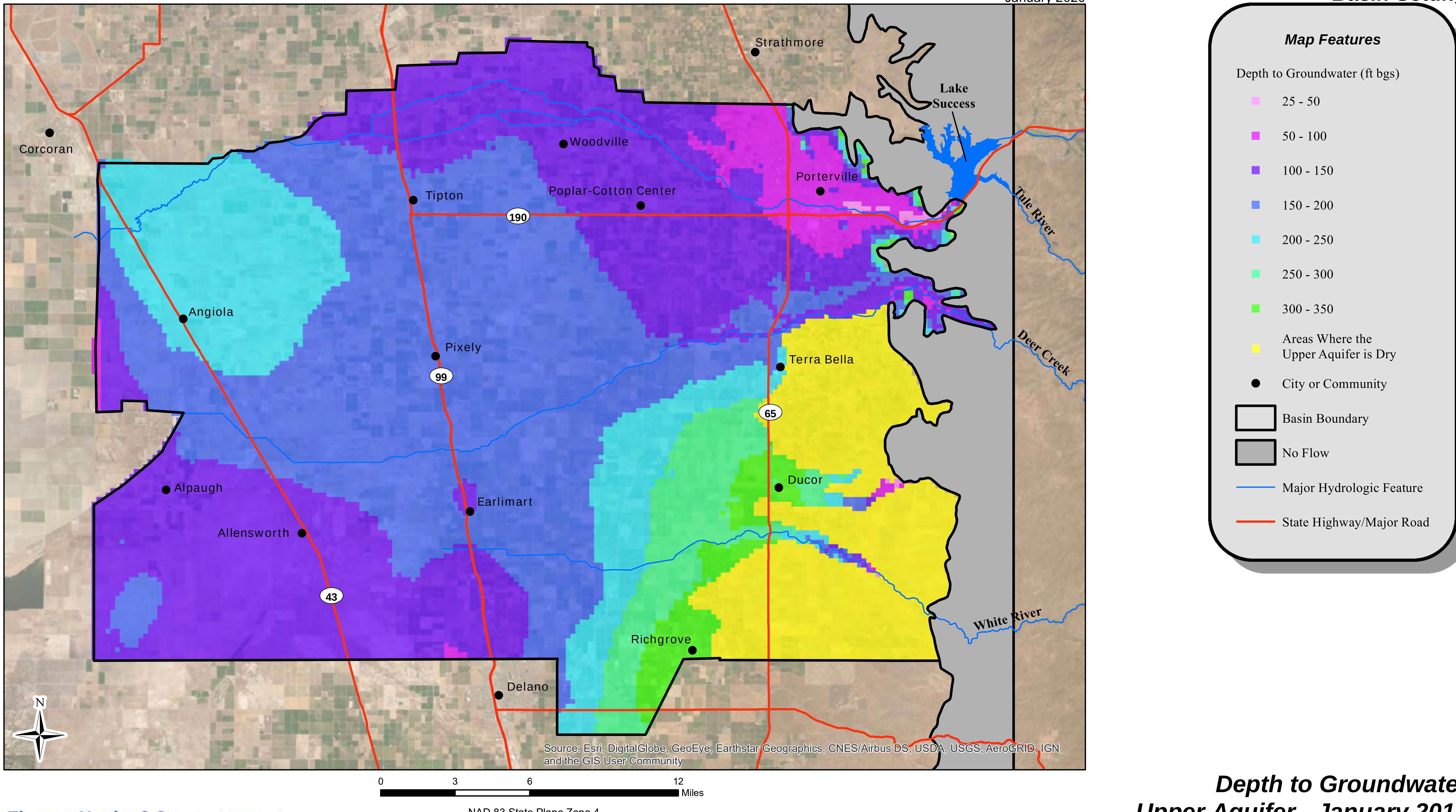
2015 to 2018 Land Subsidence

Figure 2-25

Tule Subbasin

January 2020



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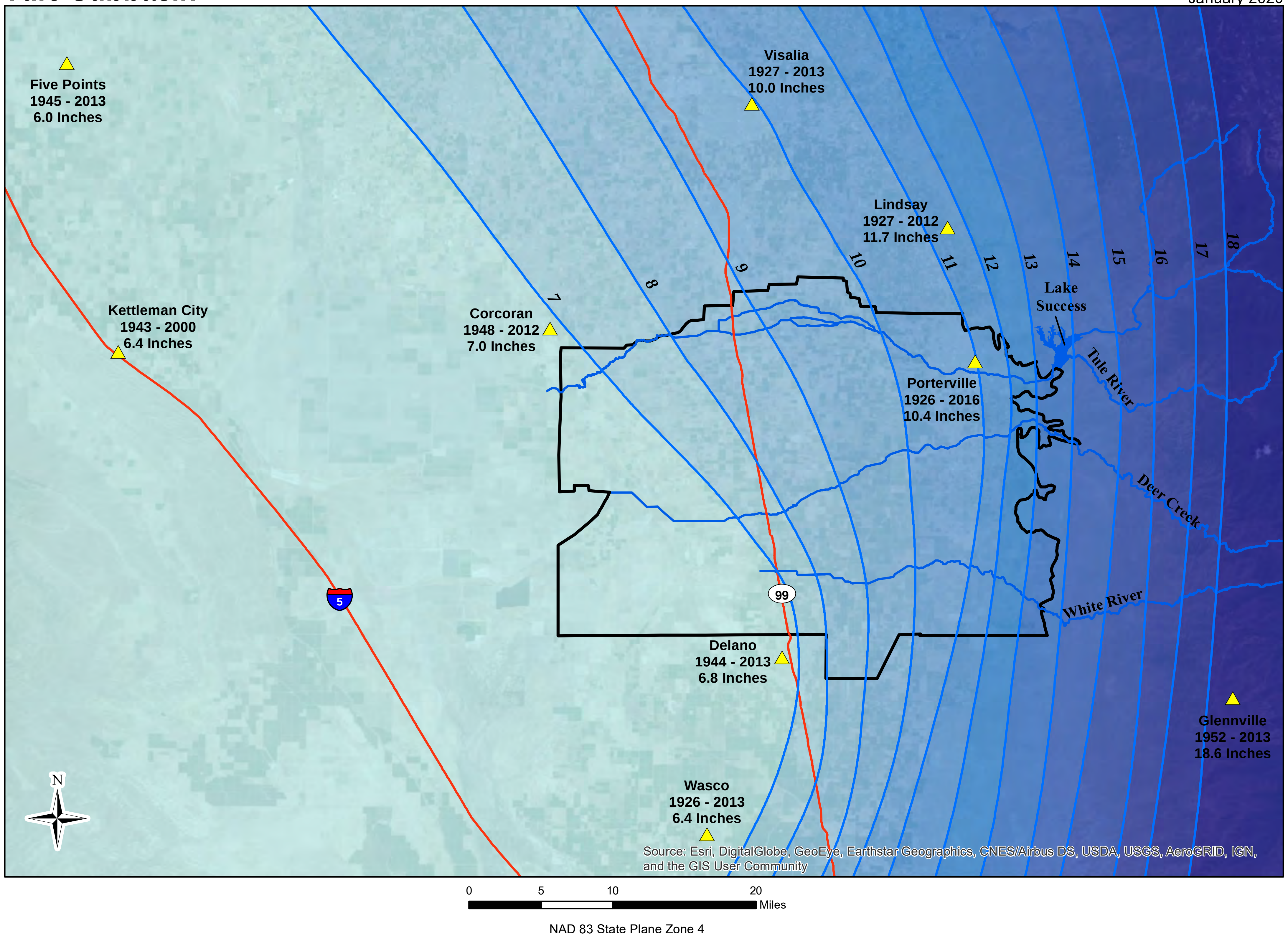
Depth to Groundwater Upper Aquifer - January 2015

Figure 2-26

Tule Subbasin

January 2020



Map Features

Lindsay 1927 - 2012 11.7 Inches — Precipitation Station, Period of Record, and Average Annual Precipitation

Average Annual Precipitation Inches Per Year

Basin Boundary

Major Hydrologic Feature

Freeway/State Highway

Notes: Precipitation station data from Western Regional Climate Center (www.wrcc.dri.edu) and California Irrigation Management Information System.

Isohyetal data from Average Annual Precipitation Zones from the California Department of Forestry and Fire Protection (1998). Data for 1900 through 1960.

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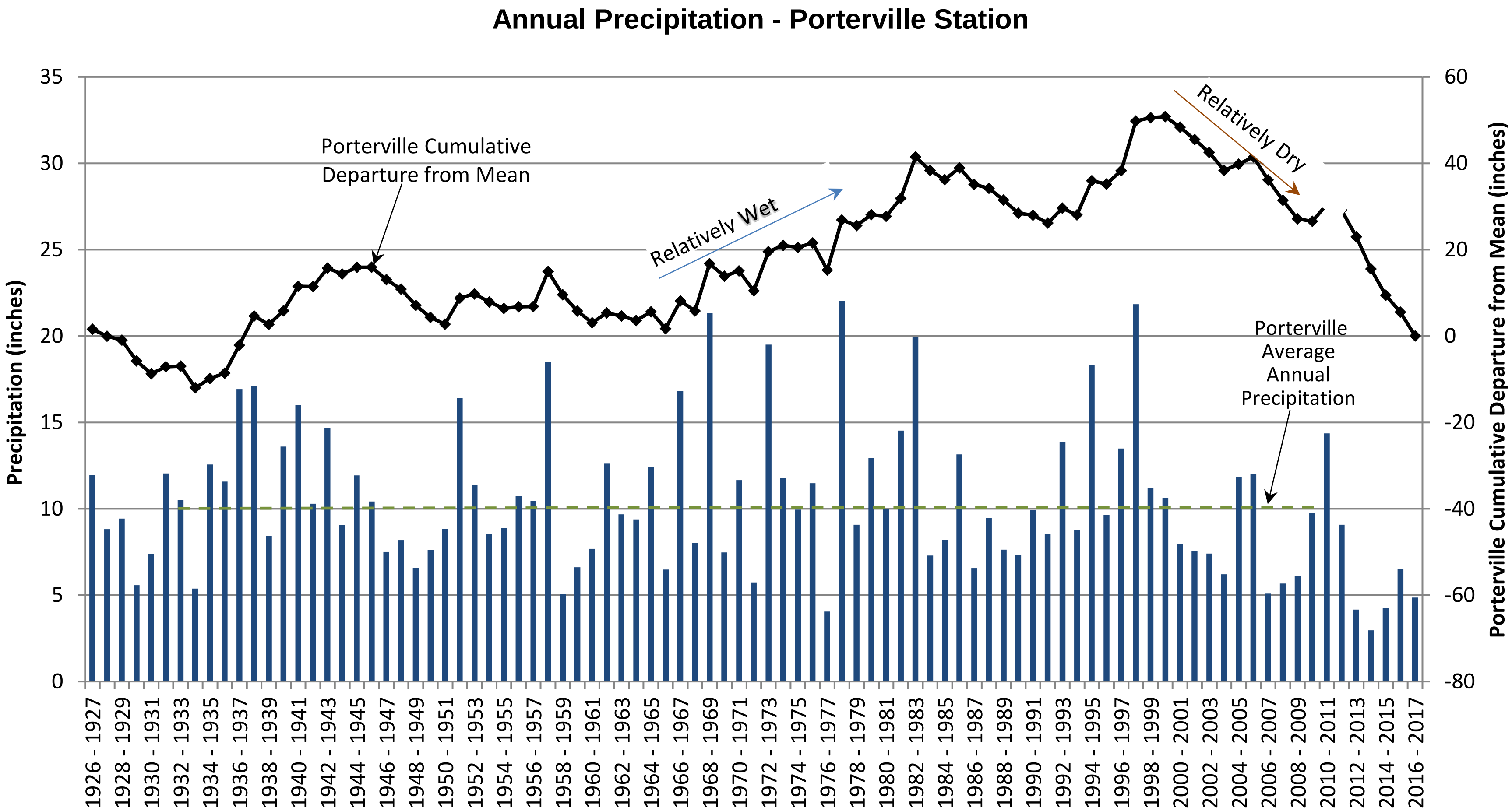
Isohyetal Map

Figure 2-27



Notes:

Data in water years (October 1 to September 30).
Data from Western Regional Climate Center (1926-2001), California Irrigation Management Information System (2002-2016).

Deer Creek versus White River Monthly Streamflow 1971 - 2005

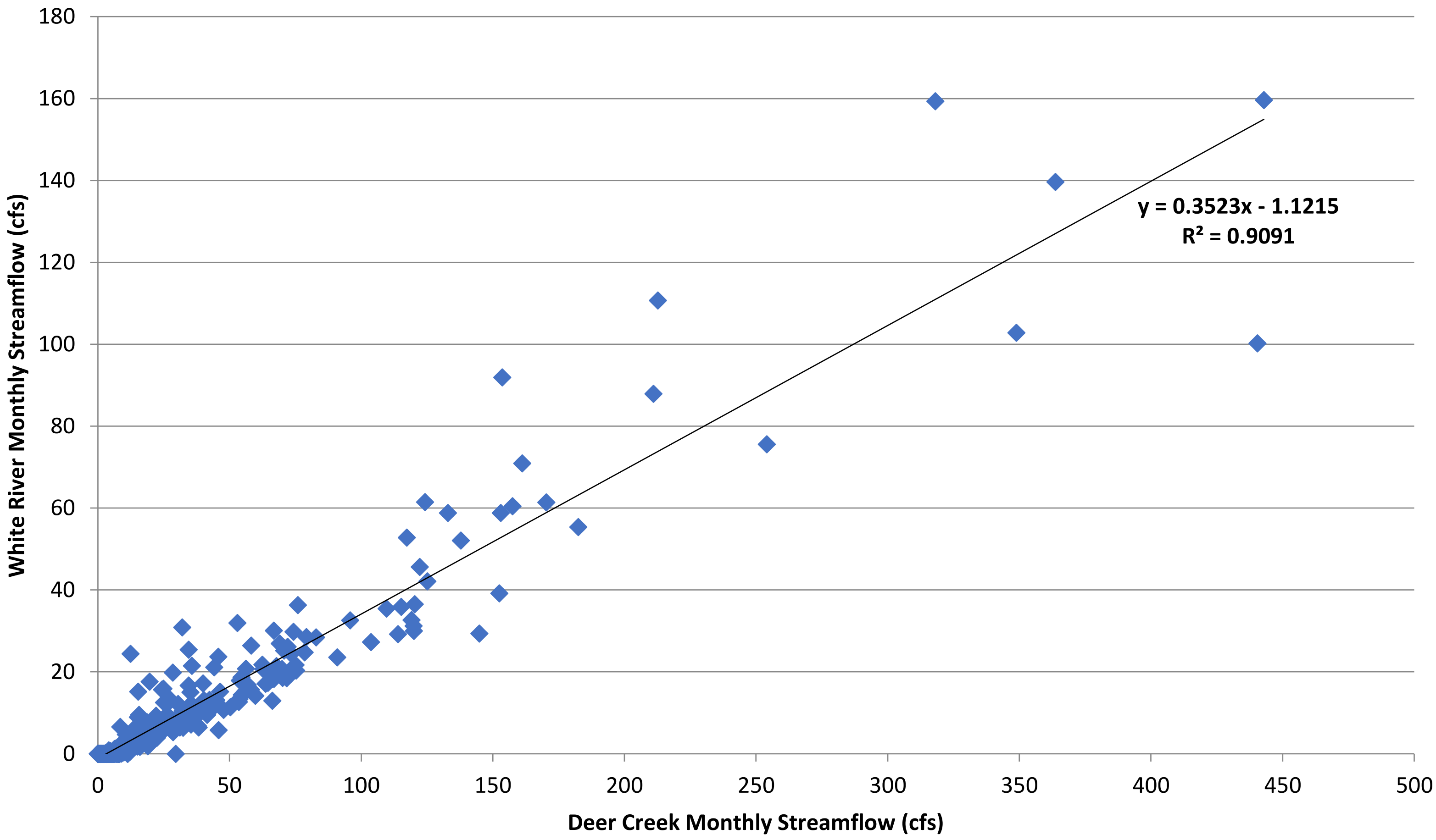


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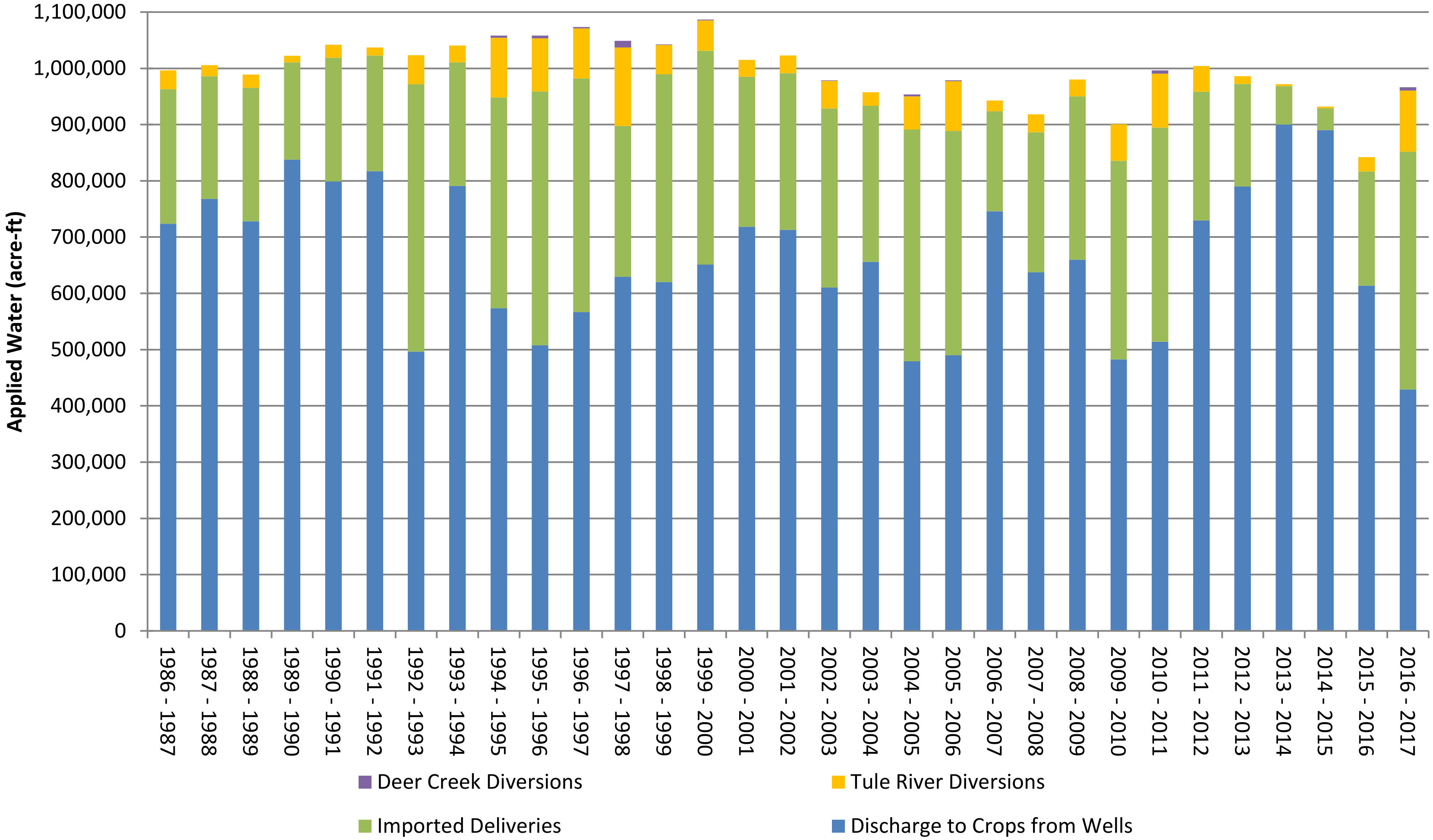
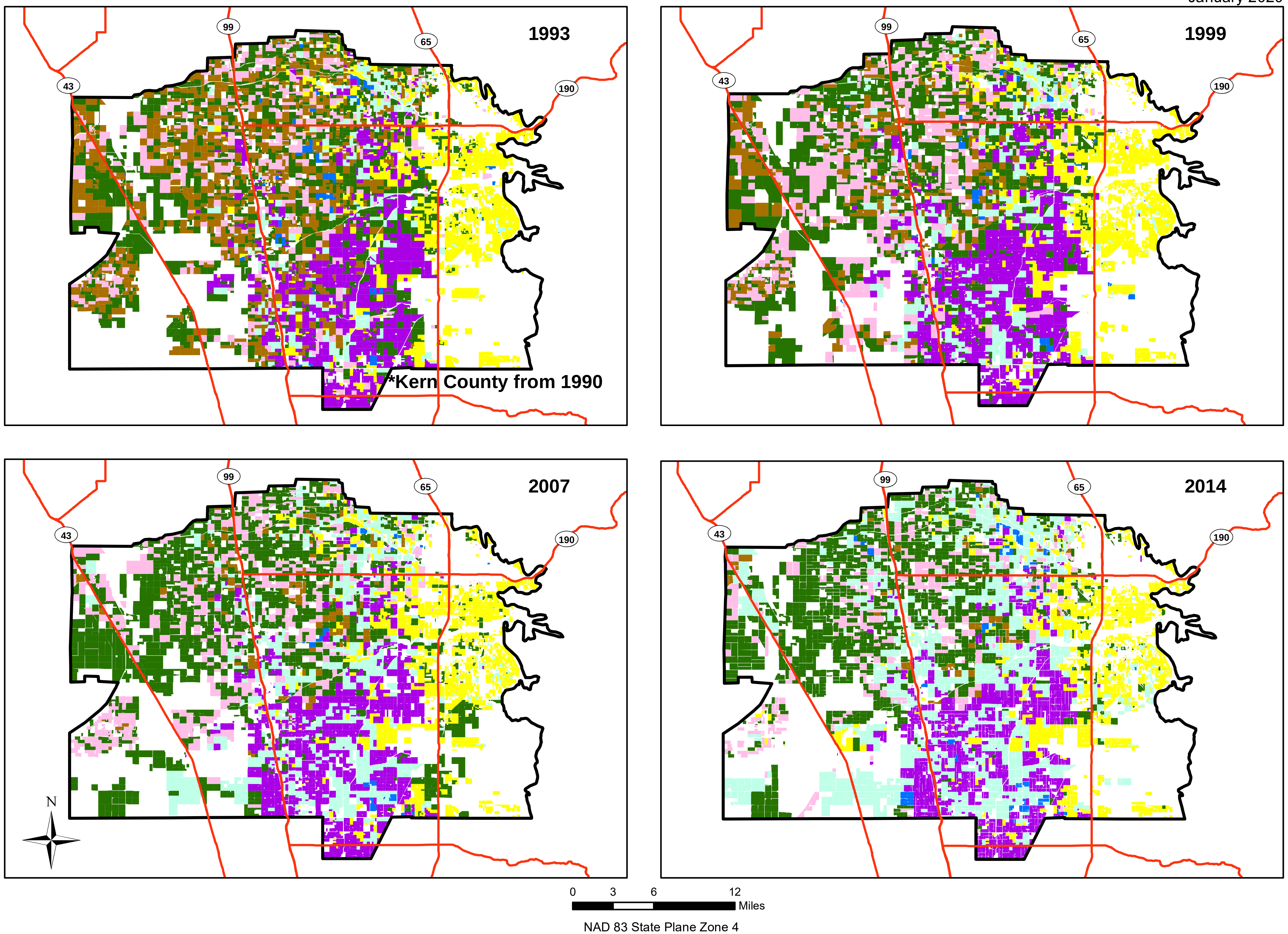
Figure 2-30

Applied Water to Irrigated Agriculture by Source



Tule Subbasin

January 2020



Map Features

- Tule Groundwater Subbasin
- Alfalfa, Pasture
- Corn, Grain, Grain Hay, and Misc. Field Crops
- Cotton
- Deciduous & Fruit Trees
- Grapes
- Nuts
- Truck Crops
- Major Road

Notes: Data from California Department of Water Resources and Kern County Department of Agriculture and Measurement Standards

Irrigated crops only.

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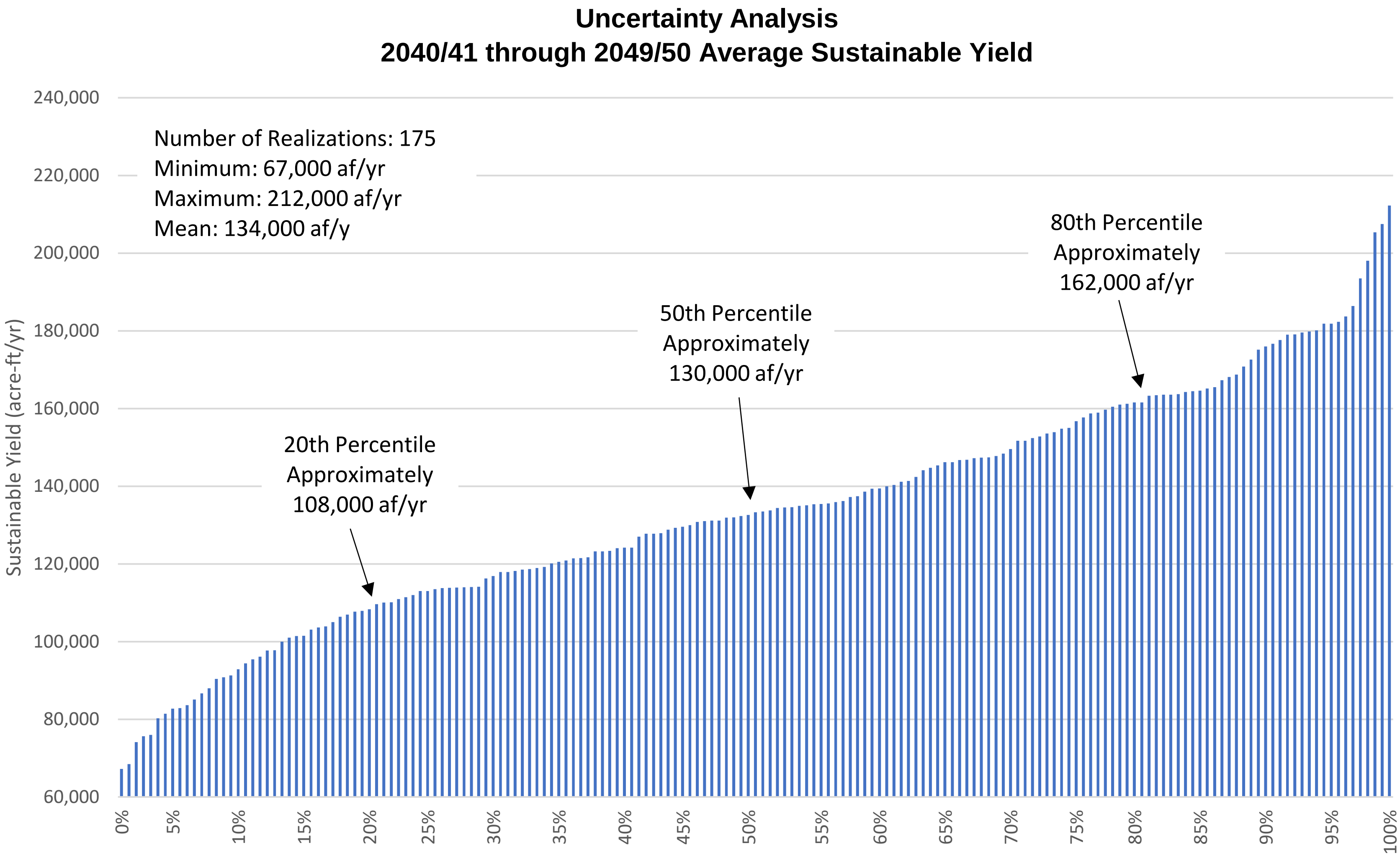
Tule Groundwater Subbasin Historical Crop Patterns

Figure 2-31

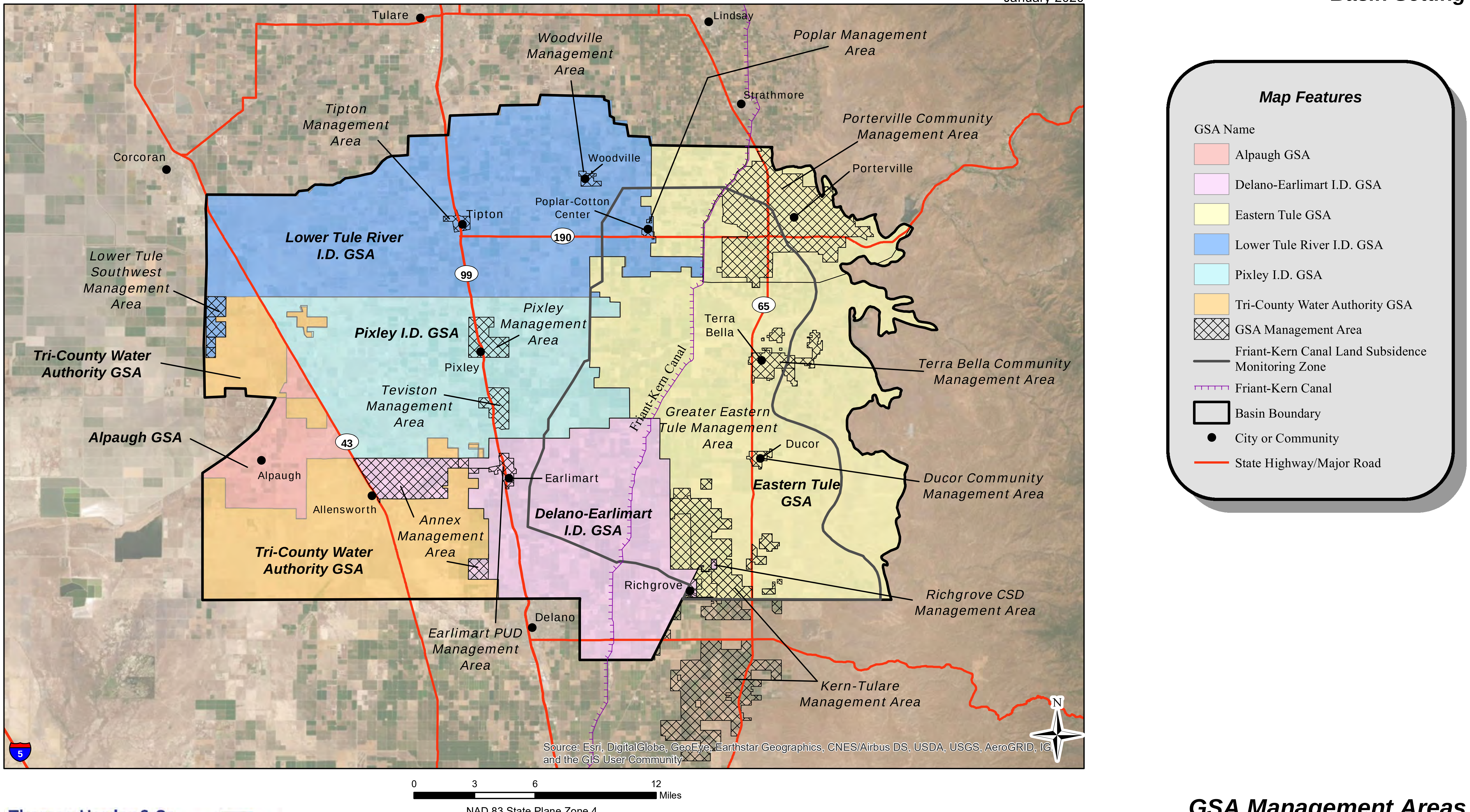
Figure 2-32



*Realizations with a storage change of -5,000 af/yr or greater

Tule Subbasin

January 2020



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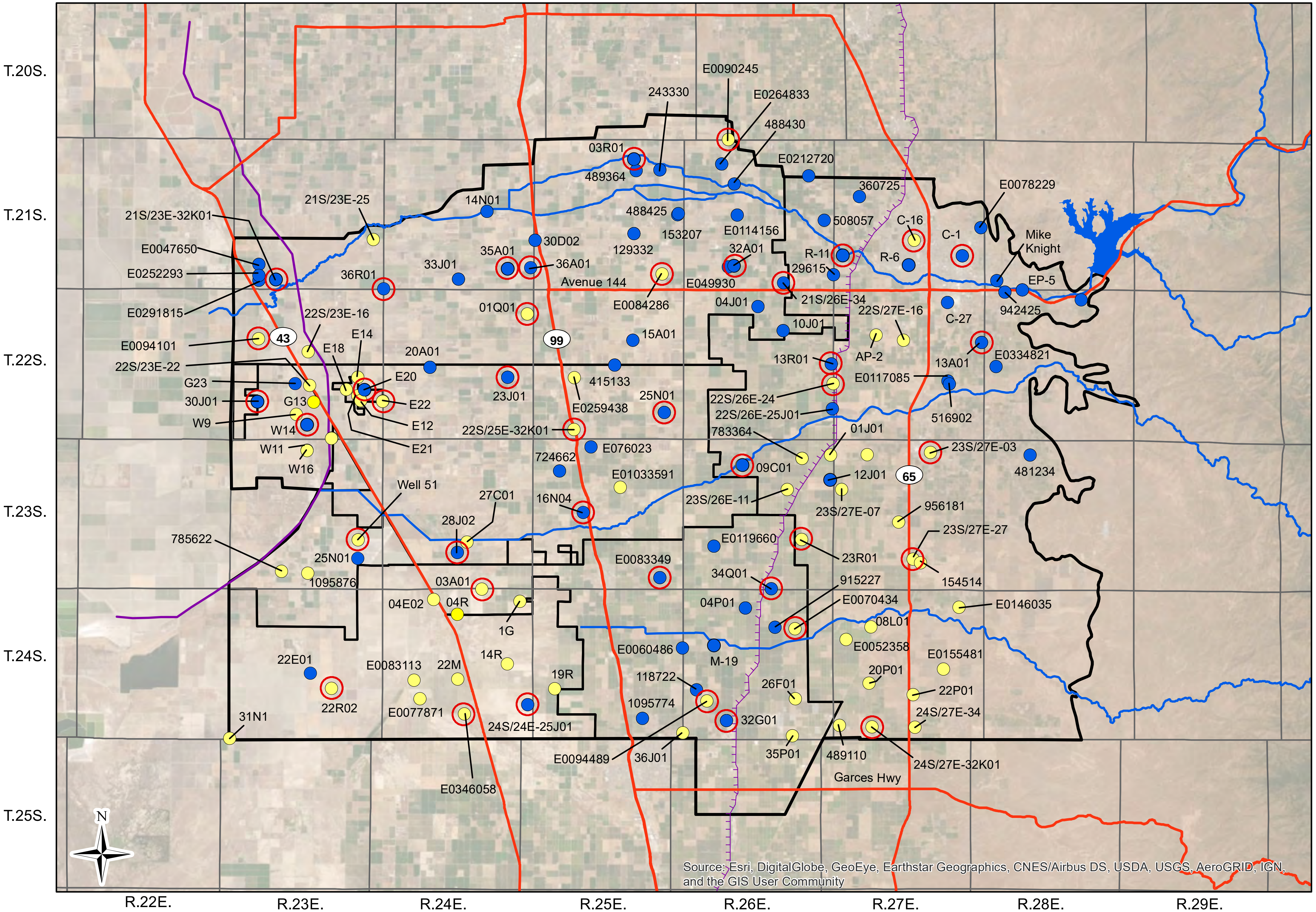
GSA Management Areas

Figure 2-33

Tule Subbasin

January 2020



Map Features

- Upper Aquifer Well
- Lower Aquifer Well
- Representative Upper Aquifer Monitoring Site
- Representative Lower Aquifer Monitoring Site
- Canal
- Friant-Kern Canal
- Basin Boundary
- GSA Boundaries
- State Highway/Major Road

0 2.5 5 10 Miles

NAD 83 State Plane Zone 4

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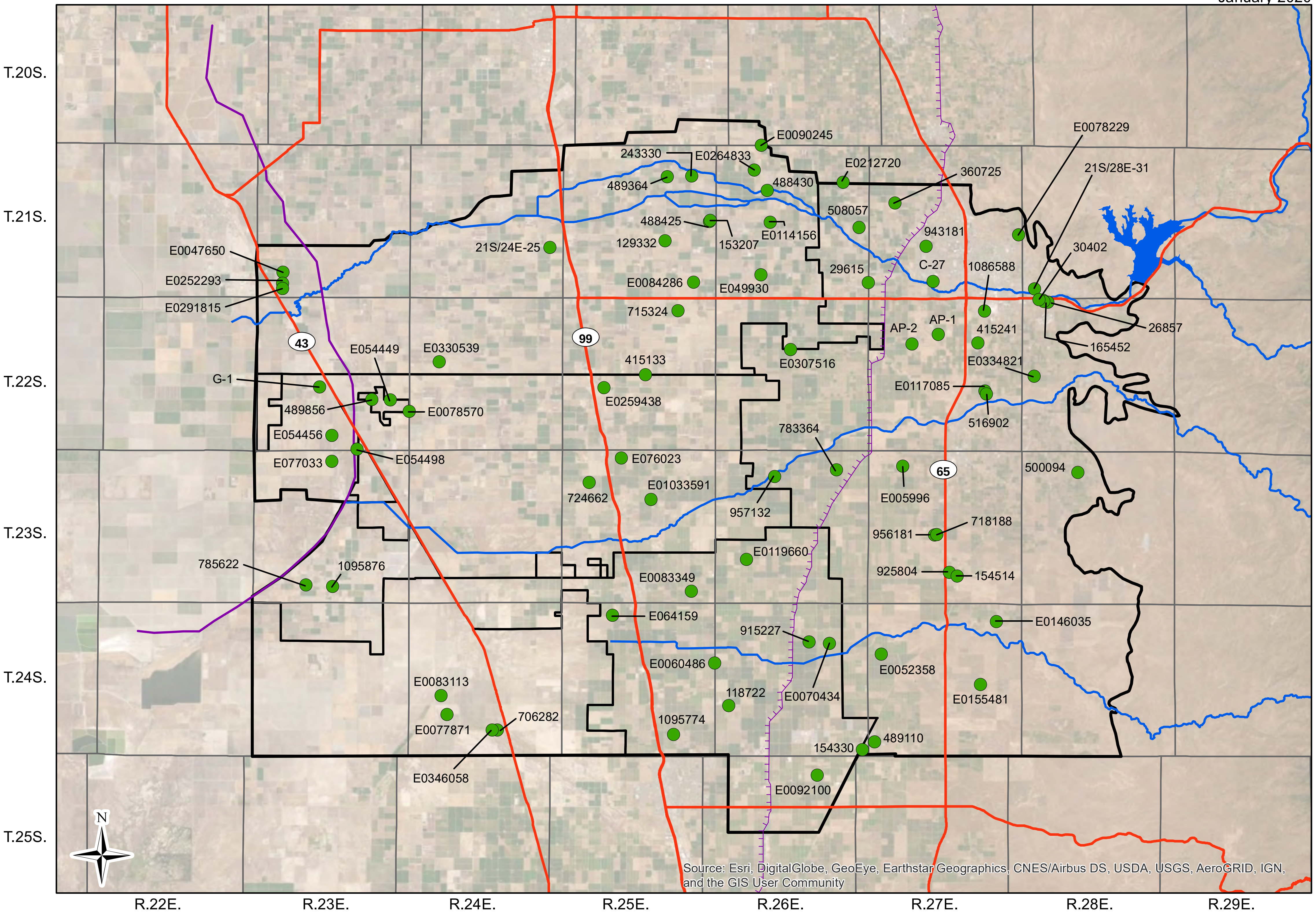
Groundwater Level Monitoring Network

Figure 2-34

Tule Subbasin

January 2020



Well Location data from:
Tule Basin Water Quality Coalition, 2017

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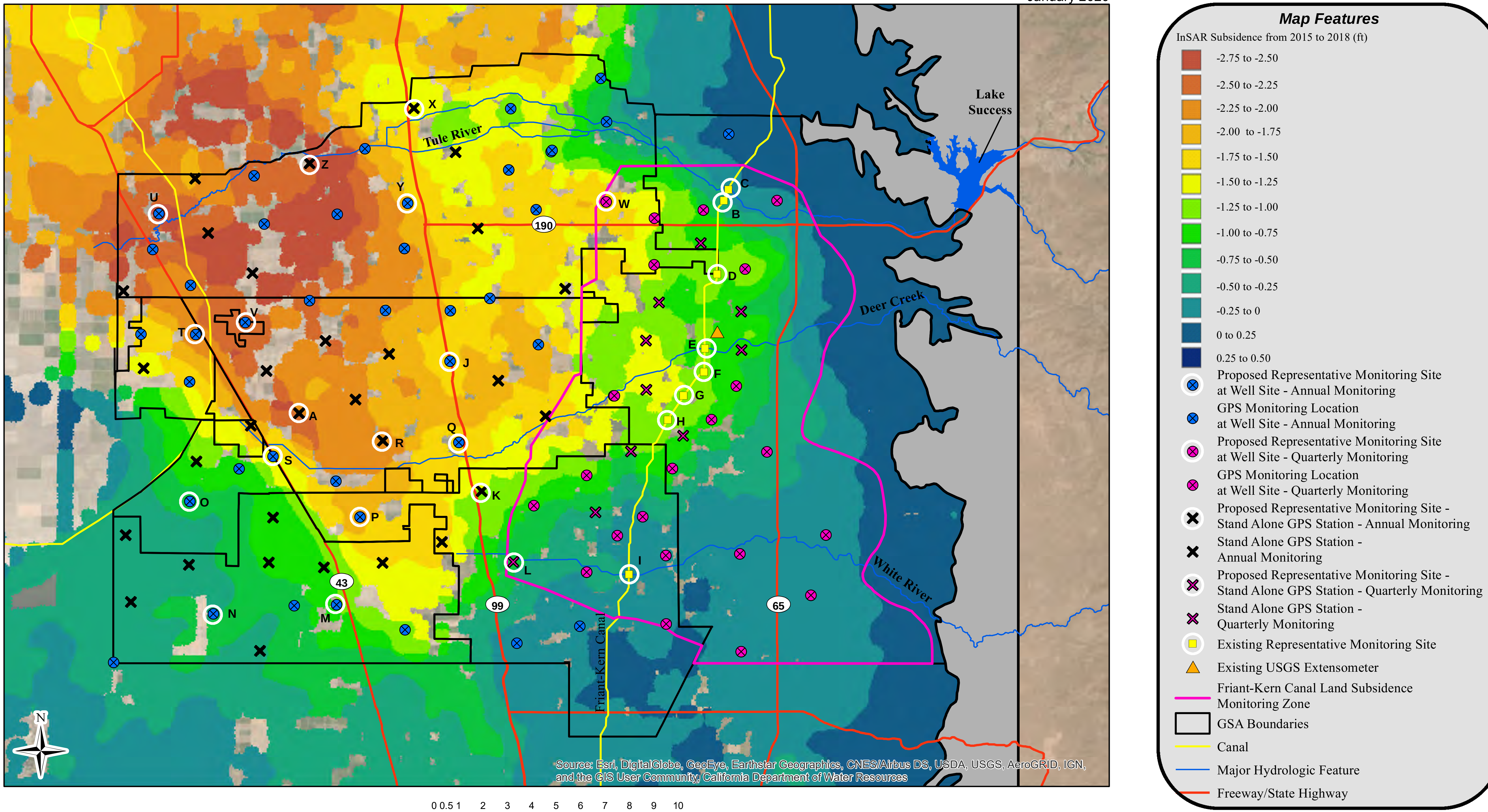
Groundwater Quality Monitoring Network

Figure 2-35

Tule Subbasin

January 2020



0 0.5 1 2 3 4 5 6 7 8 9 10 Miles

NAD 83 State Plane Zone 4

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Land Subsidence Monitoring Features

Figure 2-36

Appendix A

Lower Tule River Irrigation District GSA

Water Budgets and Hydrographs

Appendix A
Table 1a

Lower Tule River Irrigation District GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Inflow (acre-ft)					Total In
	Precipitation	Stream Inflow	Imported Water	Discharge from Wells		
		Tule River	LTRID	Agricultural	Municipal	
1986 - 1987	46,000	40,421	89,541	224,000	1,400	401,000
1987 - 1988	66,000	14,702	64,654	261,000	1,400	408,000
1988 - 1989	53,000	22,873	63,922	224,000	1,400	365,000
1989 - 1990	51,000	7,103	24,325	276,000	1,400	360,000
1990 - 1991	69,000	22,727	71,430	253,000	1,400	418,000
1991 - 1992	60,000	9,869	51,949	277,000	1,400	400,000
1992 - 1993	97,000	57,632	321,973	94,000	1,400	572,000
1993 - 1994	61,000	31,263	71,784	246,000	1,400	411,000
1994 - 1995	128,000	142,879	229,683	129,000	1,400	631,000
1995 - 1996	67,000	105,949	236,845	107,000	1,400	518,000
1996 - 1997	94,000	250,253	192,934	116,000	1,400	655,000
1997 - 1998	152,000	286,694	101,180	135,000	1,400	676,000
1998 - 1999	78,000	70,954	183,971	127,000	1,400	461,000
1999 - 2000	74,000	64,026	177,192	158,000	1,400	475,000
2000 - 2001	55,000	27,525	83,405	196,000	1,400	363,000
2001 - 2002	53,000	32,853	78,511	207,000	1,500	373,000
2002 - 2003	52,000	77,642	131,470	143,000	1,500	406,000
2003 - 2004	43,000	24,494	71,472	204,000	1,600	345,000
2004 - 2005	83,000	91,549	247,595	96,000	1,600	520,000
2005 - 2006	84,000	129,184	194,019	93,000	1,700	502,000
2006 - 2007	35,000	19,981	33,174	231,000	1,800	321,000
2007 - 2008	39,000	42,745	71,872	183,000	1,800	338,000
2008 - 2009	42,000	29,196	113,189	200,000	1,900	386,000
2009 - 2010	68,000	82,489	200,064	74,000	1,800	426,000
2010 - 2011	100,000	191,791	229,763	116,000	1,900	639,000
2011 - 2012	63,000	58,763	67,684	228,000	1,900	419,000
2012 - 2013	29,000	14,374	37,073	255,000	1,800	337,000
2013 - 2014	21,000	0	0	280,000	1,800	303,000
2014 - 2015	30,000	0	0	243,000	1,800	275,000
2015 - 2016	45,000	35,381	73,382	152,000	1,800	308,000
2016 - 2017	47,000	187,807	273,151	82,000	1,900	592,000
86/87-16/17 Avg	64,000	70,100	122,200	181,000	1,600	439,000

Appendix A
Table 1b

Lower Tule River Irrigation District GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Outflow (acre-ft)																	Total Out
	Areal Recharge of Precipitation	Streambed Infiltration	Canal Loss		Recharge in Basins		Deep Percolation of Applied Water				Evapotranspiration						Surface Outflow	
		Tule River										Tule River		Imported Water	Ag. Cons. Use from Pumping	Municipal (Landscape ET)		
		Oettle Bridge to Turnbull Weir Infiltration	Tule River	Imported Water	Tule River	Imported Water	Tule River	Imported Water	Agricultural Pumping	Municipal Pumping	Precipitation Crops/Native	Agricultural Cons. Use	Stream Channel	Agricultural Cons. Use			Tule River	
1986 - 1987	0	1,100	20,700	44,200	0	0	5,200	12,700	62,800	900	46,000	13,400	400	32,600	161,000	500	0	402,000
1987 - 1988	0	900	8,800	32,700	0	0	1,400	9,000	73,200	900	66,000	3,600	100	23,000	187,000	500	0	407,000
1988 - 1989	0	0	7,400	18,800	0	0	4,400	12,700	62,900	900	53,000	11,200	100	32,400	161,000	500	0	365,000
1989 - 1990	0	0	2,900	7,400	0	0	1,200	4,700	77,600	900	51,000	3,000	0	12,100	199,000	500	0	360,000
1990 - 1991	0	300	6,800	24,300	0	0	4,400	13,200	71,200	900	69,000	11,200	200	33,900	182,000	500	0	418,000
1991 - 1992	0	0	3,100	16,100	0	0	1,900	10,100	77,800	900	60,000	4,900	100	25,800	199,000	500	0	400,000
1992 - 1993	9,000	3,000	27,800	141,000	0	0	7,900	53,300	26,500	900	88,000	18,900	400	127,600	68,000	500	0	573,000
1993 - 1994	0	200	14,200	27,800	0	0	4,700	12,400	69,200	900	61,000	12,100	200	31,600	177,000	500	0	412,000
1994 - 1995	28,000	10,400	39,500	108,800	0	0	19,300	34,400	36,100	900	100,000	48,500	500	86,500	92,000	500	25,000	630,000
1995 - 1996	0	4,000	26,200	69,600	13,400	33,800	15,800	37,700	30,000	900	67,000	40,000	600	95,600	77,000	500	7,000	519,000
1996 - 1997	7,000	9,700	47,300	51,200	19,900	7,000	16,700	43,000	32,700	900	87,000	35,600	600	91,700	84,000	500	121,000	656,000
1997 - 1998	44,000	9,000	79,100	39,200	28,000	10,800	29,100	14,400	37,900	900	109,000	74,400	600	36,800	97,000	500	95,000	706,000
1998 - 1999	1,000	2,800	19,500	45,800	11,400	15,800	10,500	34,400	35,800	900	77,000	26,800	600	88,100	92,000	500	0	463,000
1999 - 2000	0	2,900	11,100	51,300	3,400	8,000	12,000	32,900	44,400	900	74,000	30,700	300	84,300	113,000	500	5,000	475,000
2000 - 2001	0	0	7,000	25,900	200	2,000	5,700	15,600	55,100	900	55,000	14,600	300	39,900	141,000	500	0	364,000
2001 - 2002	0	700	13,400	20,800	0	0	5,300	16,200	58,100	1,000	53,000	13,500	300	41,500	149,000	500	0	373,000
2002 - 2003	0	3,700	22,800	42,700	5,900	3,300	9,700	20,600	34,500	1,000	52,000	30,500	300	64,800	108,000	500	5,000	405,000
2003 - 2004	0	300	7,700	16,600	0	0	3,800	13,100	48,500	1,000	43,000	12,100	200	41,800	155,000	600	1,000	345,000
2004 - 2005	2,000	4,700	22,900	76,200	11,800	23,500	9,400	33,000	23,000	1,100	80,000	30,000	400	105,500	73,000	600	22,000	519,000
2005 - 2006	3,000	7,200	40,500	62,500	16,500	17,000	13,800	29,500	22,200	1,100	81,000	39,900	400	85,000	71,000	600	11,000	502,000
2006 - 2007	0	1,500	5,100	12,700	0	0	3,200	4,900	55,100	1,100	35,000	10,200	100	15,600	176,000	600	0	321,000
2007 - 2008	0	1,100	15,900	18,200	900	600	5,700	12,600	43,500	1,200	39,000	18,300	300	40,400	139,000	600	1,000	338,000
2008 - 2009	0	1,400	7,100	36,400	400	4,300	4,900	17,500	47,600	1,200	42,000	15,600	100	56,000	152,000	700	0	387,000
2009 - 2010	0	4,500	34,600	61,600	5,800	15,100	10,200	33,500	17,500	1,200	68,000	27,400	400	89,800	56,000	600	0	426,000
2010 - 2011	11,000	7,500	82,400	80,300	31,800	27,700	15,500	30,400	27,500	1,200	89,000	46,600	400	91,300	88,000	700	8,000	639,000
2011 - 2012	0	300	17,800	21,200	1,500	4,200	10,100	10,900	54,300	1,200	63,000	29,100	200	31,400	174,000	700	0	420,000
2012 - 2013	0	0	4,400	11,400	0	0	2,400	6,100	60,800	1,100	29,000	7,600	200	19,600	195,000	600	0	338,000
2013 - 2014	0	0	0	0	0	0	0	0	66,700	1,200	21,000	0	0	0	213,000	600	0	303,000
2014 - 2015	0	0	0	0	0	0	0	0	57,900	1,200	30,000	0	0	0	185,000	600	0	275,000
2015 - 2016	0	5,500	11,400	27,400	800	0	4,200	11,000	36,200	1,200	45,000	13,500	200	35,100	116,000	600	0	308,000
2016 - 2017	0	15,900	82,600	113,100	28,400	34,000	14,500	30,400	19,500	1,200	47,000	46,400	500	95,600	62,000	700	71,000	663,000
86/87-16/17 Avg	3,000	3,200	22,300	42,100	5,800	6,700	8,200	19,700	47,300	1,000	61,000	22,200	300	53,400	134,000	600	12,000	443,000

Groundwater Inflows to be Included in Sustainable Yield Estimates (light blue)
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates (pink)
Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates (yellow)

Appendix A
Table 2

Lower Tule River Irrigation District GSA
Historical Groundwater Budget 1986/87 to 2016/17

Water Year	Groundwater Inflows (acre-ft)													Total In	Groundwater Outflows (acre-ft)					Total Out	Change in Storage (acre-ft)
	Areal Recharge from Precipitation	Tule River				Imported Water Deliveries			Agricultural Pumping	Municipal Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow			Groundwater Pumping			Sub-surface Outflow			
		Oettle Bridge to Turnbull Weir Infiltration	Canal Loss	Recharge in Basins	Return Flow	Canal Loss	Recharge in Basins	Return Flow	Return Flow	Return Flow		From Outside Subbasin	From Other GSAs		Muni-cipal	Agri-cultural	Exports	To Outside Subbasin	To Other GSAs		
1986 - 1987	0	1,100	20,700	0	5,200	44,200	0	12,700	62,800	900	27,000	76,000	39,000	290,000	1,400	224,000	0	16,000	115,000	356,000	-66,000
1987 - 1988	0	900	8,800	0	1,400	32,700	0	9,000	73,200	900	26,000	90,000	38,000	281,000	1,400	261,000	15,940	16,000	108,000	402,000	-121,000
1988 - 1989	0	0	7,400	0	4,400	18,800	0	12,700	62,900	900	13,000	90,000	37,000	247,000	1,400	224,000	26,160	16,000	107,000	375,000	-128,000
1989 - 1990	0	0	2,900	0	1,200	7,400	0	4,700	77,600	900	38,000	87,000	39,000	259,000	1,400	276,000	26,590	16,000	97,000	417,000	-158,000
1990 - 1991	0	300	6,800	0	4,400	24,300	0	13,200	71,200	900	42,000	95,000	38,000	296,000	1,400	253,000	28,190	17,000	104,000	404,000	-108,000
1991 - 1992	0	0	3,100	0	1,900	16,100	0	10,100	77,800	900	53,000	97,000	38,000	298,000	1,400	277,000	17,420	17,000	101,000	414,000	-116,000
1992 - 1993	9,000	3,000	27,800	0	7,900	141,000	0	53,300	26,500	900	15,000	62,000	30,000	376,000	1,400	94,000	7,940	28,000	127,000	258,000	118,000
1993 - 1994	0	200	14,200	0	4,700	27,800	0	12,400	69,200	900	24,000	79,000	33,000	265,000	1,400	246,000	0	24,000	107,000	378,000	-113,000
1994 - 1995	28,000	10,400	39,500	0	19,300	108,800	0	34,400	36,100	900	9,000	62,000	33,000	381,000	1,400	129,000	0	26,000	123,000	279,000	102,000
1995 - 1996	0	4,000	26,200	13,400	15,800	69,600	33,800	37,700	30,000	900	2,000	53,000	30,000	316,000	1,400	107,000	0	30,000	126,000	264,000	52,000
1996 - 1997	7,000	9,700	47,300	19,900	16,700	51,200	7,000	43,000	32,700	900	1,000	60,000	31,000	327,000	1,400	116,000	0	28,000	132,000	277,000	50,000
1997 - 1998	44,000	9,000	79,100	28,000	29,100	39,200	10,800	14,400	37,900	900	0	72,000	32,000	396,000	1,400	135,000	0	26,000	134,000	296,000	100,000
1998 - 1999	1,000	2,800	19,500	11,400	10,500	45,800	15,800	34,400	35,800	900	2,000	73,000	30,000	283,000	1,400	127,000	0	28,000	139,000	295,000	-12,000
1999 - 2000	0	2,900	11,100	3,400	12,000	51,300	8,000	32,900	44,400	900	2,000	80,000	30,000	279,000	1,400	158,000	2,820	26,000	129,000	317,000	-38,000
2000 - 2001	0	0	7,000	200	5,700	25,900	2,000	15,600	55,100	900	6,000	94,000	31,000	243,000	1,400	196,000	17,290	22,000	119,000	356,000	-113,000
2001 - 2002	0	700	13,400	0	5,300	20,800	0	16,200	58,100	1,000	15,000	89,000	32,000	252,000	1,500	207,000	25,590	20,000	110,000	364,000	-112,000
2002 - 2003	0	3,700	22,800	5,900	9,700	42,700	3,300	20,600	34,500	1,000	10,000	75,000	29,000	258,000	1,500	143,000	20,610	22,000	117,000	304,000	-46,000
2003 - 2004	0	300	7,700	0	3,800	16,600	0	13,100	48,500	1,000	27,000	78,000	31,000	227,000	1,600	204,000	17,440	20,000	95,000	338,000	-111,000
2004 - 2005	2,000	4,700	22,900	11,800	9,400	76,200	23,500	33,000	23,000	1,100	9,000	56,000	27,000	300,000	1,600	96,000	7,720	26,000	107,000	238,000	62,000
2005 - 2006	3,000	7,200	40,500	16,500	13,800	62,500	17,000	29,500	22,200	1,100	2,000	53,000	27,000	295,000	1,700	93,000	0	29,000	115,000	239,000	56,000
2006 - 2007	0	1,500	5,100	0	3,200	12,700	0	4,900	55,100	1,100	24,000	71,000	30,000	209,000	1,800	231,000	27,930	22,000	85,000	368,000	-159,000
2007 - 2008	0	1,100	15,900	900	5,700	18,200	600	12,600	43,500	1,200	36,000	74,000	29,000	239,000	1,800	183,000	26,140	23,000	93,000	327,000	-88,000
2008 - 2009	0	1,400	7,100	400	4,900	36,400	4,300	17,500	47,600	1,200	47,000	74,000	31,000	273,000	1,900	200,000	21,470	24,000	96,000	343,000	-70,000
2009 - 2010	0	4,500	34,600	5,800	10,200	61,600	15,100	33,500	17,500	1,200	18,000	48,000	27,000	277,000	1,800	74,000	10,770	30,000	122,000	239,000	38,000
2010 - 2011	11,000	7,500	82,400	31,800	15,500	80,300	27,700	30,400	27,500	1,200	6,000	55,000	28,000	404,000	1,900	116,000	3,880	31,000	125,000	278,000	126,000
2011 - 2012	0	300	17,800	1,500	10,100	21,200	4,200	10,900	54,300	1,200	22,000	79,000	31,000	254,000	1,900	228,000	21,600	24,000	109,000	385,000	-131,000
2012 - 2013	0	0	4,400	0	2,400	11,400	0	6,100	60,800	1,100	53,000	88,000	33,000	260,000	1,800	255,000	39,910	25,000	88,000	410,000	-150,000
2013 - 2014	0	0	0	0	0	0	0	0	66,700	1,200	71,000	91,000	32,000	262,000	1,800	280,000	37,120	25,000	81,000	425,000	-163,000
2014 - 2015	0	0	0	0	0	0	0	0	57,900	1,200	74,000	83,000	31,000	247,000	1,800	243,000	33,170	24,000	84,000	386,000	-139,000
2015 - 2016	0	5,500	11,400	800	4,200	27,400	0	11,000	36,200	1,200	53,000	70,000	27,000	248,000	1,800	152,000	28,300	27,000	90,000	299,000	-51,000
2016 - 2017	0	15,900	82,600	28,400	14,500	113,100	34,000	30,400	19,500	1,200	16,000	55,000	24,000	435,000	1,900	82,000	6,810	33,000	112,000	236,000	199,000
36/87-16/17 Avg	3,000	3,200	22,300	5,800	8,200	42,100	6,700	19,700	47,300	1,000	24,000	74,000	32,000	289,000	1,600	181,000	15,200	24,000	110,000	332,000	-43,000

Cumulative Change in Storage | -1,290,000

Groundwater Inflows or Outflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Groundwater Outflows Not Included in Sustainable Yield Estimates

Appendix A
Table 3a

Projected Future Lower Tule River Irrigation District GSA Surface Water Budget

Water Year	Surface Water Inflow (acre-ft)					Total In
	Precipitation	Stream Inflow	Imported Water	Discharge from Wells		
		Tule River	LTRID	Agricultural	Municipal	
2017 - 2018	65,000	79,995	143,186	149,000	1,900	439,000
2018 - 2019	65,000	79,995	143,186	149,000	1,900	439,000
2019 - 2020	65,000	79,995	143,186	149,000	1,900	439,000
2020 - 2021	65,000	79,995	143,186	149,000	1,900	439,000
2021 - 2022	65,000	79,995	143,186	149,000	1,900	439,000
2022 - 2023	65,000	79,995	143,186	149,000	1,900	439,000
2023 - 2024	65,000	79,995	143,186	149,000	1,900	439,000
2024 - 2025	65,000	82,595	135,513	151,000	1,900	436,000
2025 - 2026	65,000	82,595	127,841	155,000	1,900	432,000
2026 - 2027	65,000	82,595	120,168	159,000	1,900	429,000
2027 - 2028	65,000	82,595	112,496	164,000	1,900	426,000
2028 - 2029	65,000	82,595	104,823	168,000	1,900	422,000
2029 - 2030	65,000	81,976	97,151	172,000	1,900	418,000
2030 - 2031	65,000	81,976	97,151	172,000	1,900	418,000
2031 - 2032	65,000	81,976	97,151	172,000	1,900	418,000
2032 - 2033	65,000	81,976	97,151	172,000	1,900	418,000
2033 - 2034	65,000	81,976	97,151	172,000	1,900	418,000
2034 - 2035	65,000	81,976	97,151	171,000	1,900	417,000
2035 - 2036	65,000	81,976	97,151	171,000	1,900	417,000
2036 - 2037	65,000	81,976	97,151	171,000	1,900	417,000
2037 - 2038	65,000	81,976	97,151	171,000	1,900	417,000
2038 - 2039	65,000	81,976	97,151	171,000	1,900	417,000
2039 - 2040	65,000	81,976	97,151	152,000	1,900	398,000
2040 - 2041	65,000	81,976	97,151	152,000	1,900	398,000
2041 - 2042	65,000	81,976	97,151	152,000	1,900	398,000
2042 - 2043	65,000	81,976	97,151	152,000	1,900	398,000
2043 - 2044	65,000	81,976	97,151	152,000	1,900	398,000
2044 - 2045	65,000	81,976	97,151	152,000	1,900	398,000
2045 - 2046	65,000	81,976	97,151	152,000	1,900	398,000
2046 - 2047	65,000	81,976	97,151	152,000	1,900	398,000
2047 - 2048	65,000	81,976	97,151	152,000	1,900	398,000
2048 - 2049	65,000	81,976	97,151	152,000	1,900	398,000
2049 - 2050	65,000	81,976	97,151	152,000	1,900	398,000
2050 - 2051	65,000	79,772	84,084	141,000	1,900	372,000
2051 - 2052	65,000	79,772	84,084	141,000	1,900	372,000
2052 - 2053	65,000	79,772	84,084	141,000	1,900	372,000
2053 - 2054	65,000	79,772	84,084	141,000	1,900	372,000
2054 - 2055	65,000	79,772	84,084	141,000	1,900	372,000
2055 - 2056	65,000	79,772	84,084	141,000	1,900	372,000
2056 - 2057	65,000	79,772	84,084	141,000	1,900	372,000
2057 - 2058	65,000	79,772	84,084	141,000	1,900	372,000
2058 - 2059	65,000	79,772	84,084	141,000	1,900	372,000
2059 - 2060	65,000	79,772	84,084	141,000	1,900	372,000
2060 - 2061	65,000	79,772	84,084	141,000	1,900	372,000
2061 - 2062	65,000	79,772	84,084	141,000	1,900	372,000
2062 - 2063	65,000	79,772	84,084	141,000	1,900	372,000
2063 - 2064	65,000	79,772	84,084	141,000	1,900	372,000
2064 - 2065	65,000	79,772	84,084	141,000	1,900	372,000
2065 - 2066	65,000	79,772	84,084	141,000	1,900	372,000
2066 - 2067	65,000	79,772	84,084	141,000	1,900	372,000
2067 - 2068	65,000	79,772	84,084	141,000	1,900	372,000
2068 - 2069	65,000	79,772	84,084	141,000	1,900	372,000
2069 - 2070	65,000	79,772	84,084	141,000	1,900	372,000
17/18-69/70 Avg	65,000	80,900	100,500	152,000	1,900	400,000

Appendix A
Table 3b

Projected Future Lower Tule River Irrigation District GSA Surface Water Budget

Water Year	Surface Water Outflow (acre-ft)																	Total Out
	Areal Recharge of Precipitation	Streambed Infiltration	Canal Loss		Recharge in Basins		Deep Percolation of Applied Water				Evapotranspiration						Surface Outflow	
		Tule River										Tule River		Imported Water	Ag. Cons. Use from Pumping	Municipal (Landscape ET)		
		Oettle Bridge to Turnbull Weir Infiltration	Tule River	Imported Water	Tule River	Imported Water	Tule River	Imported Water	Agricultural Pumping	Municipal Pumping	Precipitation Crops/Native	Agricultural Cons. Use	Stream Channel	Agricultural Cons. Use			Tule River	
2017 - 2018	3,000	3,900	17,000	52,400	6,400	11,400	10,800	19,400	35,400	1,200	61,000	33,500	300	59,900	113,000	700	15,000	444,000
2018 - 2019	3,000	3,900	17,000	52,400	6,400	11,400	10,800	19,400	35,400	1,200	61,000	33,500	300	59,900	113,000	700	8,000	437,000
2019 - 2020	3,000	3,900	17,000	52,400	6,400	11,400	10,800	19,400	35,400	1,200	61,000	33,500	300	59,900	113,000	700	8,000	437,000
2020 - 2021	3,000	3,900	17,000	52,400	6,400	11,400	10,800	19,400	35,400	1,200	61,000	33,500	300	59,900	113,000	700	8,000	437,000
2021 - 2022	3,000	3,900	17,000	52,400	6,400	11,400	10,800	19,400	35,400	1,200	61,000	33,500	300	59,900	113,000	700	8,000	437,000
2022 - 2023	3,000	3,900	17,000	52,400	6,400	11,400	10,800	19,400	35,400	1,200	61,000	33,500	300	59,900	113,000	700	8,000	437,000
2023 - 2024	3,000	3,900	17,000	52,400	6,400	11,400	10,800	19,400	35,400	1,200	61,000	33,500	300	59,900	113,000	700	8,000	437,000
2024 - 2025	3,000	3,900	18,200	49,600	6,600	10,800	11,200	18,400	35,900	1,200	61,000	34,600	300	56,700	115,000	700	8,000	435,000
2025 - 2026	3,000	3,900	18,400	46,800	6,600	10,200	11,200	17,300	36,900	1,200	61,000	34,600	300	53,500	118,000	700	8,000	432,000
2026 - 2027	3,000	3,900	18,700	44,000	6,600	9,600	11,200	16,300	37,900	1,200	61,000	34,600	300	50,300	121,000	700	8,000	428,000
2027 - 2028	3,000	3,900	19,000	41,200	6,600	8,900	11,200	15,300	38,900	1,200	61,000	34,500	300	47,000	125,000	700	7,000	425,000
2028 - 2029	3,000	3,900	19,300	38,400	6,600	8,300	11,200	14,300	40,000	1,200	61,000	34,500	300	43,800	128,000	700	7,000	422,000
2029 - 2030	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,200	40,900	1,200	61,000	34,200	300	40,600	131,000	700	7,000	417,000
2030 - 2031	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,200	40,900	1,200	61,000	34,200	300	40,600	131,000	700	7,000	417,000
2031 - 2032	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,200	40,900	1,200	61,000	34,200	300	40,600	131,000	700	7,000	417,000
2032 - 2033	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,200	40,900	1,200	61,000	34,200	300	40,600	131,000	700	7,000	417,000
2033 - 2034	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,200	40,900	1,200	61,000	34,200	300	40,600	131,000	700	7,000	417,000
2034 - 2035	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	40,700	1,200	61,000	34,200	300	40,600	130,000	700	7,000	416,000
2035 - 2036	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	40,700	1,200	61,000	34,200	300	40,600	130,000	700	7,000	416,000
2036 - 2037	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	40,700	1,200	61,000	34,200	300	40,600	130,000	700	7,000	416,000
2037 - 2038	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	40,700	1,200	61,000	34,200	300	40,600	130,000	700	7,000	416,000
2038 - 2039	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	40,700	1,200	61,000	34,200	300	40,600	130,000	700	7,000	416,000
2039 - 2040	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2040 - 2041	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2041 - 2042	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2042 - 2043	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2043 - 2044	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2044 - 2045	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2045 - 2046	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2046 - 2047	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2047 - 2048	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2048 - 2049	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2049 - 2050	3,000	3,900	19,400	35,600	6,500	7,700	11,200	13,300	36,200	1,200	61,000	34,200	300	40,600	116,000	700	7,000	398,000
2050 - 2051	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2051 - 2052	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2052 - 2053	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2053 - 2054	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2054 - 2055	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2055 - 2056	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2056 - 2057	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2057 - 2058	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2058 - 2059	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2059 - 2060	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2060 - 2061	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2061 - 2062	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2062 - 2063	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2063 - 2064	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2064 - 2065	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2065 - 2066	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2066 - 2067	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2067 - 2068	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2068 - 2069	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
2069 - 2070	3,000	3,800	19,300	30,800	6,300	6,700	10,900	11,500	33,600	1,200	61,000	33,300	300	35,100	108,000	700	6,000	372,000
17/18-69/70 Avg	3,000	3,900	19,000	36,800	6,400	8,000	11,000	13,700	36,100	1,200	61,000	33,800	300	42,000	116,000	700	6,900	400,000

Projected Future Lower Tule River Irrigation District GSA Groundwater Budget

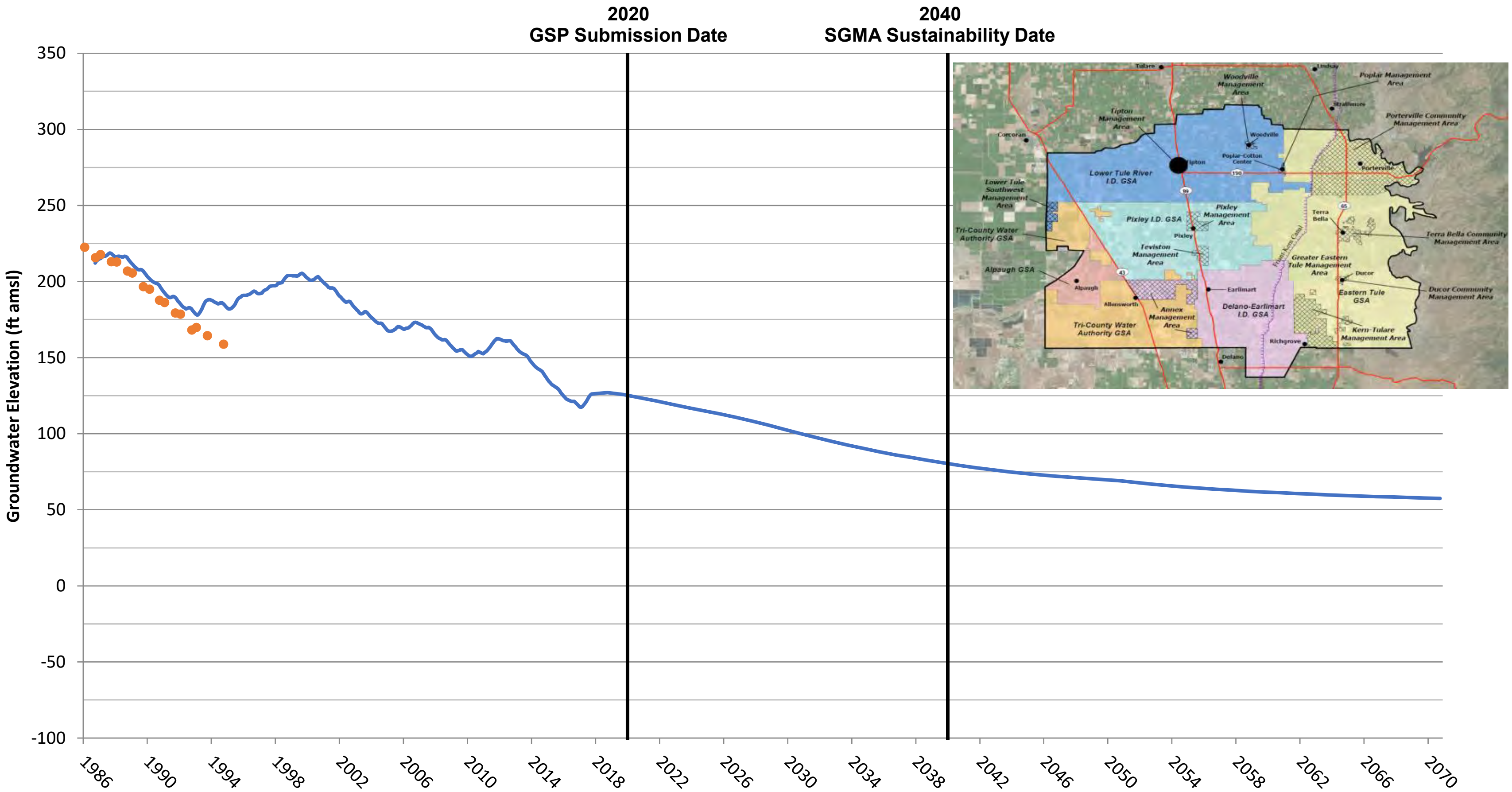
Water Year	Groundwater Inflows (acre-ft)													Total In	Groundwater Outflows (acre-ft)					Total Out	Change in Storage (acre-ft)
	Areal Recharge from Precipitation	Tule River				Imported Water Deliveries			Agricultural Pumping	Municipal Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow			Groundwater Pumping			Sub-surface Outflow			
		Oettle Bridge to Turnbull Weir Infiltration	Canal Loss	Recharge in Basins	Return Flow	Canal Loss	Recharge in Basins	Return Flow	Return Flow	Return Flow		From Outside Subbasin	From Other GSAs		Muni-cipal	Agri-cultural	Exports	To Outside Subbasin	To Other GSAs		
2017 - 2018	3,000	3,900	17,000	6,400	10,800	52,400	11,400	19,400	35,400	1,200	10,000	44,000	42,000	257,000	1,900	149,000	11,640	41,000	98,000	302,000	-45,000
2018 - 2019	3,000	3,900	17,000	6,400	10,800	52,400	11,400	19,400	35,400	1,200	12,000	43,000	43,000	259,000	1,900	149,000	11,640	41,000	96,000	300,000	-41,000
2019 - 2020	3,000	3,900	17,000	6,400	10,800	52,400	11,400	19,400	35,400	1,200	14,000	41,000	44,000	260,000	1,900	149,000	11,640	41,000	93,000	297,000	-37,000
2020 - 2021	3,000	3,900	17,000	6,400	10,800	52,400	11,400	19,400	35,400	1,200	16,000	39,000	44,000	260,000	1,900	149,000	11,640	41,000	92,000	296,000	-36,000
2021 - 2022	3,000	3,900	17,000	6,400	10,800	52,400	11,400	19,400	35,400	1,200	17,000	37,000	45,000	260,000	1,900	149,000	11,640	41,000	91,000	295,000	-35,000
2022 - 2023	3,000	3,900	17,000	6,400	10,800	52,400	11,400	19,400	35,400	1,200	18,000	35,000	45,000	259,000	1,900	149,000	11,640	42,000	90,000	295,000	-36,000
2023 - 2024	3,000	3,900	17,000	6,400	10,800	52,400	11,400	19,400	35,400	1,200	19,000	33,000	46,000	259,000	1,900	149,000	11,640	42,000	89,000	294,000	-35,000
2024 - 2025	3,000	3,900	18,200	6,600	11,200	49,600	10,800	18,400	35,900	1,200	20,000	32,000	46,000	257,000	1,900	151,000	11,640	43,000	85,000	293,000	-36,000
2025 - 2026	3,000	3,900	18,400	6,600	11,200	46,800	10,200	17,300	36,900	1,200	20,000	31,000	47,000	254,000	1,900	155,000	8,730	43,000	83,000	292,000	-38,000
2026 - 2027	3,000	3,900	18,700	6,600	11,200	44,000	9,600	16,300	37,900	1,200	22,000	31,000	48,000	253,000	1,900	159,000	8,730	43,000	80,000	293,000	-40,000
2027 - 2028	3,000	3,900	19,000	6,600	11,200	41,200	8,900	15,300	38,900	1,200	23,000	31,000	48,000	251,000	1,900	164,000	8,730	43,000	78,000	296,000	-45,000
2028 - 2029	3,000	3,900	19,300	6,600	11,200	38,400	8,300	14,300	40,000	1,200	24,000	32,000	49,000	251,000	1,900	168,000	8,730	42,000	75,000	296,000	-45,000
2029 - 2030	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,200	40,900	1,200	24,000	32,000	50,000	249,000	1,900	172,000	8,730	42,000	70,000	295,000	-46,000
2030 - 2031	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,200	40,900	1,200	23,000	31,000	51,000	248,000	1,900	172,000	5,820	42,000	68,000	290,000	-42,000
2031 - 2032	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,200	40,900	1,200	23,000	32,000	51,000	249,000	1,900	172,000	5,820	42,000	67,000	289,000	-40,000
2032 - 2033	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,200	40,900	1,200	22,000	32,000	52,000	249,000	1,900	172,000	5,820	41,000	65,000	286,000	-37,000
2033 - 2034	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,200	40,900	1,200	22,000	32,000	52,000	249,000	1,900	172,000	5,820	41,000	64,000	285,000	-36,000
2034 - 2035	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	40,700	1,200	20,000	31,000	53,000	247,000	1,900	171,000	5,820	42,000	56,000	277,000	-30,000
2035 - 2036	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	40,700	1,200	18,000	31,000	53,000	245,000	1,900	171,000	2,910	42,000	54,000	272,000	-27,000
2036 - 2037	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	40,700	1,200	17,000	31,000	53,000	244,000	1,900	171,000	2,910	41,000	52,000	269,000	-25,000
2037 - 2038	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	40,700	1,200	16,000	31,000	53,000	243,000	1,900	171,000	2,910	41,000	50,000	267,000	-24,000
2038 - 2039	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	40,700	1,200	16,000	31,000	53,000	243,000	1,900	171,000	2,910	41,000	48,000	265,000	-22,000
2039 - 2040	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	12,000	29,000	53,000	232,000	1,900	152,000	0	42,000	47,000	243,000	-11,000
2040 - 2041	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	10,000	30,000	53,000	231,000	1,900	152,000	0	42,000	46,000	242,000	-11,000
2041 - 2042	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	10,000	30,000	53,000	231,000	1,900	152,000	0	42,000	45,000	241,000	-10,000
2042 - 2043	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	9,000	30,000	53,000	230,000	1,900	152,000	0	42,000	44,000	240,000	-10,000
2043 - 2044	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	8,000	30,000	53,000	229,000	1,900	152,000	0	42,000	43,000	239,000	-10,000
2044 - 2045	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	8,000	31,000	53,000	230,000	1,900	152,000	0	42,000	42,000	238,000	-8,000
2045 - 2046	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	7,000	31,000	53,000	229,000	1,900	152,000	0	41,000	42,000	237,000	-8,000
2046 - 2047	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	7,000	31,000	53,000	229,000	1,900	152,000	0	41,000	41,000	236,000	-7,000
2047 - 2048	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	7,000	31,000	54,000	230,000	1,900	152,000	0	41,000	41,000	236,000	-6,000
2048 - 2049	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	6,000	31,000	54,000	229,000	1,900	152,000	0	41,000	41,000	236,000	-7,000
2049 - 2050	3,000	3,900	19,400	6,500	11,200	35,600	7,700	13,300	36,200	1,200	6,000	32,000	54,000	230,000	1,900	152,000	0	41,000	40,000	235,000	-5,000
2050 - 2051	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	6,000	31,000	54,000	218,000	1,900	141,000	0	41,000	41,000	225,000	-7,000
2051 - 2052	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	6,000	31,000	54,000	218,000	1,900	141,000	0	41,000	41,000	225,000	-7,000
2052 - 2053	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	6,000	31,000	54,000	218,000	1,900	141,000	0	41,000	41,000	225,000	-7,000
2053 - 2054	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	6,000	31,000	54,000	218,000	1,900	141,000	0	41,000	40,000	224,000	-6,000
2054 - 2055	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	5,000	31,000	54,000	217,000	1,900	141,000	0	41,000	40,000	224,000	-7,000
2055 - 2056	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	5,000	32,000	54,000	218,000	1,900	141,000	0	41,000	40,000	224,000	-6,000
2056 - 2057	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	5,000	32,000	54,000	218,000	1,900	141,000	0	41,000	39,000	223,000	-5,000
2057 - 2058	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	5,000	32,000	54,000	218,000	1,900	141,000	0	41,000	39,000	223,000	-5,000
2058 - 2059	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	5,000	32,000	54,000	218,000	1,900	141,000	0	41,000	39,000	223,000	-5,000
2059 - 2060	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	5,000	32,000	54,000	218,000	1,900	141,000	0	41,000	39,000	223,000	-5,000
2060 - 2061	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	4,000	32,000	54,000	217,000	1,900	141,000	0	41,000	39,000	223,000	-6,000
2061 - 2062	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	4,000	33,000	54,000	218,000	1,900	141,000	0	41,000	39,000	223,000	-5,000
2062 - 2063	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	4,000	33,000	54,000	218,000	1,900	141,000	0	41,000	39,000	223,000	-5,000
2063 - 2064	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	4,000	33,000	54,000	218,000	1,900	141,000	0	41,000	39,000	223,000	-5,000
2064 - 2065	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	4,000	33,000	54,000	218,000	1,900	141,000	0	41,000	39,000	223,000	-5,000
2065 - 2066	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	4,000	33,000	54,000	218,000	1,900	141,000	0	41,000	38,000	222,000	-4,000
2066 - 2067	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	4,000	33,000	54,000	218,000	1,900	141,000	0	41,000	38,000	222,000	-4,000
2067 - 2068	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	3,000	33,000	54,000	217,000	1,900	141,000	0	41,000	39,000	223,000	-6,000
2068 - 2069	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	3,000	33,000	54,000	217,000	1,900	141,000	0	41,000	38,000	222,000	-5,000
2069 - 2070	3,000	3,800	19,300	6,300	10,900	30,800	6,700	11,500	33,600	1,200	3,000	33,000	54,000	217,000	1,900	141,000	0	41,000	38,000	222,000	-5,000
17/18-69/70 Avg	3,000	3,900	19,000	6,400	11,000	36,800	8,000	13,700	36,100	1,200	11,000	33,000	52,000	235,000	1,900	152,000	3,300	41,000	55,000	253,000	-18,000

Tule Subbasin
Basin Setting

Lower Tule River Irrigation District GSA
Representative Monitoring Site

Appendix A
Figure **1**

21S/24E-36A01
Upper Aquifer



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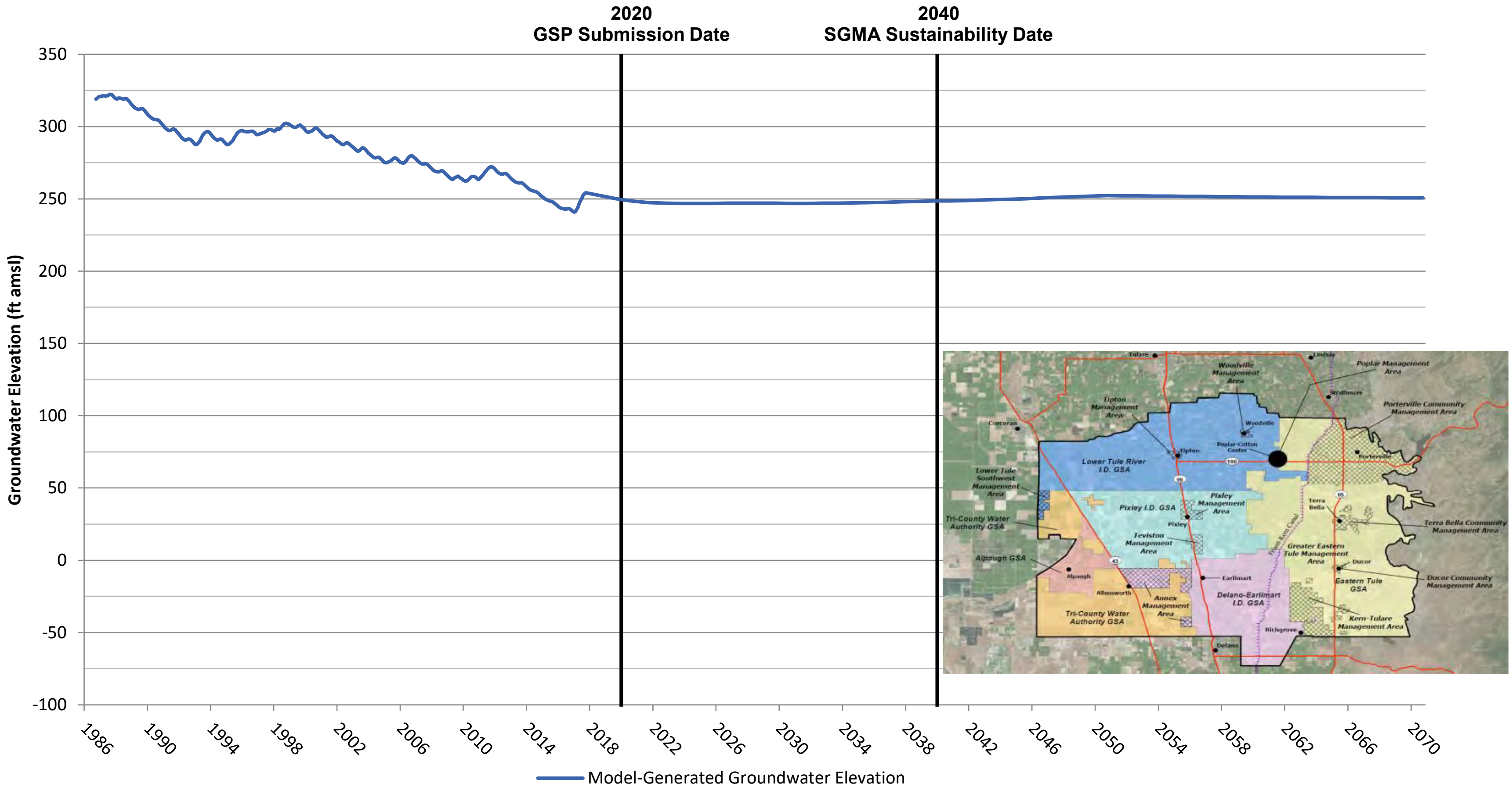
Lower Tule River Irrigation District GSA
Representative Monitoring Site

Appendix A
Figure 2

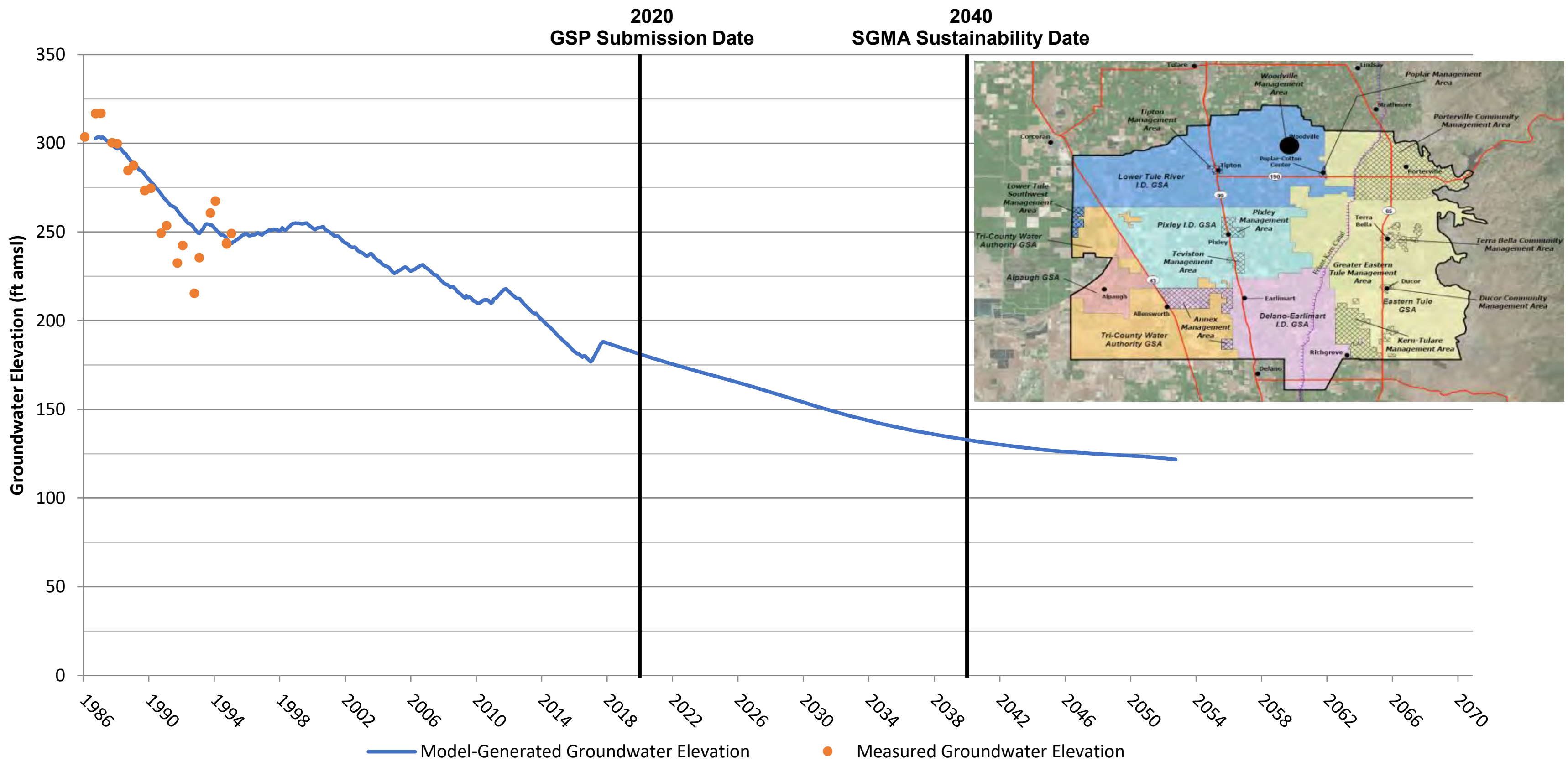
21S/26E-34
Upper Aquifer
Perforations: 253 to -27 (ft amsl)



Lower Tule River Irrigation District GSA
Representative Monitoring Site

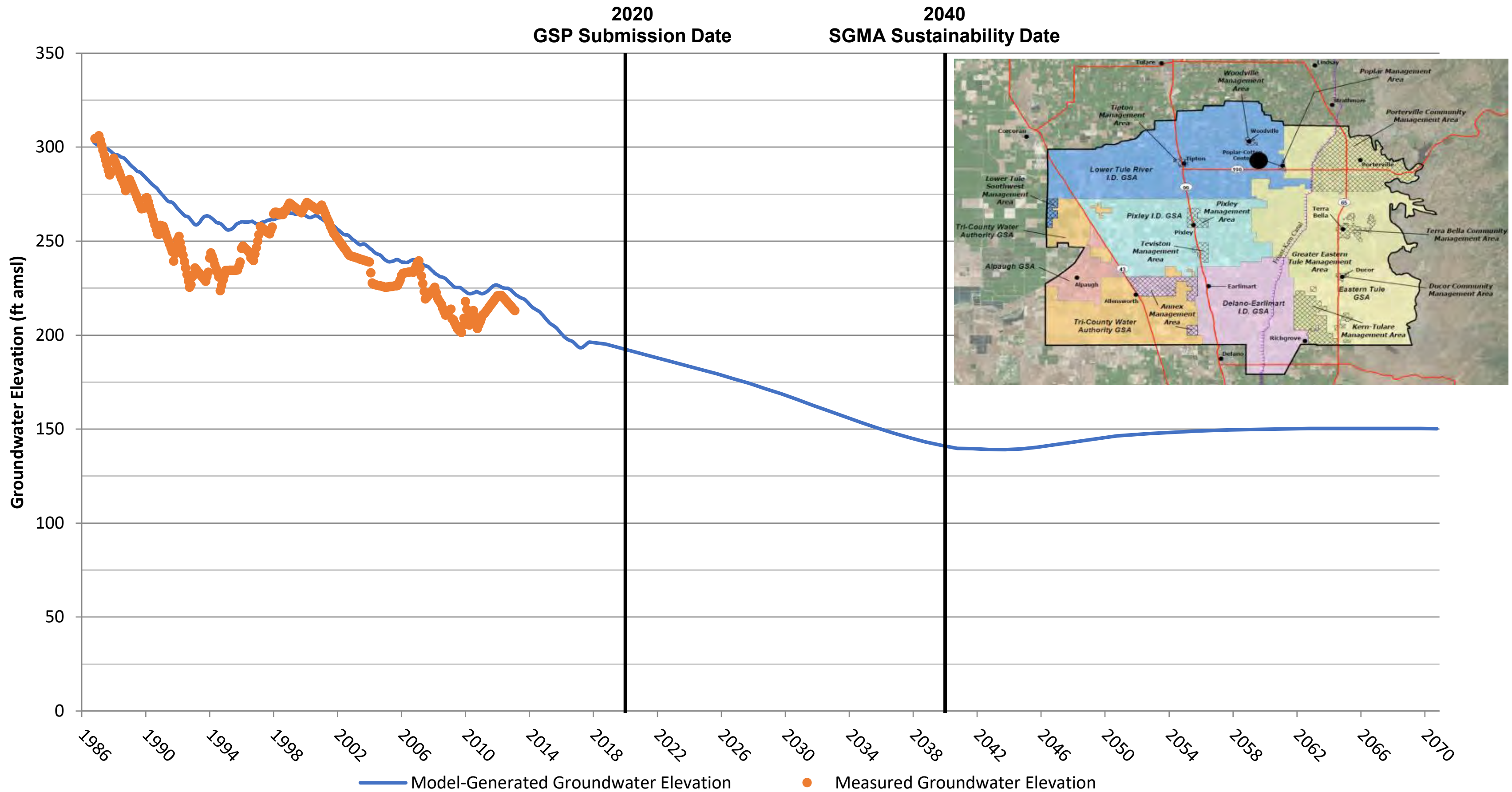
Appendix A
Figure **3**

21S/26E-17N01
Upper Aquifer



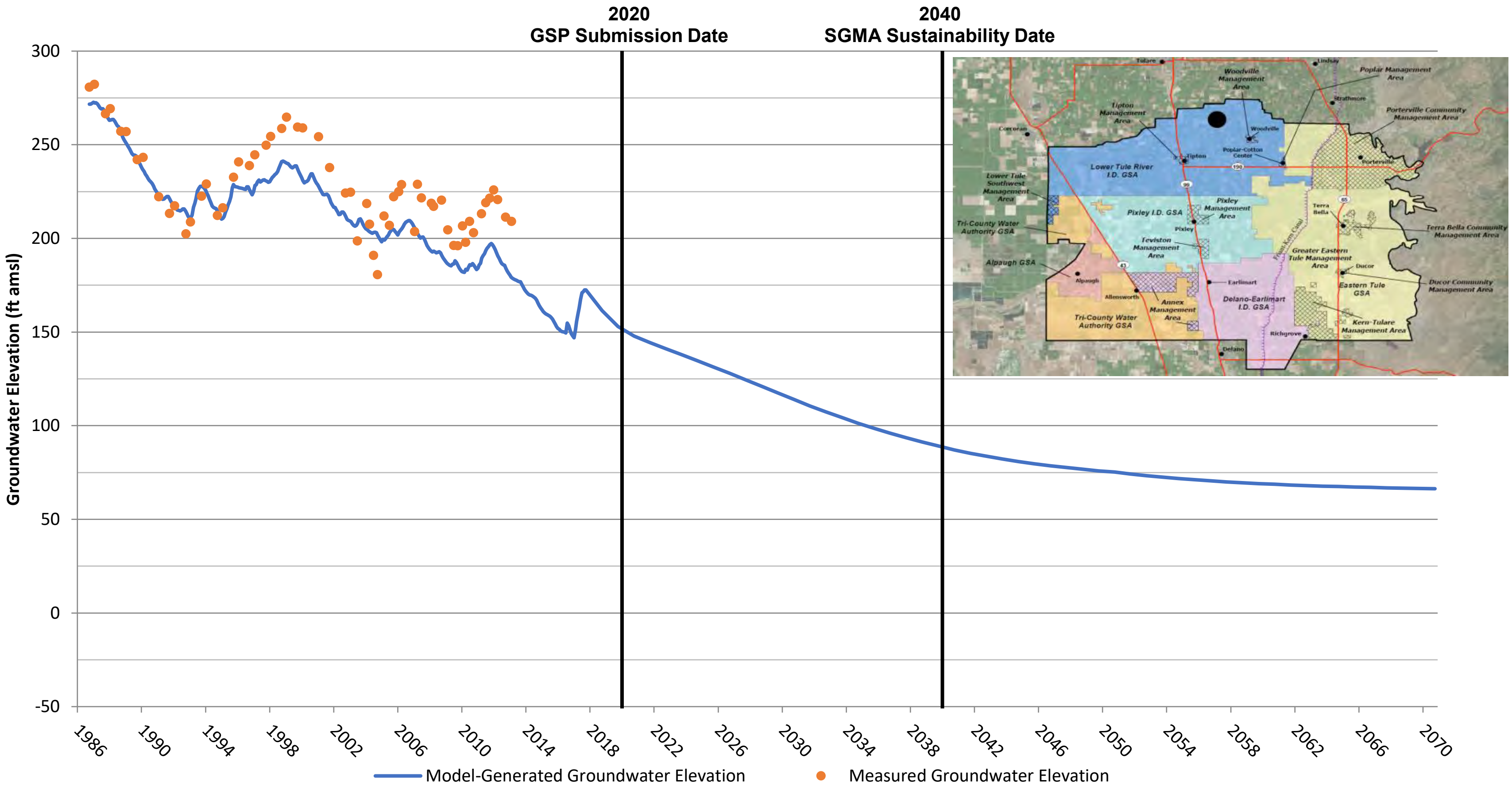
Lower Tule River Irrigation District GSA
Representative Monitoring Site

21S/26E-32A01
Upper Aquifer
Perforations: 194 to 86 (ft amsl)



Lower Tule River Irrigation District GSA
Representative Monitoring Site

21S/25E-03R01
Upper Aquifer
Perforations: 153 to 60 (ft amsl)

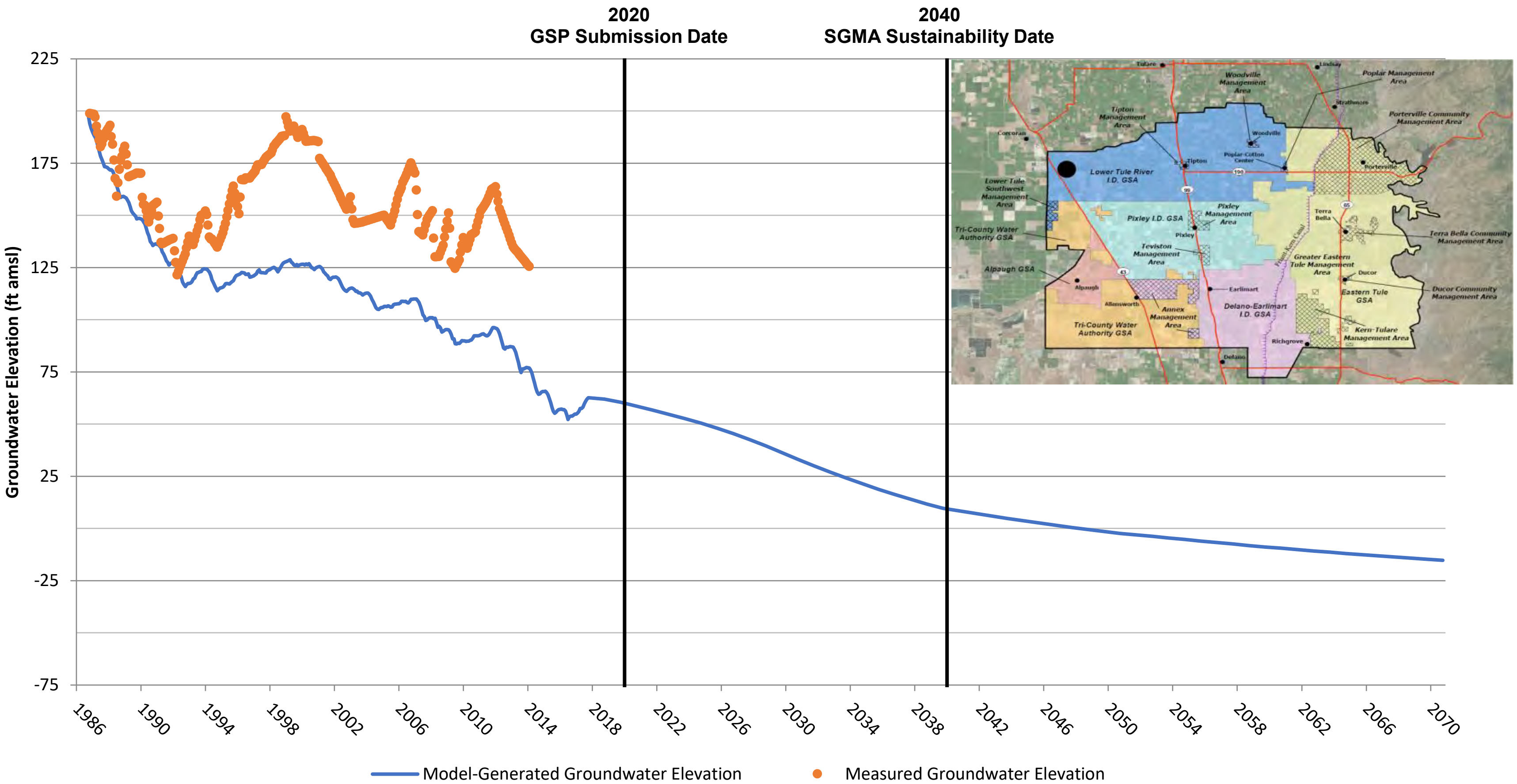


Tule Subbasin
Basin Setting

Lower Tule River Irrigation District GSA
Representative Monitoring Site

Appendix A
Figure **6**

21S/23E-32K01
Upper Aquifer
Perforations: 96 to -202 (ft amsl)



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Lower Tule River Irrigation District GSA
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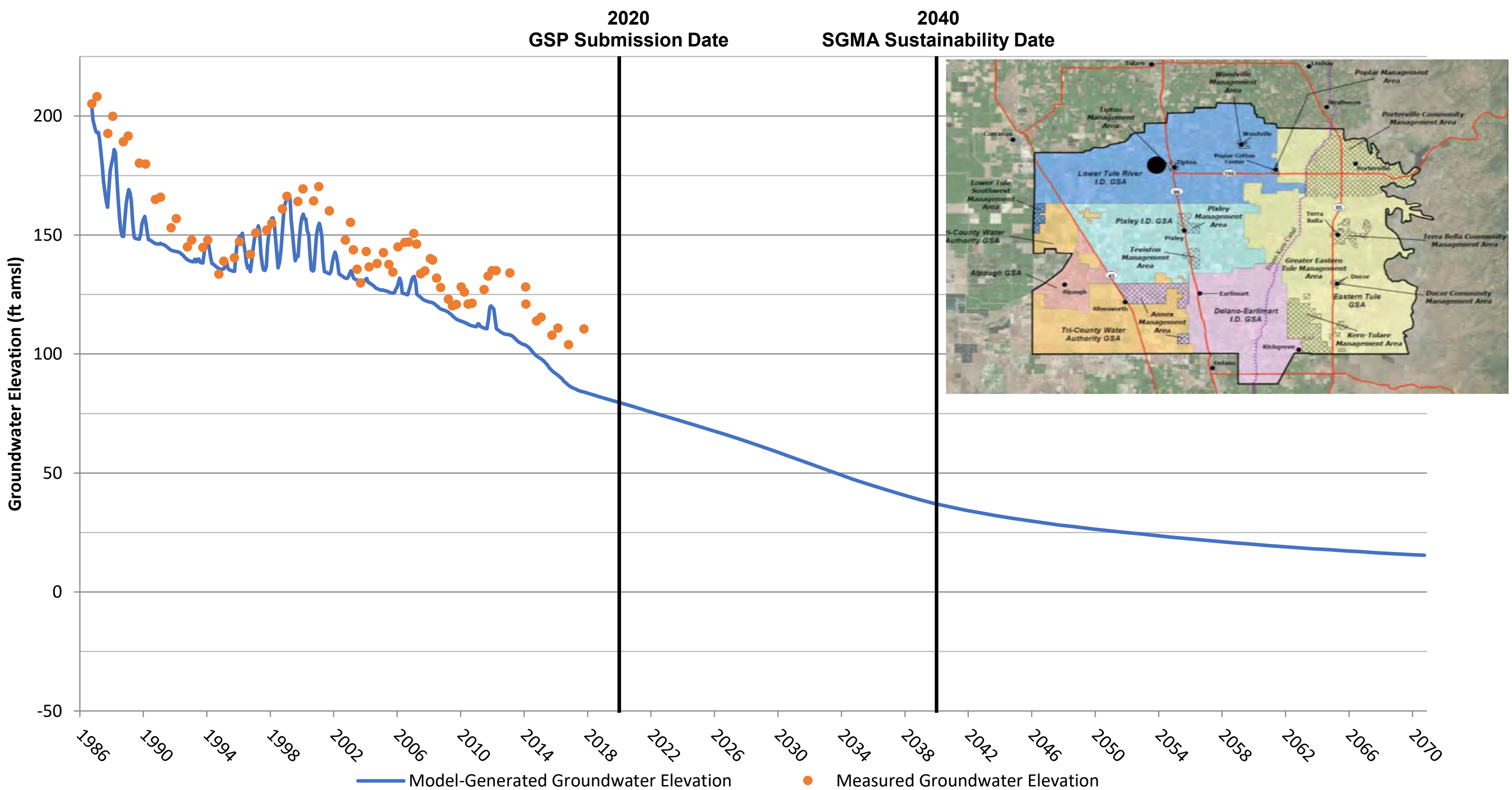
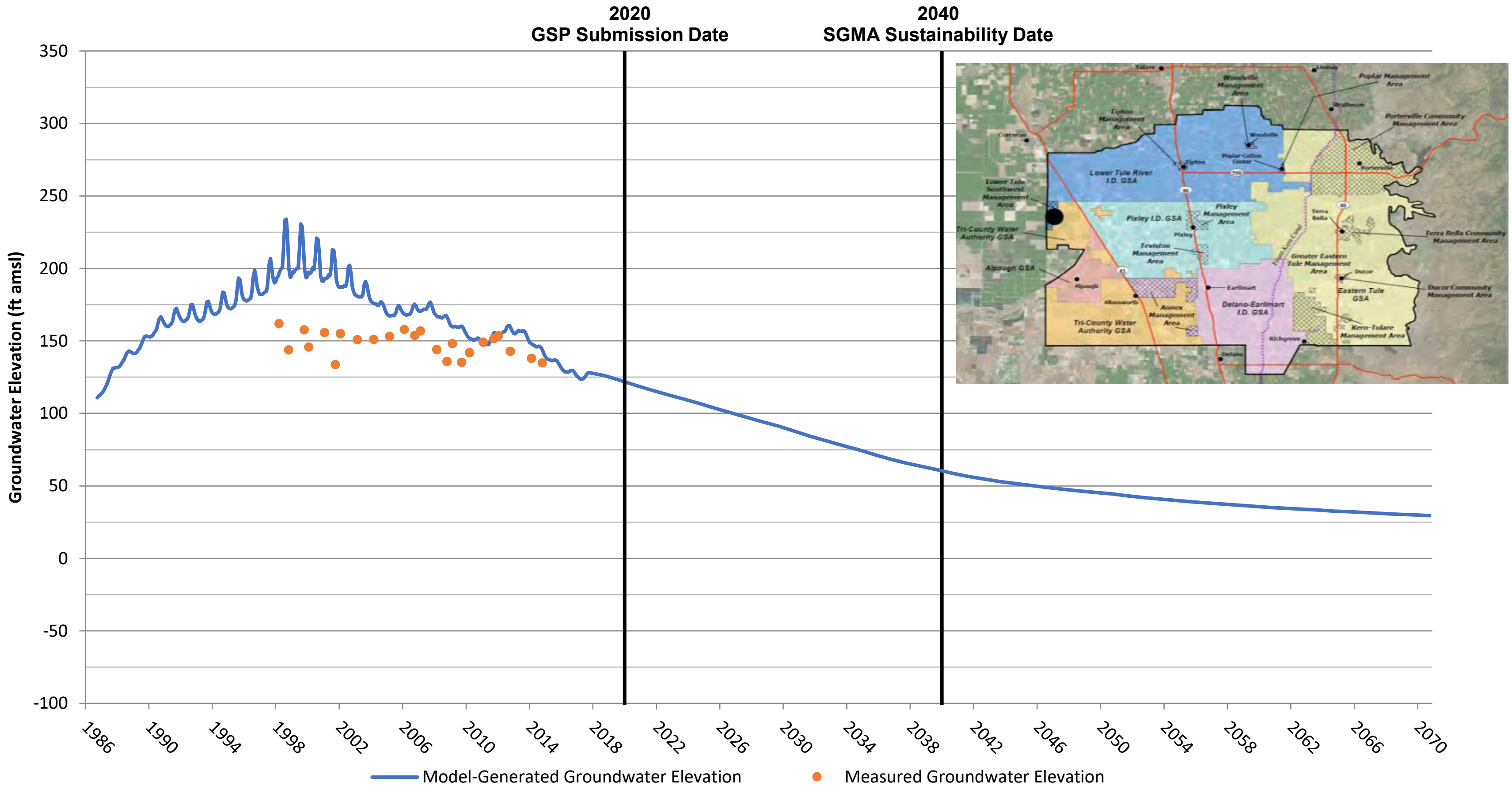
21S/24E-35A01
Upper Aquifer
Perforations: 4 to -53 (ft amsl)



Lower Tule River Irrigation District GSA
Representative Monitoring Site

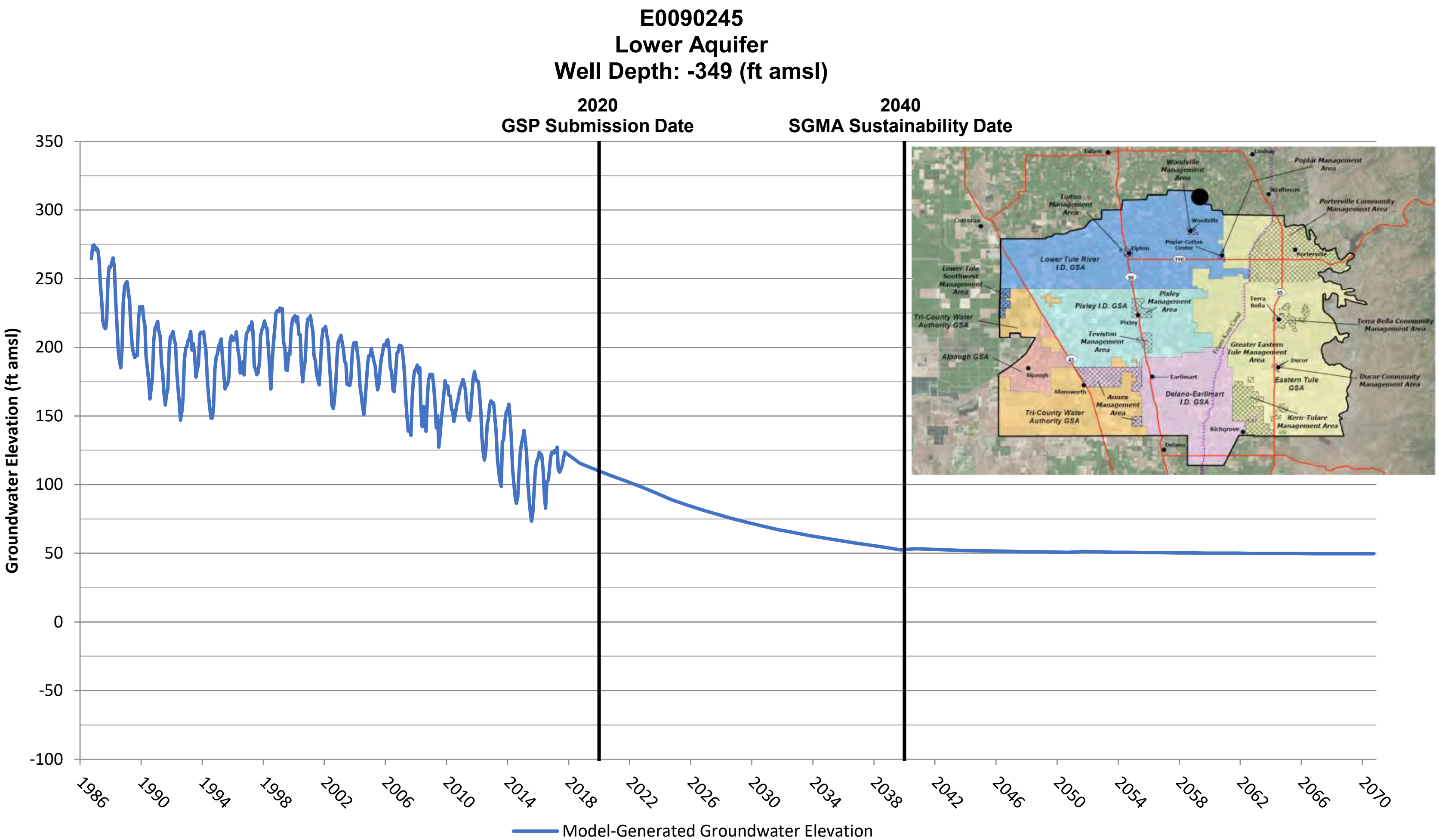
22S/23E-30J01
Upper Aquifer
Perforations: -44 to -254 (ft amsl)



Tule Subbasin
Basin Setting

Lower Tule River Irrigation District GSA
Representative Monitoring Site

Appendix A
Figure **9**



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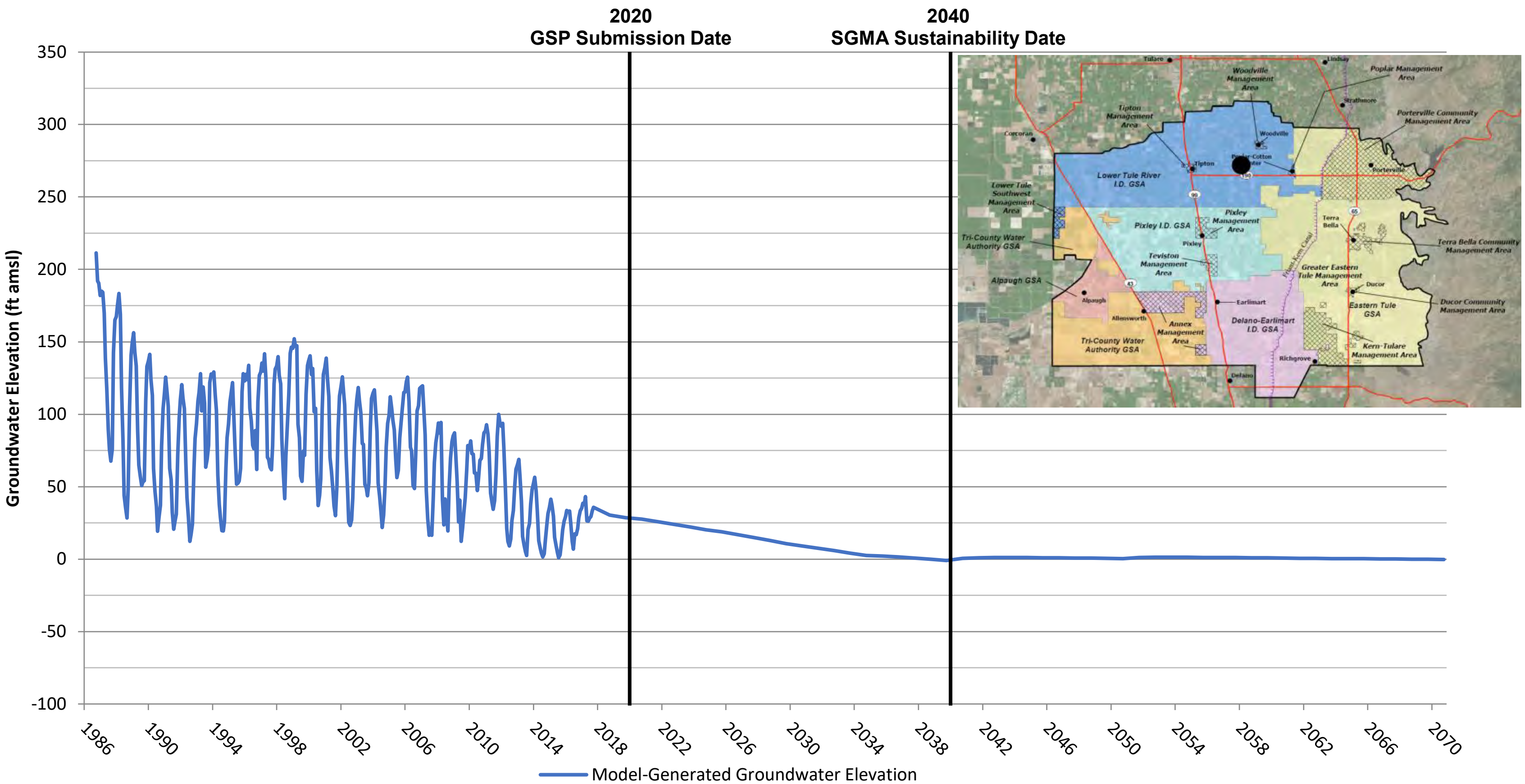
Lower Tule River Irrigation District GSA
Representative Monitoring Site

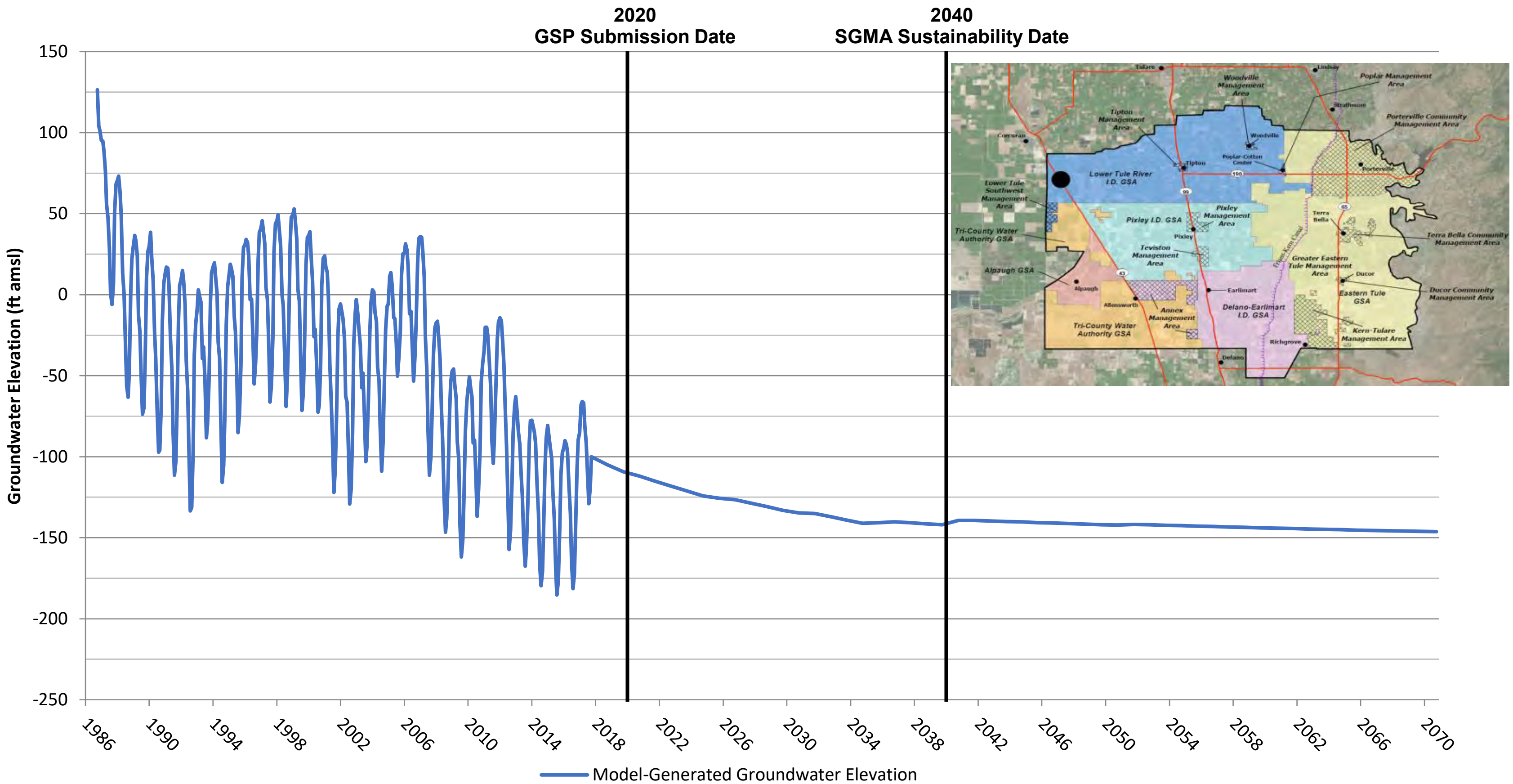
Appendix A
Figure 10

E0084286
Lower Aquifer
Well Depth: -332 (ft amsl)



Lower Tule River Irrigation District GSA
Representative Monitoring Site

E0094101
Lower Aquifer
Perforations: -380 to -1,030 (ft amsl)



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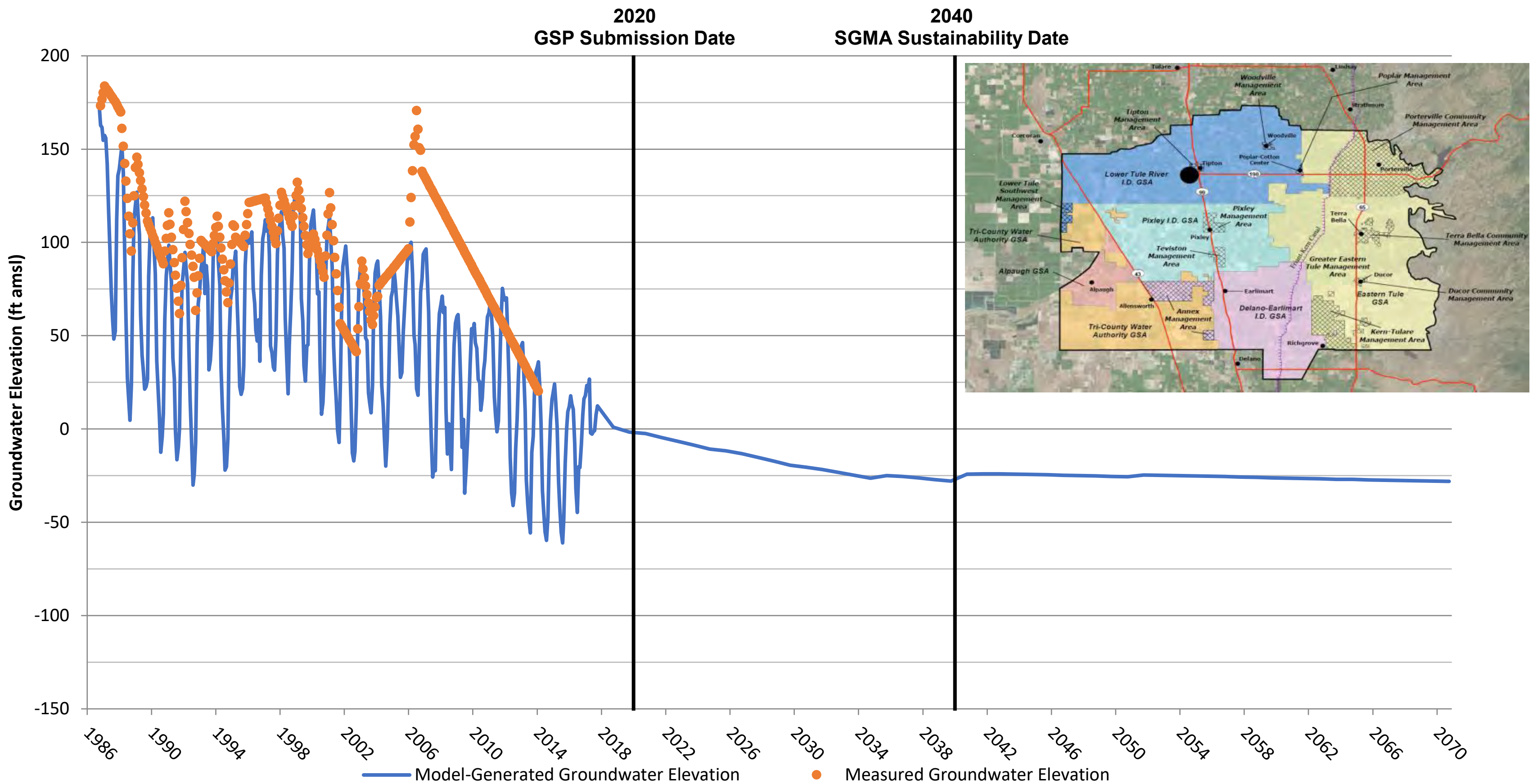
Lower Tule River Irrigation District GSA
Representative Monitoring Site

Appendix A
Figure 12

22S/24E-01Q01
Lower Aquifer
Perforations: -211 to -431 (ft amsl)



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Appendix B

Eastern Tule GSA

Water Budgets and Hydrographs

Appendix B
Table 1a

Eastern Tule GSA
Historical Surface Water Budget 1986/87 to 2016/17

	Surface Water Inflow (acre-ft)											
Water Year	Precip-itation	Stream Inflow			Imported Water					Discharge from Wells		Total In
		Tule River	Deer Creek	White River	Saucelito ID	Terra Bella ID	Kern-Tulare WD	Porterville ID	Tea Pot Dome WD	Agricultural	Municipal	
1986 - 1987	92,000	70,029	8,389	2,496	23,879	13,136	10,899	15,337	5,490	207,000	9,600	458,000
1987 - 1988	132,000	39,842	6,095	1,420	19,666	21,961	12,210	13,067	5,493	207,000	11,100	470,000
1988 - 1989	107,000	49,667	7,795	1,942	22,426	22,561	11,991	13,106	6,226	206,000	11,700	460,000
1989 - 1990	103,000	29,342	4,706	778	16,166	23,159	11,371	11,520	6,193	215,000	12,200	433,000
1990 - 1991	139,000	51,275	7,247	1,362	19,848	18,725	9,762	11,322	5,636	218,000	12,600	495,000
1991 - 1992	120,000	34,325	4,080	739	21,336	20,743	11,700	15,569	6,607	207,000	12,900	455,000
1992 - 1993	194,000	115,640	15,422	3,623	41,261	18,180	12,357	12,310	6,968	181,000	13,100	614,000
1993 - 1994	123,000	61,313	6,908	1,148	22,064	18,740	14,255	12,895	6,526	206,000	13,500	486,000
1994 - 1995	256,000	218,480	32,053	10,596	37,477	16,186	11,681	9,455	6,562	180,000	13,400	792,000
1995 - 1996	135,000	174,473	23,095	5,957	48,924	21,617	15,415	13,808	7,993	163,000	13,600	623,000
1996 - 1997	189,000	353,968	58,781	12,920	40,908	20,158	15,736	13,379	7,298	172,000	14,500	899,000
1997 - 1998	305,000	439,125	88,360	36,764	28,221	13,165	11,745	10,159	4,913	195,000	13,700	1,146,000
1998 - 1999	156,000	108,466	18,410	7,469	37,062	17,567	14,527	16,107	9,218	185,000	13,700	584,000
1999 - 2000	149,000	102,354	15,230	4,878	39,734	19,200	16,476	15,545	7,191	186,000	14,600	570,000
2000 - 2001	111,000	55,249	7,016	4,695	25,252	19,194	17,550	15,436	6,456	200,000	14,700	477,000
2001 - 2002	106,000	73,206	10,370	6,176	26,131	20,234	15,088	13,628	6,388	201,000	16,400	495,000
2002 - 2003	104,000	125,004	15,678	5,875	33,692	18,356	14,591	14,646	5,844	190,000	16,000	544,000
2003 - 2004	87,000	51,738	6,882	2,350	26,988	20,352	15,755	14,698	6,913	191,000	17,000	441,000
2004 - 2005	166,000	172,558	22,758	6,502	42,840	15,266	13,495	14,748	5,217	172,000	15,800	647,000
2005 - 2006	168,000	195,667	23,868	7,588	45,106	21,763	14,507	13,251	6,436	159,000	16,600	672,000
2006 - 2007	71,000	38,587	6,901	1,815	16,280	20,797	15,133	9,775	5,489	207,000	17,500	410,000
2007 - 2008	79,000	74,030	8,411	2,355	24,083	18,192	17,689	12,988	6,894	192,000	17,700	453,000
2008 - 2009	85,000	54,737	6,620	1,751	31,282	19,701	15,524	18,000	6,165	181,000	17,000	437,000
2009 - 2010	136,000	144,778	16,470	5,080	42,855	17,574	14,027	14,335	5,845	165,000	16,300	578,000
2010 - 2011	201,000	266,473	44,873	14,997	46,733	16,381	13,405	9,387	6,105	154,000	16,200	790,000
2011 - 2012	127,000	87,533	11,311	3,334	19,189	19,757	14,309	9,318	4,680	195,000	16,800	508,000
2012 - 2013	58,000	30,283	4,777	1,145	14,102	20,628	14,955	10,298	4,354	199,000	17,100	375,000
2013 - 2014	41,000	13,171	2,957	535	5,724	12,390	9,986	178	1,030	233,000	16,100	336,000
2014 - 2015	59,000	8,820	1,994	253	1,503	12,012	5,438	114	260	243,000	13,900	346,000
2015 - 2016	91,000	74,330	14,559	4,547	20,049	14,357	11,805	13,271	4,627	194,000	13,700	456,000
2016 - 2017	95,000	352,963	51,145	17,241	51,137	16,089	14,203	21,651	6,694	144,000	14,000	784,000
86/87-16/17 Avg	129,000	118,300	17,800	5,800	28,800	18,300	13,500	12,600	5,900	192,000	14,600	557,000

Eastern Tule GSA
Historical Subbasin Surface Water Budget 1986/87 to 2016/17

Surface Water Outflow (acre-ft)

Water Year	Areal Recharge of Precip-itation	Streambed Infiltration			Recharge in Basins		Deep Percolation of Applied Water					Evapotransportation										Surface Outflow				Total Out
		Tule River	Deer Creek	White River	Tule River	Recyled Water	Tule River	Imported Water	Recycled Water	Agri-cultural Pumping	Muni-cipal Pumping	Precipitation Crops/Native	Tule River		Deer Creek	White River	Imported Water	Ag. Cons. Use from Pumping	Recycled Water		Municipal (Landscape ET)	Tule River		Deer Creek	White River	
		Success to Oettle Bridge Infiltration	Before Trenton Weir Infiltration										Agricultural Cons. Use	Stream Channel	Stream Channel	Stream Channel	Agricultural Cons. Use		Agricultural Cons. Use	Recharge in Basins		To LTIRD GSA	To FKC	To Pixley GSA	To DEID GSA	
1986 - 1987	0	11,600	8,100	2,400	5,400	2,600	3,200	13,400	200	36,000	2,700	92,000	11,300	400	300	100	55,300	171,000	700	50	3,400	40,400	0	0	0	659,000
1987 - 1988	4,000	8,000	5,800	1,300	5,000	3,200	4,100	15,000	200	37,100	2,900	128,000	10,200	300	300	100	57,400	170,000	900	50	3,900	14,700	0	0	0	709,000
1988 - 1989	0	8,700	7,500	1,800	6,200	3,400	1,700	14,300	200	37,000	3,000	107,000	6,500	300	300	100	62,000	169,000	1,000	50	4,100	22,900	0	0	0	673,000
1989 - 1990	0	5,000	4,400	700	3,700	3,600	1,500	12,500	200	39,100	3,100	103,000	5,800	400	300	100	55,900	175,000	1,000	50	4,300	7,100	0	0	0	634,000
1990 - 1991	7,000	6,400	6,900	1,300	5,200	3,700	1,500	12,500	200	39,200	3,200	132,000	5,500	300	300	100	52,800	179,000	1,000	50	4,500	22,700	0	0	0	719,000
1991 - 1992	1,000	4,300	3,800	700	3,700	3,800	1,600	14,300	200	37,100	3,200	118,000	5,900	400	300	100	61,600	170,000	1,100	50	4,500	9,900	0	0	0	672,000
1992 - 1993	41,000	18,500	15,100	3,500	8,200	3,900	8,900	20,000	200	30,600	3,300	153,000	16,000	400	400	100	71,100	150,000	1,100	50	4,600	57,600	0	0	0	882,000
1993 - 1994	2,000	6,100	6,600	1,100	5,000	4,000	4,000	15,700	200	36,900	3,400	121,000	8,900	300	300	100	58,800	169,000	1,100	50	4,800	31,300	0	0	0	710,000
1994 - 1995	81,000	36,400	21,200	6,600	7,800	3,900	15,400	17,600	200	30,200	3,400	175,000	23,100	400	400	100	63,800	150,000	1,100	50	4,700	142,900	0	10,400	3,900	1,096,000
1995 - 1996	5,000	20,700	13,700	4,600	7,800	3,900	16,100	27,100	200	27,000	3,500	130,000	22,600	400	400	100	80,700	136,000	1,100	50	4,800	105,900	0	9,000	1,300	887,000
1996 - 1997	37,000	34,600	45,100	6,100	5,400	4,300	14,700	23,300	200	29,200	3,600	151,000	21,500	400	400	100	74,200	143,000	1,200	50	5,100	250,300	36,400	13,300	6,700	1,188,000
1997 - 1998	112,000	41,100	14,900	9,500	4,100	3,900	12,000	14,400	200	33,000	3,600	193,000	23,600	400	400	200	53,800	162,000	1,100	50	4,800	286,700	0	74,600	27,100	1,384,000
1998 - 1999	17,000	14,300	13,300	7,100	6,200	3,900	3,600	19,700	200	32,000	3,600	139,000	10,900	400	400	200	74,800	153,000	1,100	50	4,800	71,000	0	4,800	200	843,000
1999 - 2000	12,000	16,900	10,100	4,100	5,500	4,200	3,200	21,500	200	32,500	3,700	137,000	8,500	400	400	100	76,700	154,000	1,200	50	5,100	64,000	0	4,800	600	826,000
2000 - 2001	0	12,300	6,700	4,300	4,800	4,300	2,100	16,700	200	35,800	3,800	111,000	7,300	300	300	100	67,100	164,000	1,200	50	5,200	27,500	0	0	300	701,000
2001 - 2002	0	14,800	10,100	5,000	5,800	4,900	3,800	17,300	300	36,000	4,000	106,000	9,100	400	300	100	64,100	165,000	1,400	50	5,800	32,900	0	0	1,100	708,000
2002 - 2003	0	19,700	13,600	5,100	6,300	4,800	1,800	15,800	200	30,000	3,900	104,000	6,900	400	400	100	71,400	160,000	1,400	50	5,600	77,600	0	1,700	600	748,000
2003 - 2004	0	9,900	6,600	2,300	3,900	5,100	2,400	14,600	200	30,100	4,100	87,000	6,100	400	300	100	70,100	160,000	1,500	50	6,000	24,500	0	0	0	633,000
2004 - 2005	23,000	24,200	14,400	5,100	7,300	2,400	5,900	16,900	500	26,200	3,900	143,000	13,900	400	400	100	74,700	146,000	3,300	50	5,600	91,500	0	8,000	1,300	881,000
2005 - 2006	24,000	28,100	14,400	5,100	6,900	2,000	15,500	21,000	700	24,200	4,000	144,000	18,900	400	400	100	80,000	135,000	4,000	50	5,800	129,200	0	9,200	2,400	947,000
2006 - 2007	0	6,200	6,600	1,700	4,300	2,000	1,700	11,600	700	33,300	4,100	71,000	4,000	300	300	100	55,900	174,000	4,400	50	6,200	20,000	0	0	0	577,000
2007 - 2008	0	11,700	8,100	2,300	6,000	2,000	2,100	13,800	800	30,500	4,200	79,000	6,000	300	300	100	66,000	162,000	4,500	50	6,200	42,700	0	0	0	635,000
2008 - 2009	0	9,500	6,300	1,600	4,800	2,000	2,700	16,500	700	28,400	4,100	85,000	6,700	400	300	100	74,200	153,000	4,200	50	6,000	29,200	0	0	0	635,000
2009 - 2010	6,000	25,600	16,100	5,000	8,500	2,000	9,000	18,600	600	24,900	4,000	131,000	18,100	400	400	100	76,100	140,000	3,900	50	5,800	82,500	0	0	0	834,000
2010 - 2011	45,000	37,100	24,400	8,300	7,200	2,000	14,700	18,500	600	23,400	4,000	156,000	18,800	400	400	200	73,500	131,000	3,800	50	5,700	191,800	10,000	20,200	6,500	1,080,000
2011 - 2012	3,000	13,600	11,000	3,200	6,600	2,000	1,800	11,600	700	31,500	4,100	124,000	4,700	400	300	100	55,700	163,000	4,100	50	5,900	58,800	0	0	0	727,000
2012 - 2013	0	4,900	4,500	1,000	5,300	2,000	1,100	10,900	700	32,300	4,100	58,000	2,700	400	300	100	53,400	167,000	4,200	50	6,000	14,400	0	0	0	525,000
2013 - 2014	0	2,300	2,700	400	3,800	2,000	1,000	5,100	600	37,900	4,000	41,000	2,400	300	300	100	24,200	195,000	3,800	50	5,700	0	0	0	0	443,000
2014 - 2015	0	1,000	1,800	200	3,600	2,000	1,100	2,600	500	39,400	3,700	59,000	2,300	300	200	100	16,700	203,000	2,700	50	4,900	0	0	0	0	467,000
2015 - 2016	0	16,000	14,300	4,400	5,800	2,000	1,700	10,600	400	30,700	3,700	91,000	5,900	300	300	100	53,500	163,000	2,700	50	4,800	35,400	0	0	0	632,000
2016 - 2017	0	42,100	37,000	6,900	8,900	2,000	26,900	29,300	500	21,400	3,700	95,000	20,700	400	400	200	80,500	122,000	2,800	50	4,900	187,800	0	13,800	10,200	940,000
86/87-16/17 Avg	14,000	16,500	12,100	3,600	5,800	3,200	6,000	15,900	400	32,000	3,700	115,000	10,800	400	300	100	63,100	160,000	2,200	50	5,100	70,100	1,500	5,500	2,000	775,000

Groundwater Inflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Appendix B
Table 2

Eastern Tule GSA
Historical Groundwater Budget 1986/87 to 2016/17

Water Year	Groundwater Inflows (acre-ft)															Total In	Groundwater Outflows (acre-ft)				Total Out	Change in Storage (acre-ft)
	Areal Recharge from Precip-itation	Tule River			Deer Creek	White River	Imported Water Deliveries	Agricultural Pumping	Municipal Pumping			Release of Water from Compression of Aquitards	Sub-surface Inflow		Mountain-Block Recharge		Groundwater Pumping		Sub-surface Outflow			
		Success to Oettle Bridge Infiltration	Recharge in Basins	Return Flow	Infiltration Before Trenton Weir	Infiltration Before DEID	Return Flow	Irrigated Agriculture	Return Flow	Recycled Water: Agricultural Return Flow	Recycled Water: Artificial Recharge		From Outside Subbasin	From Other GSAs			Muni-cipal	Agri-culture	To Outside Subbasin	To Other GSAs		
1986 - 1987	0	11,600	5,400	3,200	8,100	2,400	13,400	36,000	2,700	200	2,600	36,000	9,000	37,000	28,000	196,000	9,600	207,000	4,000	74,000	295,000	-99,000
1987 - 1988	4,000	8,000	5,000	4,100	5,800	1,300	15,000	37,100	2,900	200	3,200	15,000	10,000	36,000	29,000	177,000	11,100	207,000	4,000	73,000	295,000	-118,000
1988 - 1989	0	8,700	6,200	1,700	7,500	1,800	14,300	37,000	3,000	200	3,400	12,000	11,000	45,000	29,000	181,000	11,700	206,000	3,000	72,000	293,000	-112,000
1989 - 1990	0	5,000	3,700	1,500	4,400	700	12,500	39,100	3,100	200	3,600	15,000	10,000	39,000	29,000	167,000	12,200	215,000	4,000	79,000	310,000	-143,000
1990 - 1991	7,000	6,400	5,200	1,500	6,900	1,300	12,500	39,200	3,200	200	3,700	16,000	10,000	45,000	29,000	187,000	12,600	218,000	4,000	77,000	312,000	-125,000
1991 - 1992	1,000	4,300	3,700	1,600	3,800	700	14,300	37,100	3,200	200	3,800	15,000	10,000	41,000	30,000	170,000	12,900	207,000	4,000	78,000	302,000	-132,000
1992 - 1993	41,000	18,500	8,200	8,900	15,100	3,500	20,000	30,600	3,300	200	3,900	10,000	9,000	54,000	30,000	256,000	13,100	181,000	4,000	59,000	257,000	-1,000
1993 - 1994	2,000	6,100	5,000	4,000	6,600	1,100	15,700	36,900	3,400	200	4,000	14,000	8,000	36,000	30,000	173,000	13,500	206,000	5,000	70,000	295,000	-122,000
1994 - 1995	81,000	36,400	7,800	15,400	21,200	6,600	17,600	30,200	3,400	200	3,900	8,000	8,000	51,000	30,000	321,000	13,400	180,000	6,000	65,000	264,000	57,000
1995 - 1996	5,000	20,700	7,800	16,100	13,700	4,600	27,100	27,000	3,500	200	3,900	7,000	7,000	49,000	27,000	220,000	13,600	163,000	6,000	56,000	239,000	-19,000
1996 - 1997	37,000	34,600	5,400	14,700	45,100	6,100	23,300	29,200	3,600	200	4,300	5,000	7,000	46,000	28,000	290,000	14,500	172,000	6,000	58,000	251,000	39,000
1997 - 1998	112,000	41,100	4,100	12,000	14,900	9,500	14,400	33,000	3,600	200	3,900	7,000	6,000	49,000	30,000	341,000	13,700	195,000	7,000	58,000	274,000	67,000
1998 - 1999	17,000	14,300	6,200	3,600	13,300	7,100	19,700	32,000	3,600	200	3,900	6,000	6,000	49,000	30,000	212,000	13,700	185,000	6,000	58,000	263,000	-51,000
1999 - 2000	12,000	16,900	5,500	3,200	10,100	4,100	21,500	32,500	3,700	200	4,200	5,000	8,000	45,000	30,000	202,000	14,600	186,000	5,000	58,000	264,000	-62,000
2000 - 2001	0	12,300	4,800	2,100	6,700	4,300	16,700	35,800	3,800	200	4,300	8,000	8,000	42,000	30,000	179,000	14,700	200,000	5,000	61,000	281,000	-102,000
2001 - 2002	0	14,800	5,800	3,800	10,100	5,000	17,300	36,000	4,000	300	4,900	10,000	8,000	43,000	30,000	193,000	16,400	201,000	5,000	63,000	285,000	-92,000
2002 - 2003	0	19,700	6,300	1,800	13,600	5,100	15,800	30,000	3,900	200	4,800	10,000	8,000	48,000	29,000	196,000	16,000	190,000	4,000	56,000	266,000	-70,000
2003 - 2004	0	9,900	3,900	2,400	6,600	2,300	14,600	30,100	4,100	200	5,100	11,000	8,000	40,000	29,000	167,000	17,000	191,000	4,000	57,000	269,000	-102,000
2004 - 2005	23,000	24,200	7,300	5,900	14,400	5,100	16,900	26,200	3,900	500	2,400	9,000	7,000	49,000	29,000	224,000	15,800	172,000	5,000	49,000	242,000	-18,000
2005 - 2006	24,000	28,100	6,900	15,500	14,400	5,100	21,000	24,200	4,000	700	2,000	5,000	7,000	47,000	29,000	234,000	16,600	159,000	6,000	52,000	234,000	0
2006 - 2007	0	6,200	4,300	1,700	6,600	1,700	11,600	33,300	4,100	700	2,000	11,000	7,000	35,000	29,000	154,000	17,500	207,000	6,000	59,000	290,000	-136,000
2007 - 2008	0	11,700	6,000	2,100	8,100	2,300	13,800	30,500	4,200	800	2,000	12,000	7,000	42,000	30,000	173,000	17,700	192,000	5,000	57,000	272,000	-99,000
2008 - 2009	0	9,500	4,800	2,700	6,300	1,600	16,500	28,400	4,100	700	2,000	14,000	7,000	39,000	30,000	167,000	17,000	181,000	5,000	60,000	263,000	-96,000
2009 - 2010	6,000	25,600	8,500	9,000	16,100	5,000	18,600	24,900	4,000	600	2,000	12,000	6,000	47,000	29,000	214,000	16,300	165,000	6,000	52,000	239,000	-25,000
2010 - 2011	45,000	37,100	7,200	14,700	24,400	8,300	18,500	23,400	4,000	600	2,000	5,000	6,000	47,000	29,000	272,000	16,200	154,000	6,000	55,000	231,000	41,000
2011 - 2012	3,000	13,600	6,600	1,800	11,000	3,200	11,600	31,500	4,100	700	2,000	10,000	7,000	39,000	29,000	174,000	16,800	195,000	6,000	63,000	281,000	-107,000
2012 - 2013	0	4,900	5,300	1,100	4,500	1,000	10,900	32,300	4,100	700	2,000	13,000	7,000	37,000	29,000	153,000	17,100	199,000	5,000	64,000	285,000	-132,000
2013 - 2014	0	2,300	3,800	1,000	2,700	400	5,100	37,900	4,000	600	2,000	22,000	7,000	35,000	30,000	154,000	16,100	233,000	6,000	65,000	320,000	-166,000
2014 - 2015	0	1,000	3,600	1,100	1,800	200	2,600	39,400	3,700	500	2,000	24,000	7,000	33,000	30,000	150,000	13,900	243,000	6,000	63,000	326,000	-176,000
2015 - 2016	0	16,000	5,800	1,700	14,300	4,400	10,600	30,700	3,700	400	2,000	18,000	6,000	35,000	30,000	179,000	13,700	194,000	6,000	54,000	268,000	-89,000
2016 - 2017	0	42,100	8,900	26,900	37,000	6,900	29,300	21,400	3,700	500	2,000	13,000	5,000	42,000	29,000	268,000	14,000	144,000	7,000	45,000	210,000	58,000
86/87-16/17 Avg	14,000	16,500	5,800	6,000	12,100	3,600	15,900	32,000	3,700	400	3,200	12,000	8,000	43,000	29,000	205,000	14,600	192,000	5,000	62,000	274,000	-69,000

Cummulative Change in Storage | -2,132,000

Groundwater Inflows or Outflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Groundwater Outflows Not Included in Sustainable Yield Estimates

Projected Future Eastern Tule GSA Surface Water Budget

Water Year	Surface Water Inflow (acre-ft)														Total In
	Precip-itation	Stream Inflow			Imported Water								Discharge from Wells		
		Tule River	Deer Creek	White River	Saucelito ID	Terra Bella ID	Kern-Tulare WD	Porterville ID	Tea Pot Dome WD	City of Porterville	Hope WD	Ducor ID	Agricultural	Municipal	
2017 - 2018	128,000	131,258	19,410	6,347	34,567	18,786	15,335	19,803	6,528	0	0	0	158,000	14,700	553,000
2018 - 2019	128,000	131,258	19,410	6,347	34,567	18,786	15,335	19,803	6,528	0	0	0	157,000	16,400	553,000
2019 - 2020	128,000	131,258	19,410	6,347	34,567	18,786	15,335	23,103	6,528	0	0	0	151,000	18,000	552,000
2020 - 2021	128,000	131,258	19,410	6,347	35,667	18,786	17,935	23,103	6,528	1,100	0	0	148,000	18,400	555,000
2021 - 2022	128,000	131,258	19,410	6,347	35,667	18,786	17,935	23,103	6,528	1,100	0	0	148,000	18,800	555,000
2022 - 2023	128,000	131,258	19,410	6,347	35,667	18,786	17,935	23,103	6,528	1,100	1,667	0	148,000	19,100	557,000
2023 - 2024	128,000	131,258	19,410	6,347	35,667	18,786	17,935	23,103	6,528	1,100	1,667	4,000	148,000	19,500	561,000
2024 - 2025	128,000	134,258	19,410	6,347	34,893	20,304	18,229	24,339	6,594	1,100	1,667	4,000	138,000	20,000	557,000
2025 - 2026	128,000	134,258	19,410	6,347	34,118	21,823	17,843	25,575	6,661	1,100	1,667	4,000	138,000	20,400	559,000
2026 - 2027	128,000	134,258	19,410	6,347	33,343	23,341	17,458	26,812	6,727	1,100	1,667	4,000	136,000	20,800	559,000
2027 - 2028	128,000	134,258	19,410	6,347	32,568	24,860	17,072	28,048	6,793	1,100	1,667	4,000	134,000	21,300	559,000
2028 - 2029	128,000	134,258	19,410	6,347	31,794	26,378	16,687	29,285	6,860	1,100	1,667	4,000	132,000	21,700	559,000
2029 - 2030	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	92,000	22,200	523,000
2030 - 2031	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	97,000	22,700	529,000
2031 - 2032	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	96,000	23,100	528,000
2032 - 2033	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	96,000	23,600	529,000
2033 - 2034	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	96,000	24,200	529,000
2034 - 2035	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	70,000	24,700	504,000
2035 - 2036	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	70,000	25,200	504,000
2036 - 2037	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	70,000	25,800	505,000
2037 - 2038	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	26,300	504,000
2038 - 2039	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	26,900	505,000
2039 - 2040	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2040 - 2041	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2041 - 2042	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2042 - 2043	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2043 - 2044	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2044 - 2045	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2045 - 2046	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2046 - 2047	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2047 - 2048	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2048 - 2049	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2049 - 2050	128,000	134,258	19,410	6,347	31,019	27,897	18,039	30,521	6,926	1,100	1,667	4,000	69,000	27,500	506,000
2050 - 2051	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2051 - 2052	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2052 - 2053	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2053 - 2054	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2054 - 2055	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2055 - 2056	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2056 - 2057	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2057 - 2058	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2058 - 2059	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2059 - 2060	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2060 - 2061	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2061 - 2062	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2062 - 2063	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2063 - 2064	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2064 - 2065	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2065 - 2066	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2066 - 2067	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2067 - 2068	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2068 - 2069	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
2069 - 2070	128,000	130,581	18,943	6,143	29,378	26,278	18,039	28,441	6,524	1,100	1,667	4,000	68,000	27,500	495,000
17/18-69/70 Avg	128,000	132,500	19,200	6,300	31,200	25,700	17,800	28,300	6,700	1,000	1,500	3,500	88,000	25,000	515,000

Appendix B
Table 3b

Projected Future Eastern Tule GSA Subbasin Surface Water Budget

Water Year	Surface Water Outflow (acre-ft)																											
	Areal Recharge of Precip-itation	Streambed Infiltration			Recharge in Basins				Deep Percolation of Applied Water					Evapotranspiration										Surface Outflow				Total Out
		Tule River	Deer Creek	White River										Precipitation Crops/Native	Tule River		Deer Creek	White River	Imported Water	Ag. Cons. Use from Pumping	Recycled Water		Municipal (Landscape ET)	Tule River		Deer Creek	White River	
		Success to Oettle Bridge Infiltration	Before Trenton Weir Infiltration		Tule River	Deer Creek	Imported Water	Recycled Water	Tule River	Imported Water	Recycled Water	Agri-cultural Pumping	Muni-cipal Pumping		Agricultural Cons. Use	Stream Channel	Stream Channel	Stream Channel	Agricultural Cons. Use		Agricultural Cons. Use	Recharge in Basins		To LTIRD GSA	To FKC	To Pixley GSA	To DEID GSA	
2017 - 2018	14,000	17,900	11,600	4,000	5,800	800	0	2,000	4,600	19,700	600	24,300	3,400	115,000	13,900	300	300	100	75,400	133,000	3,500	50	5,200	80,000	0	6,700	2,200	544,000
2018 - 2019	14,000	17,900	11,600	4,000	5,800	800	0	2,000	4,600	19,700	700	24,200	3,600	115,000	13,900	300	300	100	75,400	133,000	4,300	50	5,800	80,000	0	6,700	2,200	546,000
2019 - 2020	14,000	17,900	11,600	4,000	6,700	800	3,300	2,500	4,600	20,600	400	23,200	3,800	115,000	13,900	300	300	100	77,700	125,000	2,600	50	8,700	80,000	0	6,700	2,200	546,000
2020 - 2021	14,000	17,900	11,600	4,000	6,700	800	5,500	2,600	4,600	21,000	400	22,800	3,800	115,000	13,900	300	300	100	80,000	123,000	2,600	50	8,900	80,000	0	6,700	2,200	549,000
2021 - 2022	14,000	17,900	11,600	4,000	6,700	800	5,500	2,600	4,600	21,000	400	22,800	3,800	115,000	13,900	300	300	100	80,000	123,000	2,700	50	9,100	80,000	0	6,700	2,200	549,000
2022 - 2023	14,000	17,900	11,600	4,000	6,700	800	7,200	2,700	4,600	21,000	500	22,800	3,900	115,000	13,900	300	300	100	80,000	123,000	2,800	50	9,300	80,000	0	6,700	2,200	551,000
2023 - 2024	14,000	17,900	11,600	4,000	6,700	800	11,200	2,800	4,600	21,000	500	22,800	3,900	115,000	13,900	300	300	100	80,000	123,000	2,800	50	9,500	80,000	0	6,700	2,200	556,000
2024 - 2025	14,000	17,900	11,600	4,000	7,100	800	11,200	2,800	4,600	21,400	500	21,300	4,000	115,000	14,000	300	300	100	81,900	114,000	2,900	50	9,700	82,600	0	6,700	2,200	551,000
2025 - 2026	14,000	17,900	11,600	4,000	7,100	800	11,200	2,900	4,600	21,700	500	21,200	4,000	115,000	14,000	300	300	100	83,200	114,000	3,000	50	9,900	82,600	0	6,700	2,200	553,000
2026 - 2027	14,000	17,900	11,600	4,000	7,100	800	11,200	3,000	4,600	22,000	500	20,900	4,100	115,000	14,000	300	300	100	84,600	113,000	3,000	50	10,100	82,600	0	6,700	2,200	554,000
2027 - 2028	14,000	17,900	11,600	4,000	7,100	800	11,200	3,100	4,600	22,300	500	20,600	4,100	115,000	14,000	300	300	100	86,000	111,000	3,100	50	10,400	82,600	0	6,700	2,200	554,000
2028 - 2029	14,000	17,900	11,600	4,000	7,100	800	11,200	3,100	4,500	22,600	500	20,300	4,200	115,000	14,000	300	300	100	87,300	110,000	3,200	50	10,600	82,600	0	6,700	2,200	554,000
2029 - 2030	14,000	17,900	11,600	4,000	7,100	800	11,200	3,200	4,300	23,200	500	14,300	4,200	115,000	13,200	300	300	100	90,100	75,000	3,300	50	10,800	82,000	0	6,700	2,200	515,000
2030 - 2031	14,000	17,900	11,600	4,000	7,100	800	11,200	3,300	4,300	23,200	600	15,100	4,300	115,000	13,200	300	300	100	90,100	79,000	3,400	50	11,100	82,000	0	6,700	2,200	521,000
2031 - 2032	14,000	17,900	11,600	4,000	7,100	800	11,200	3,400	4,300	23,200	600	15,100	4,400	115,000	13,200	300	300	100	90,100	79,000	3,400	50	11,300	82,000	0	6,700	2,200	521,000
2032 - 2033	14,000	17,900	11,600	4,000	7,100	800	11,200	3,500	4,300	23,200	600	15,100	4,400	115,000	13,200	300	300	100	90,100	79,000	3,500	50	11,600	82,000	0	6,700	2,200	522,000
2033 - 2034	14,000	17,900	11,600	4,000	7,100	800	11,200	3,500	4,300	23,200	600	15,100	4,500	115,000	13,200	300	300	100	90,100	79,000	3,600	50	11,900	82,000	0	6,700	2,200	522,000
2034 - 2035	14,000	17,900	11,600	4,000	7,100	800	11,200	3,600	4,300	23,200	600	11,000	4,500	115,000	13,200	300	300	100	90,100	56,000	3,700	50	12,100	82,000	0	6,700	2,200	496,000
2035 - 2036	14,000	17,900	11,600	4,000	7,100	800	11,200	3,700	4,300	23,200	600	11,000	4,600	115,000	13,200	300	300	100	90,100	56,000	3,800	50	12,400	82,000	0	6,700	2,200	496,000
2036 - 2037	14,000	17,900	11,600	4,000	7,100	800	11,200	3,800	4,300	23,200	700	10,900	4,700	115,000	13,200	300	300	100	90,100	56,000	3,900	50	12,700	82,000	0	6,700	2,200	497,000
2037 - 2038	14,000	17,900	11,600	4,000	7,100	800	11,200	3,900	4,300	23,200	700	10,900	4,700	115,000	13,200	300	300	100	90,100	56,000	4,000	50	13,000	82,000	0	6,700	2,200	497,000
2038 - 2039	14,000	17,900	11,600	4,000	7,100	800	11,200	4,000	4,300	23,200	700	10,900	4,800	115,000	13,200	300	300	100	90,100	56,000	4,100	50	13,300	82,000	0	6,700	2,200	498,000
2039 - 2040	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2040 - 2041	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2041 - 2042	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2042 - 2043	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2043 - 2044	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2044 - 2045	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2045 - 2046	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2046 - 2047	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2047 - 2048	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2048 - 2049	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2049 - 2050	14,000	17,900	11,600	4,000	7,100	800	11,200	4,100	4,300	23,200	700	10,900	4,900	115,000	13,200	300	300	100	90,100	56,000	4,200	50	13,600	82,000	0	6,700	2,200	498,000
2050 - 2051	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2051 - 2052	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2052 - 2053	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2053 - 2054	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2054 - 2055	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2055 - 2056	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2056 - 2057	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2057 - 2058	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2058 - 2059	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2059 - 2060	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2060 - 2061	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2061 - 2062	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2062 - 2063	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2063 - 2064	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2064 - 2065	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2065 - 2066	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2066 - 2067	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2067 - 2068	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2068 - 2069	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
2069 - 2070	14,000	17,400	11,300	3,900	6,600	800	11,200	4,100	4,500	22,200	700	10,800	4,900	115,000	12,500	300	300	100	85,400	54,000	4,200	50	13,600	79,800	0	6,500	2,200	486,000
17/18-69/70 Avg	14,000	17,700	11,500	4,000	6,800	800	10,300	3,700	4,400	22,400	600	13,800	4,600	115,000	13,100	300	300	100	86,300	72,000	3,800	50	12,200	81,000	0	6,600	2,200	508,000

Projected Future Eastern Tule GSA Groundwater Budget

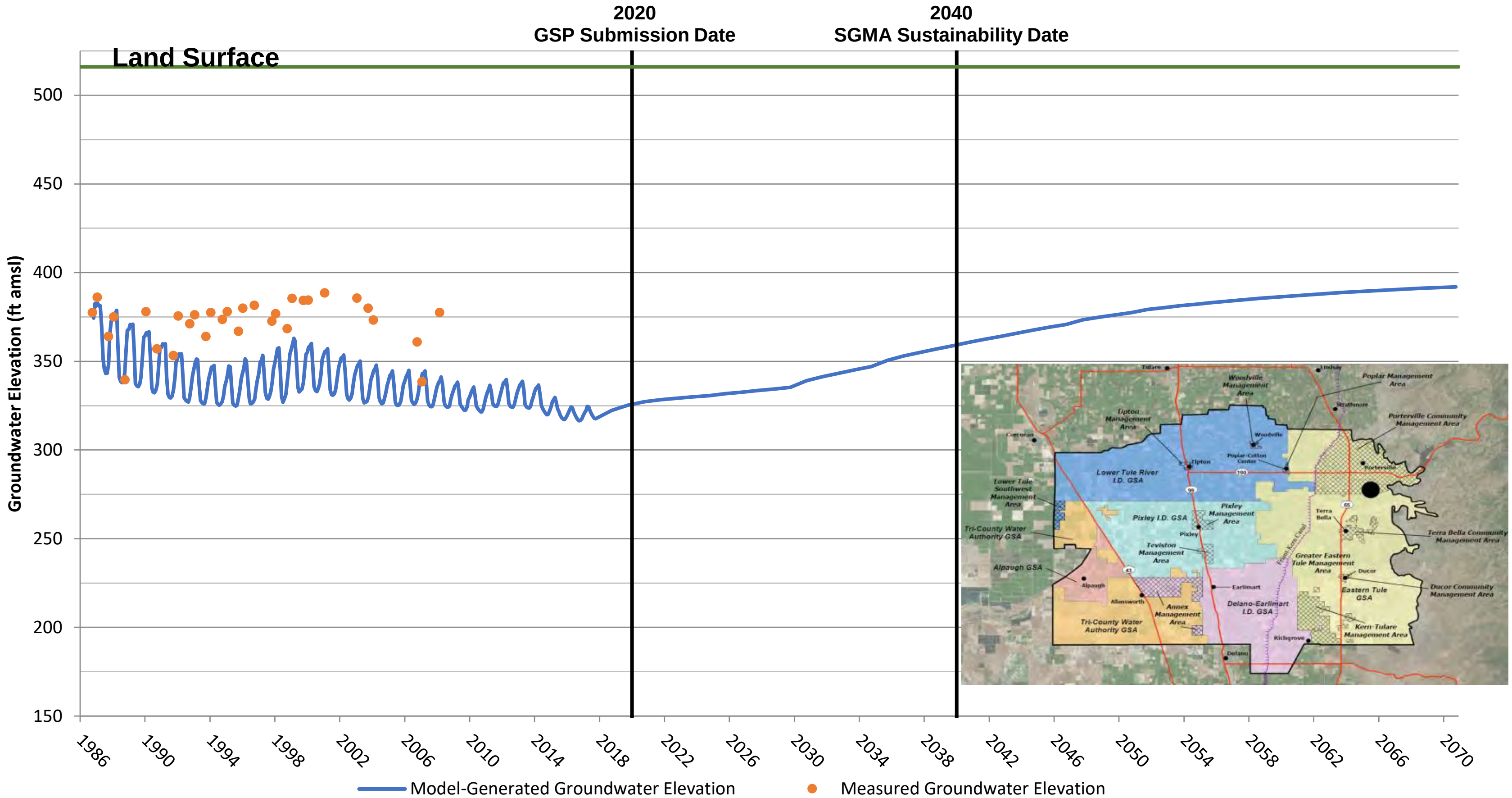
Water Year	Groundwater Inflows (acre-ft): Areal Recharge from Precip-itation	Tule River: Success to Oettle Bridge Infiltration	Tule River: Recharge in Basins	Tule River: Return Flow	Deer Creek: Infiltration Before Trenton Weir	Deer Creek: Recharge in Basins	White River: Infiltration Before DEID	Imported Water Deliveries: Return Flow	Imported Water Deliveries: Recharge in Basins	Agricultural Pumping: Irrigated Agriculture	Municipal Pumping: Return Flow	Municipal Pumping, Recycled Water: Agricultural Return Flow	Municipal Pumping, Recycled Water: Artificial Recharge	Release of Water from Compression of Aquitards	Sub-surface Inflow: From Outside Subbasin	Sub-surface Inflow: From Other GSAs	Mountain-Block Recharge	Total In	Groundwater Outflows (acre-ft): Groundwater Pumping: Muni-cipal	Groundwater Pumping: Agri-culture	Sub-surface Outflow: To Outside Subbasin	Sub-surface Outflow: To Other GSAs	Total Out	Change in Storage (acre-ft)
2017 - 2018	14,000	17,900	5,800	4,600	11,600	800	4,000	19,700	0	24,300	3,400	600	2,000	9,000	6,000	36,000	33,000	193,000	14,700	158,000	7,000	51,000	231,000	-38,000
2018 - 2019	14,000	17,900	5,800	4,600	11,600	800	4,000	19,700	0	24,200	3,600	700	2,000	9,000	6,000	36,000	33,000	193,000	16,400	157,000	7,000	51,000	231,000	-38,000
2019 - 2020	14,000	17,900	6,700	4,600	11,600	800	4,000	20,600	3,300	23,200	3,800	400	2,500	9,000	6,000	36,000	33,000	197,000	18,000	151,000	6,000	51,000	226,000	-29,000
2020 - 2021	14,000	17,900	6,700	4,600	11,600	800	4,000	21,000	5,500	22,800	3,800	400	2,600	8,000	5,000	35,000	33,000	197,000	18,400	148,000	7,000	51,000	224,000	-27,000
2021 - 2022	14,000	17,900	6,700	4,600	11,600	800	4,000	21,000	5,500	22,800	3,800	400	2,600	8,000	5,000	35,000	33,000	197,000	18,800	148,000	7,000	50,000	224,000	-27,000
2022 - 2023	14,000	17,900	6,700	4,600	11,600	800	4,000	21,000	7,170	22,800	3,900	500	2,700	8,000	5,000	35,000	33,000	199,000	19,100	148,000	7,000	50,000	224,000	-25,000
2023 - 2024	14,000	17,900	6,700	4,600	11,600	800	4,000	21,000	11,170	22,800	3,900	500	2,800	8,000	5,000	35,000	33,000	203,000	19,500	148,000	7,000	50,000	225,000	-22,000
2024 - 2025	14,000	17,900	7,100	4,600	11,600	800	4,000	21,400	11,170	21,300	4,000	500	2,800	6,000	5,000	34,000	33,000	199,000	20,000	138,000	6,000	49,000	213,000	-14,000
2025 - 2026	14,000	17,900	7,100	4,600	11,600	800	4,000	21,700	11,170	21,200	4,000	500	2,900	6,000	5,000	33,000	33,000	198,000	20,400	138,000	6,000	49,000	213,000	-15,000
2026 - 2027	14,000	17,900	7,100	4,600	11,600	800	4,000	22,000	11,170	20,900	4,100	500	3,000	6,000	5,000	32,000	33,000	198,000	20,800	136,000	6,000	49,000	212,000	-14,000
2027 - 2028	14,000	17,900	7,100	4,600	11,600	800	4,000	22,300	11,170	20,600	4,100	500	3,100	5,000	4,000	32,000	33,000	196,000	21,300	134,000	7,000	49,000	211,000	-15,000
2028 - 2029	14,000	17,900	7,100	4,500	11,600	800	4,000	22,600	11,170	20,300	4,200	500	3,100	5,000	4,000	31,000	33,000	195,000	21,700	132,000	7,000	49,000	210,000	-15,000
2029 - 2030	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	14,300	4,200	500	3,200	2,000	4,000	28,000	33,000	183,000	22,200	92,000	4,000	49,000	167,000	16,000
2030 - 2031	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	15,100	4,300	600	3,300	2,000	4,000	27,000	33,000	183,000	22,700	97,000	4,000	49,000	173,000	10,000
2031 - 2032	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	15,100	4,400	600	3,400	2,000	4,000	26,000	33,000	183,000	23,100	96,000	4,000	49,000	172,000	11,000
2032 - 2033	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	15,100	4,400	600	3,500	2,000	4,000	25,000	33,000	182,000	23,600	96,000	4,000	49,000	173,000	9,000
2033 - 2034	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	15,100	4,500	600	3,500	2,000	4,000	25,000	33,000	182,000	24,200	96,000	3,000	49,000	172,000	10,000
2034 - 2035	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	11,000	4,500	600	3,600	1,000	4,000	22,000	33,000	174,000	24,700	70,000	2,000	49,000	146,000	28,000
2035 - 2036	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	11,000	4,600	600	3,700	1,000	4,000	21,000	33,000	173,000	25,200	70,000	2,000	49,000	146,000	27,000
2036 - 2037	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,700	700	3,800	1,000	4,000	20,000	32,000	171,000	25,800	70,000	2,000	50,000	148,000	23,000
2037 - 2038	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,700	700	3,900	0	4,000	20,000	32,000	170,000	26,300	69,000	2,000	50,000	147,000	23,000
2038 - 2039	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,800	700	4,000	0	4,000	19,000	32,000	169,000	26,900	69,000	2,000	51,000	149,000	20,000
2039 - 2040	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	19,000	32,000	170,000	27,500	69,000	1,000	50,000	148,000	22,000
2040 - 2041	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	18,000	32,000	169,000	27,500	69,000	1,000	50,000	148,000	21,000
2041 - 2042	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	18,000	32,000	169,000	27,500	69,000	1,000	50,000	148,000	21,000
2042 - 2043	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	17,000	32,000	168,000	27,500	69,000	1,000	50,000	148,000	20,000
2043 - 2044	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	17,000	32,000	168,000	27,500	69,000	1,000	51,000	149,000	19,000
2044 - 2045	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	17,000	32,000	168,000	27,500	69,000	1,000	51,000	149,000	19,000
2045 - 2046	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	16,000	32,000	167,000	27,500	69,000	1,000	52,000	150,000	17,000
2046 - 2047	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	16,000	32,000	167,000	27,500	69,000	1,000	52,000	150,000	17,000
2047 - 2048	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	16,000	32,000	167,000	27,500	69,000	1,000	53,000	151,000	16,000
2048 - 2049	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	16,000	32,000	167,000	27,500	69,000	1,000	53,000	151,000	16,000
2049 - 2050	14,000	17,900	7,100	4,300	11,600	800	4,000	23,200	11,170	10,900	4,900	700	4,100	0	4,000	16,000	32,000	167,000	27,500	69,000	1,000	54,000	152,000	15,000
2050 - 2051	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	4,000	16,000	31,000	163,000	27,500	68,000	1,000	55,000	152,000	11,000
2051 - 2052	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	4,000	15,000	32,000	163,000	27,500	68,000	1,000	55,000	152,000	11,000
2052 - 2053	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	4,000	15,000	31,000	162,000	27,500	68,000	1,000	56,000	153,000	9,000
2053 - 2054	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	4,000	15,000	31,000	162,000	27,500	68,000	1,000	56,000	153,000	9,000
2054 - 2055	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	4,000	15,000	31,000	162,000	27,500	68,000	1,000	57,000	154,000	8,000
2055 - 2056	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	4,000	15,000	32,000	163,000	27,500	68,000	1,000	58,000	155,000	8,000
2056 - 2057	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	58,000	155,000	5,000
2057 - 2058	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	58,000	155,000	5,000
2058 - 2059	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	59,000	156,000	4,000
2059 - 2060	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	59,000	156,000	4,000
2060 - 2061	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	59,000	156,000	4,000
2061 - 2062	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	60,000	157,000	3,000
2062 - 2063	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	60,000	157,000	3,000
2063 - 2064	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	60,000	157,000	3,000
2064 - 2065	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	60,000	157,000	3,000
2065 - 2066	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	61,000	158,000	2,000
2066 - 2067	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	61,000	158,000	2,000
2067 - 2068	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	61,000	158,000	2,000
2068 - 2069	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	61,000	158,000	2,000
2069 - 2070	14,000	17,400	6,600	4,500	11,300	800	3,900	22,200	11,170	10,800	4,900	700	4,100	0	3,000	14,000	31,000	160,000	27,500	68,000	1,000	62,000	159,000	1,000
17/18-69/70 Avg	14,000	17,700	6,800	4,400	11,500	800	4,000	22,400	10,300	13,800	4,600	600	3,700	2,000	4,000	21,000	32,000	174,000	25,000	88,000	3,000	53,000	169,000	5,000

Tule Subbasin
Basin Setting

Eastern Tule GSA
Representative Monitoring Site

Appendix **B**
Figure **1**

22S/27E-13A01
Upper Aquifer
Perforations: 396 to 136 (ft amsl)



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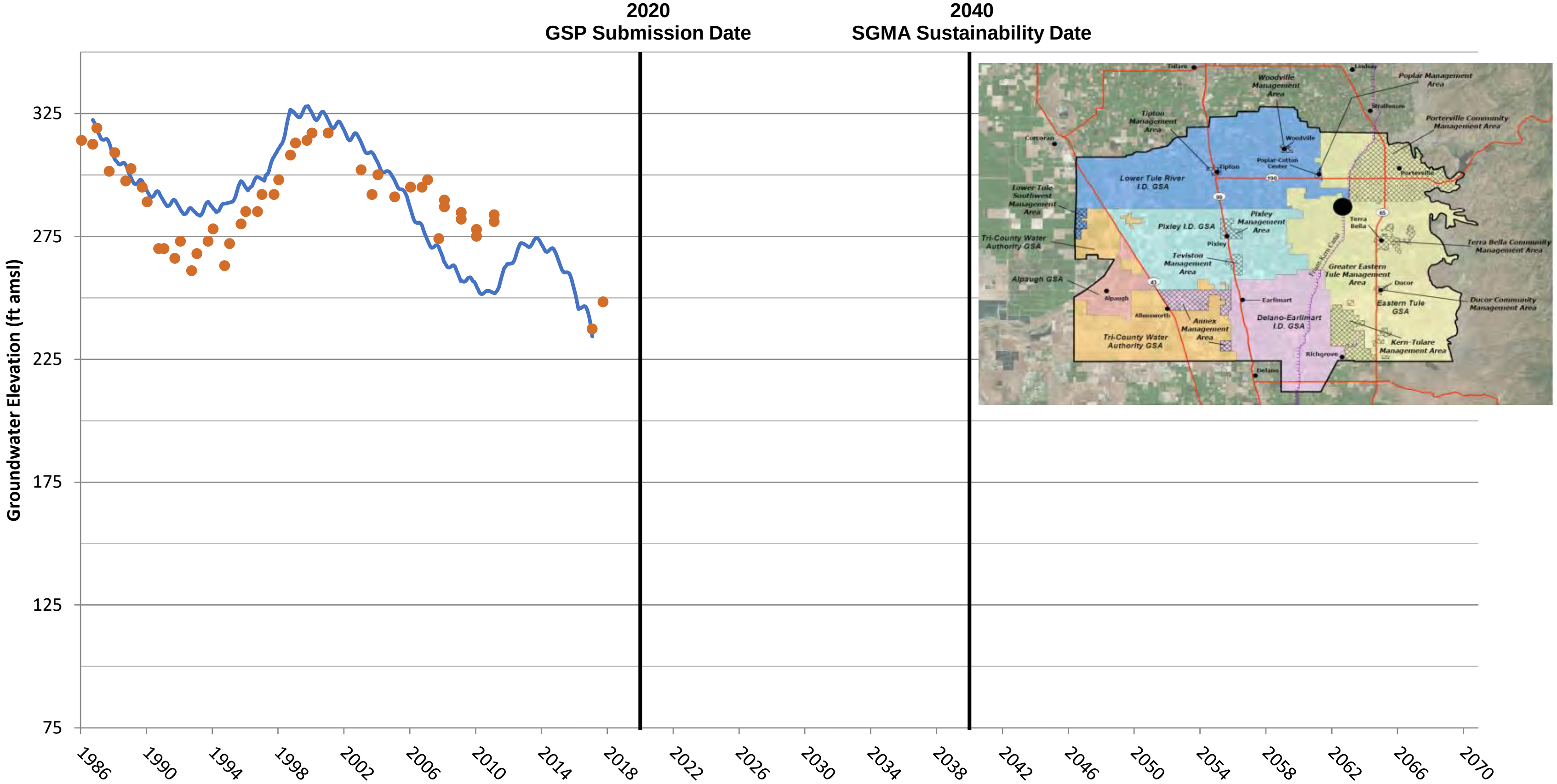
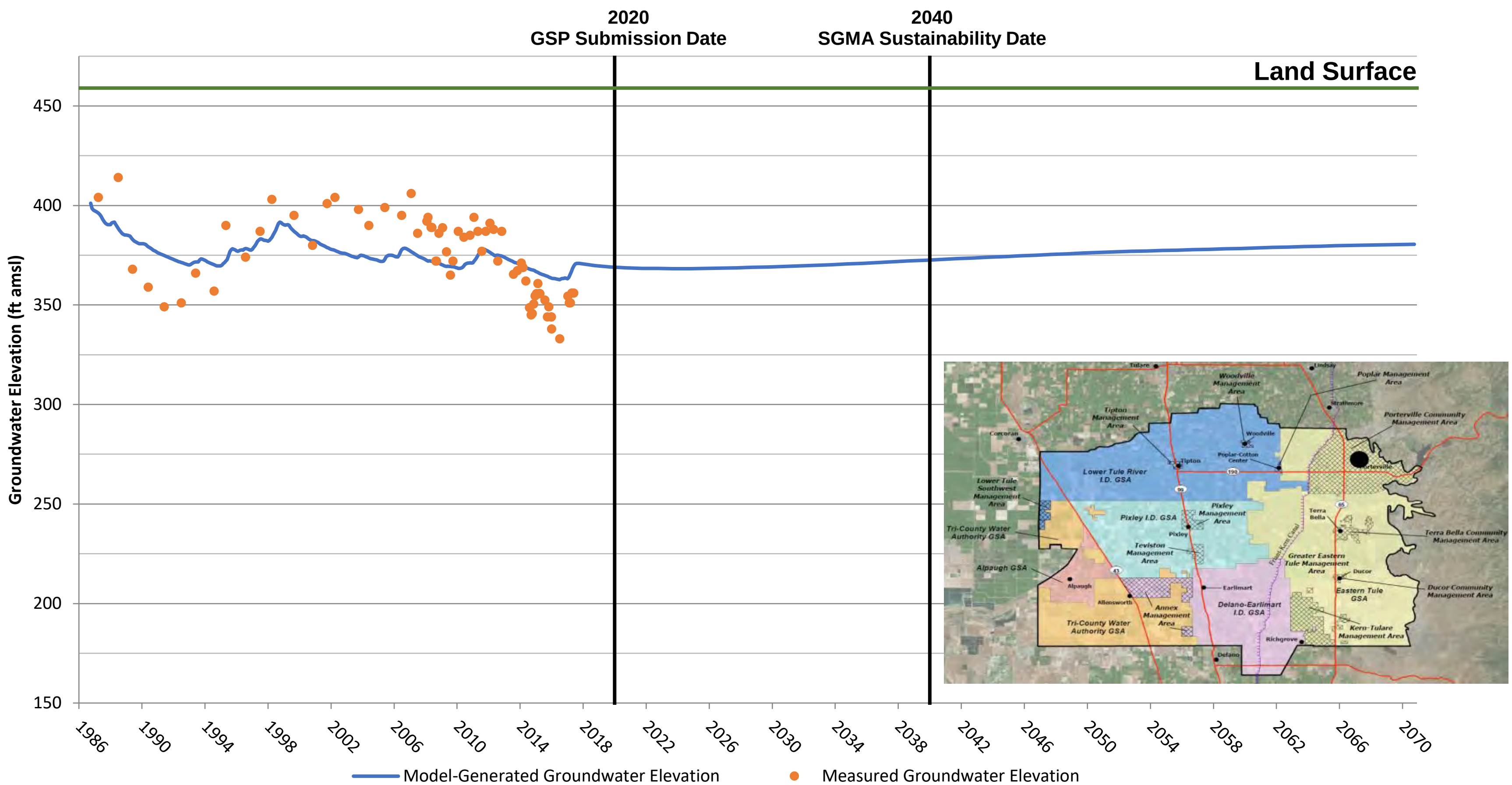
Eastern Tule GSA
Representative Monitoring Site

22S/26E-13R01
Upper Aquifer
Perforations: 158 to 18 (ft amsl)



Eastern Tule GSA
Representative Monitoring Site

C-1
Upper Aquifer
Perforations: 337 to 217 (ft amsl)



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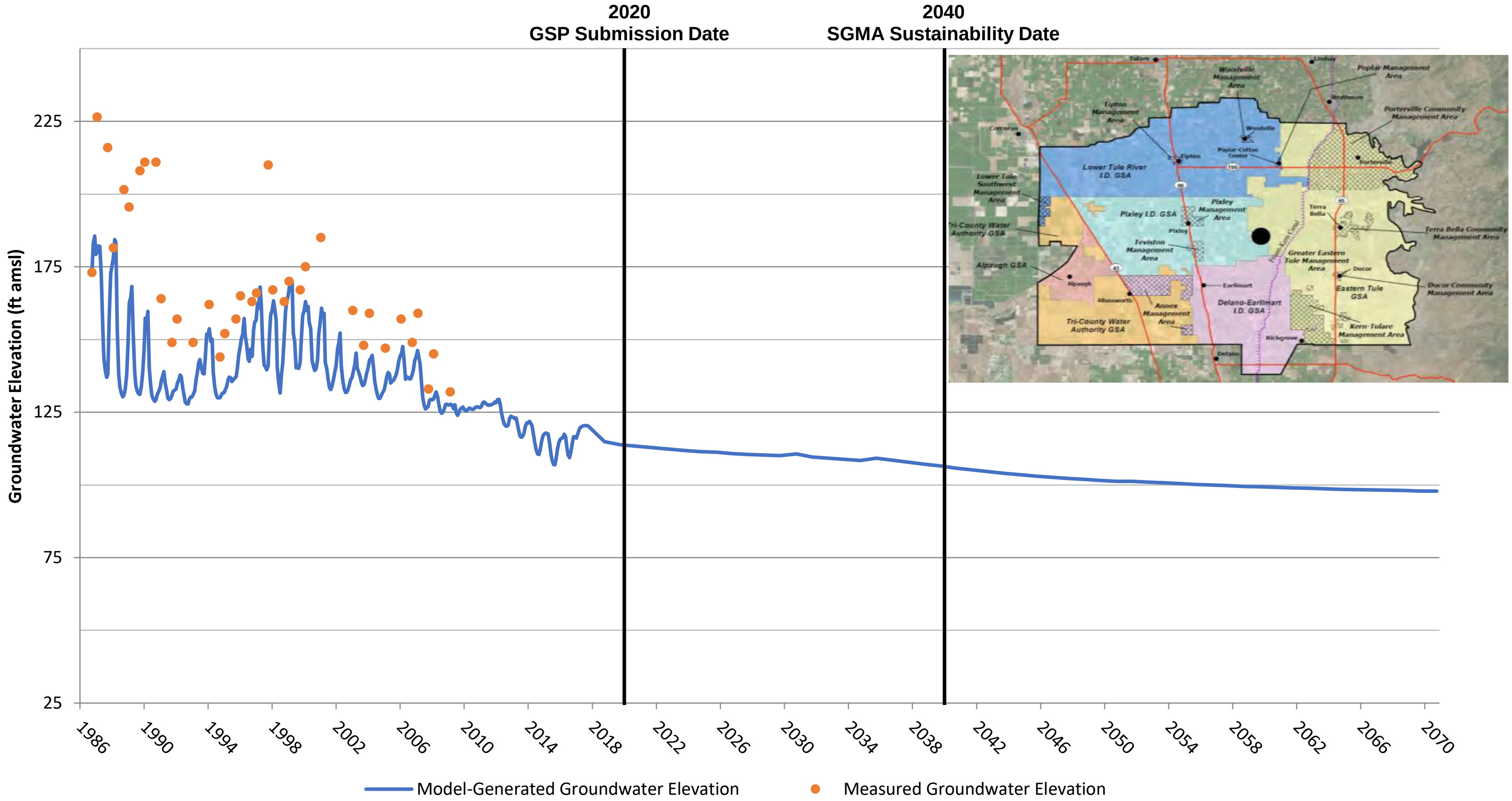
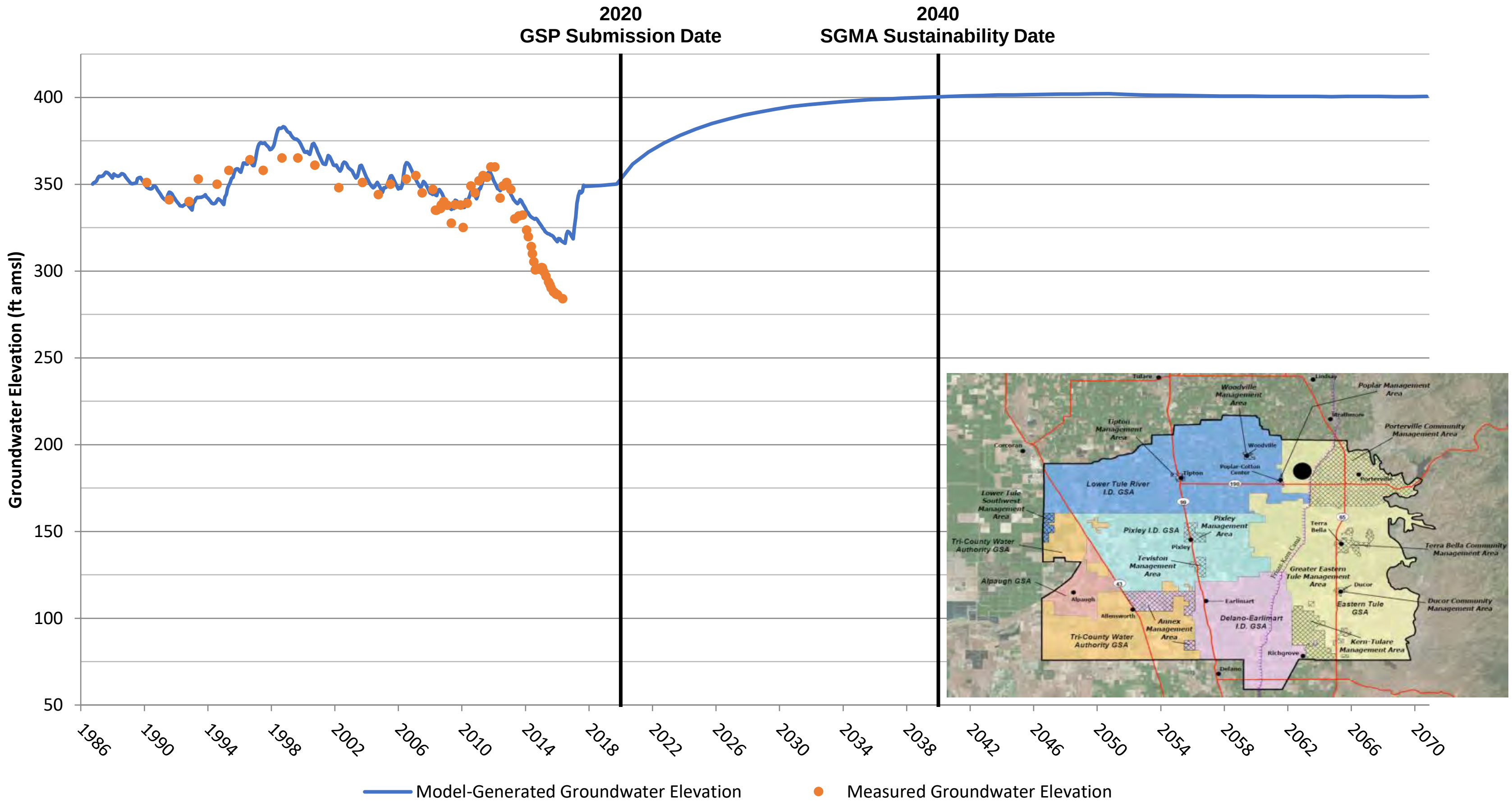
23S/26E-09C01
Upper Aquifer
Perforations: 148 to -42 (ft amsl)



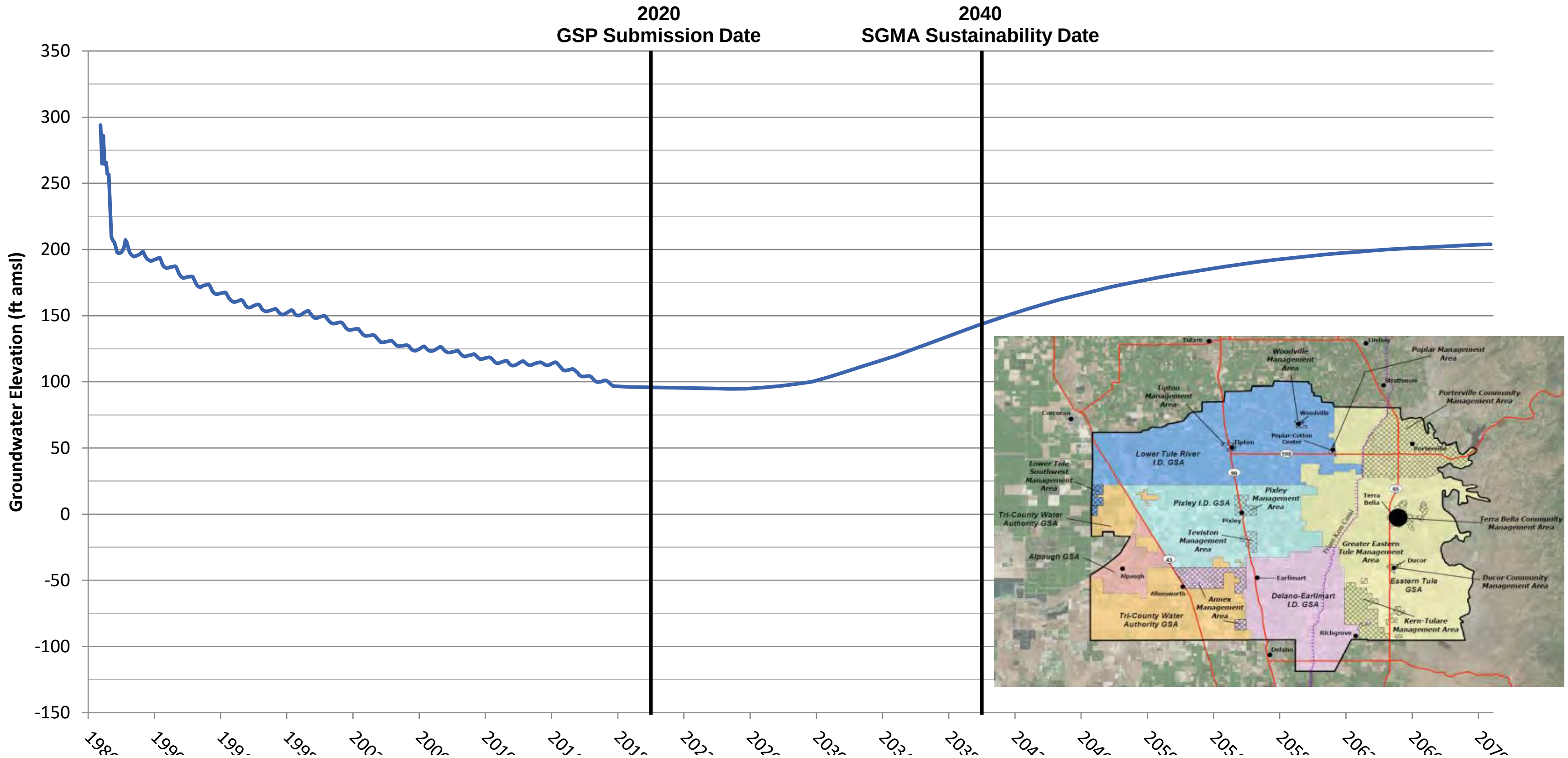
Eastern Tule GSA
Representative Monitoring Site

Port R-11
Upper Aquifer
Well Depth: (184 ft amsl)



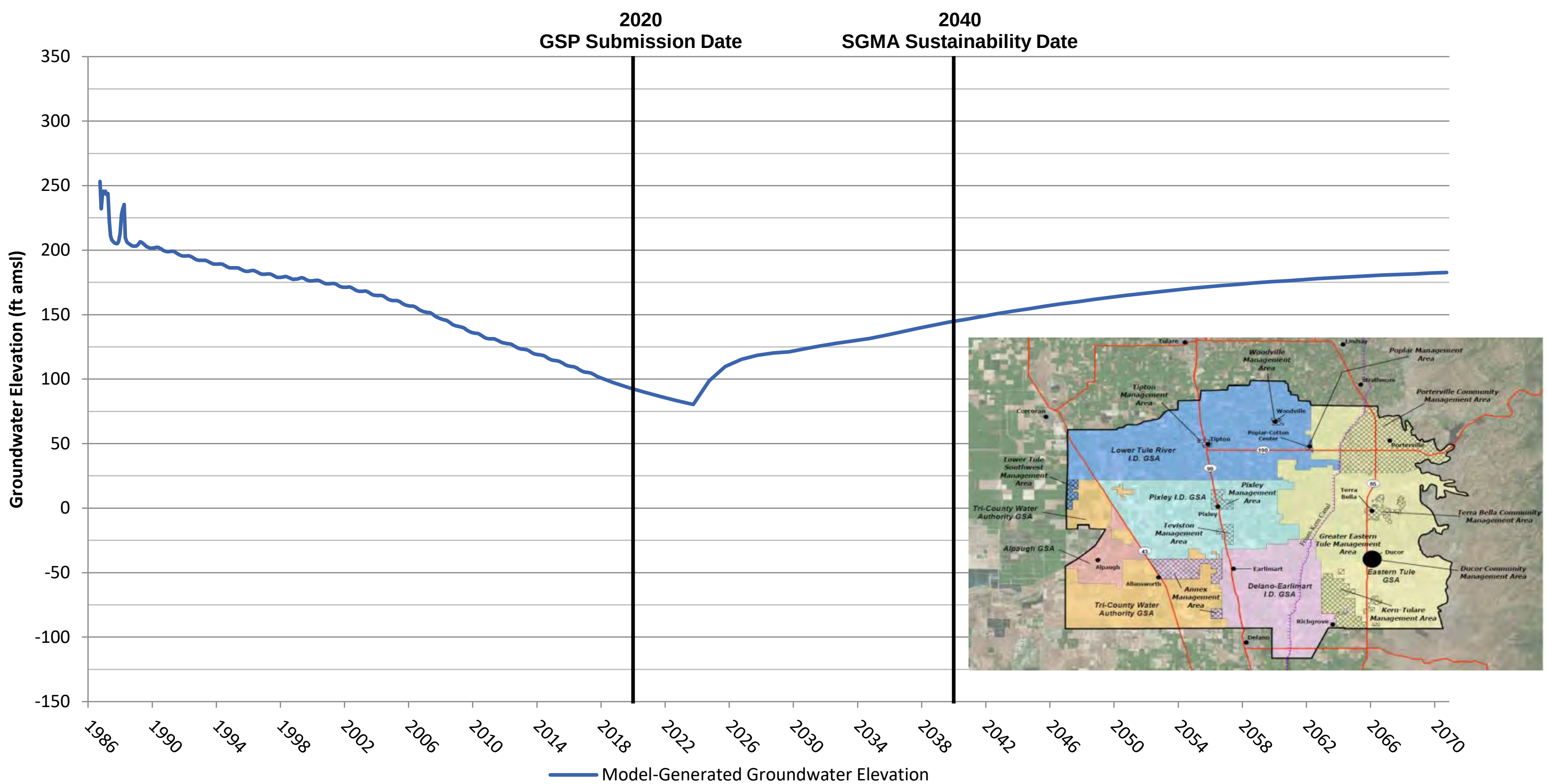
Eastern Tule GSA
Representative Monitoring Site

23S/27E-03
Lower Aquifer
Perforations: 298 to -92 (ft amsl)



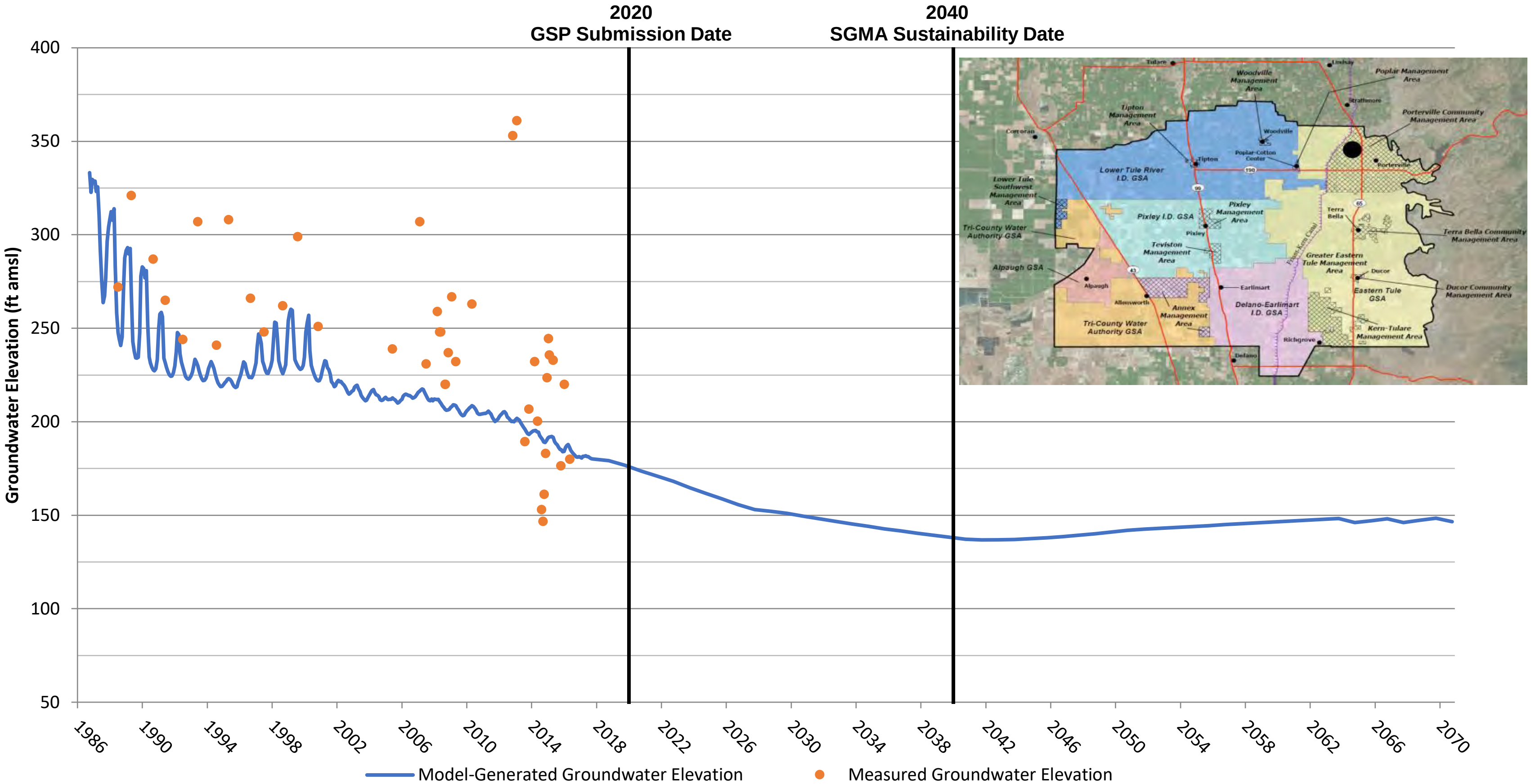
Eastern Tule GSA
Representative Monitoring Site

23S/27E-27
Lower Aquifer
Perforations: -505 to -855 (ft amsl)



Eastern Tule GSA
Representative Monitoring Site

C-16
Lower Aquifer
Perforations: 191 to -117 (ft amsl)



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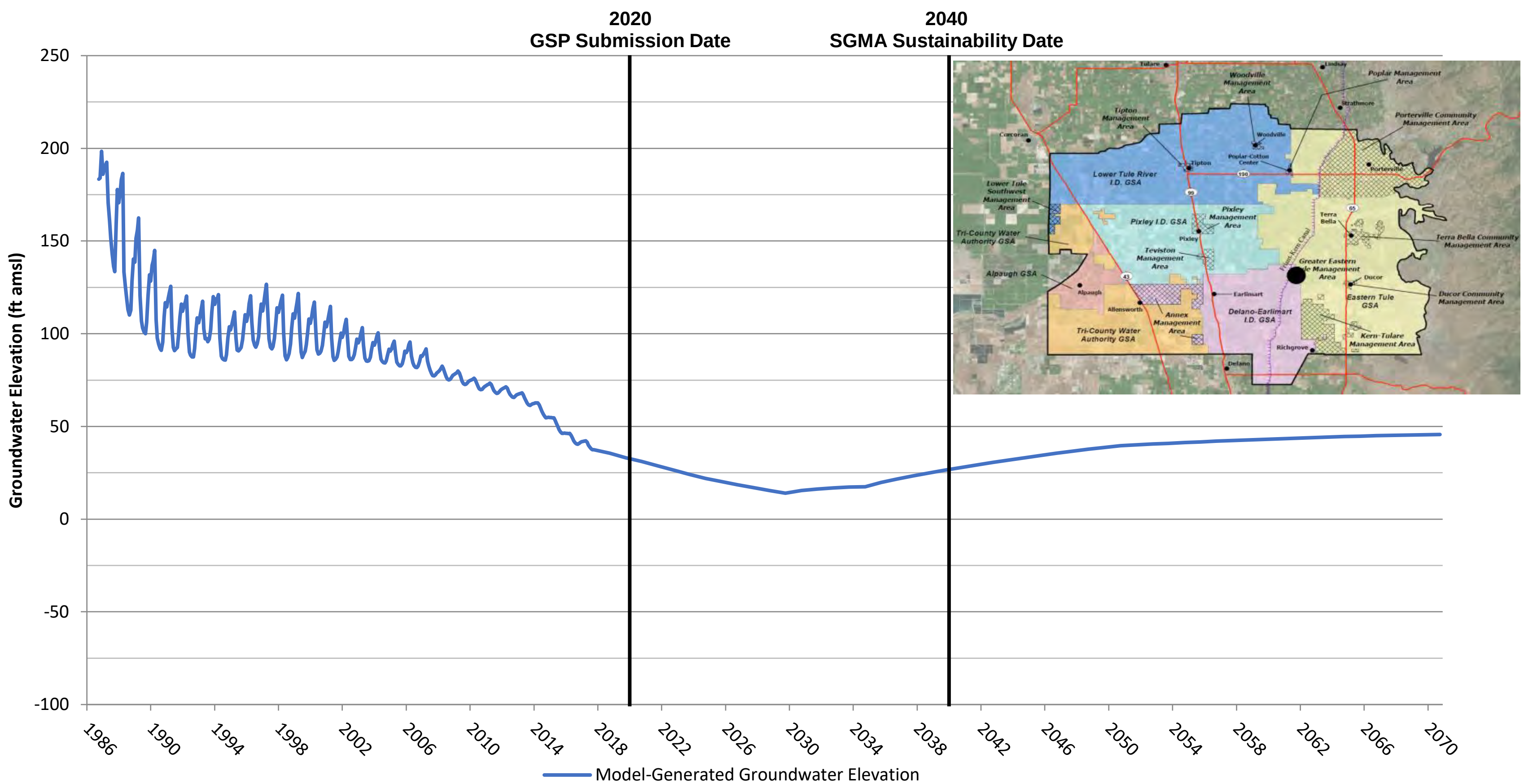
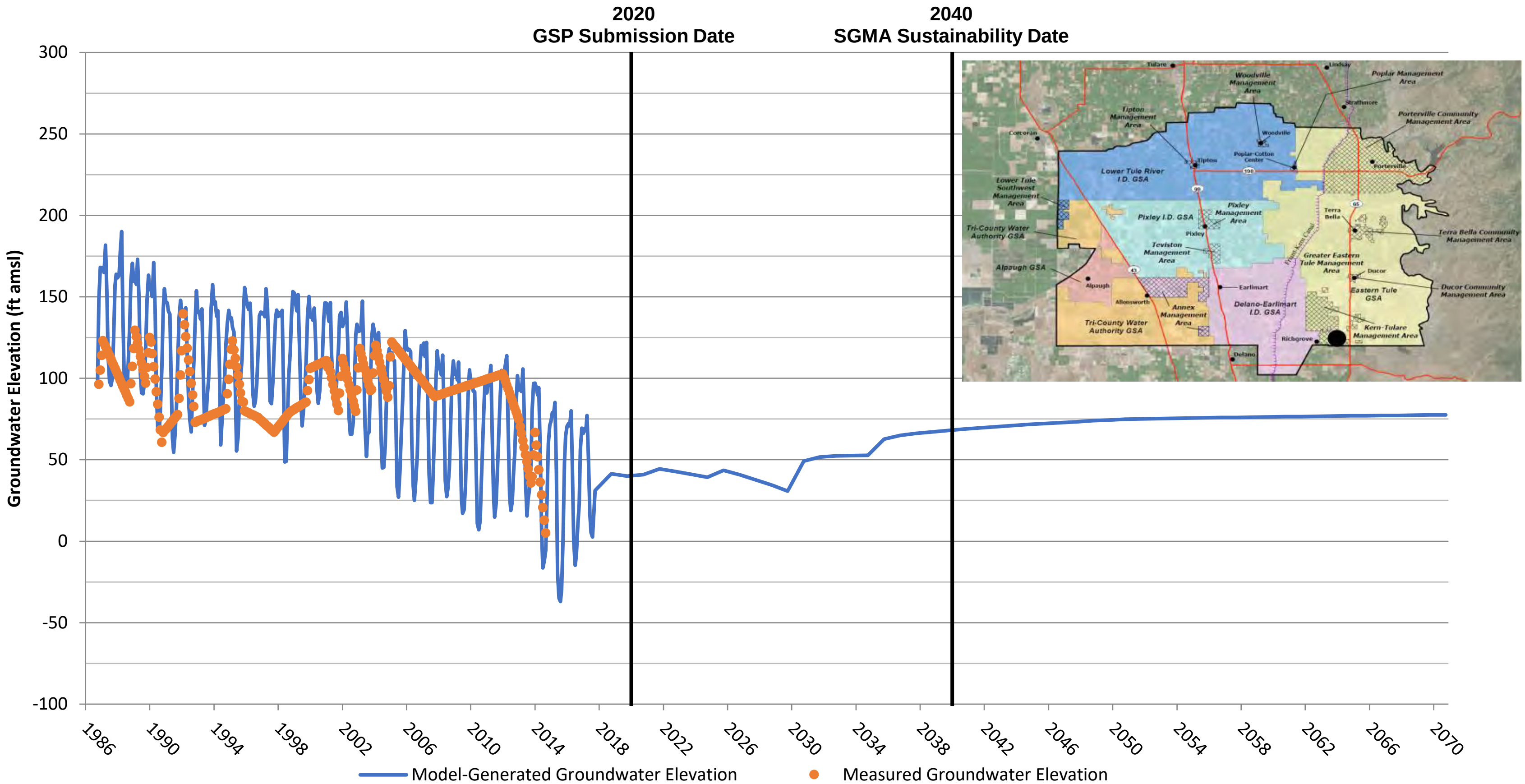
Representative Monitoring Site

23S/26E-23R01
Lower Aquifer
Perforations: -174 to -1,274 (ft amsl)



Eastern Tule GSA
Representative Monitoring Site

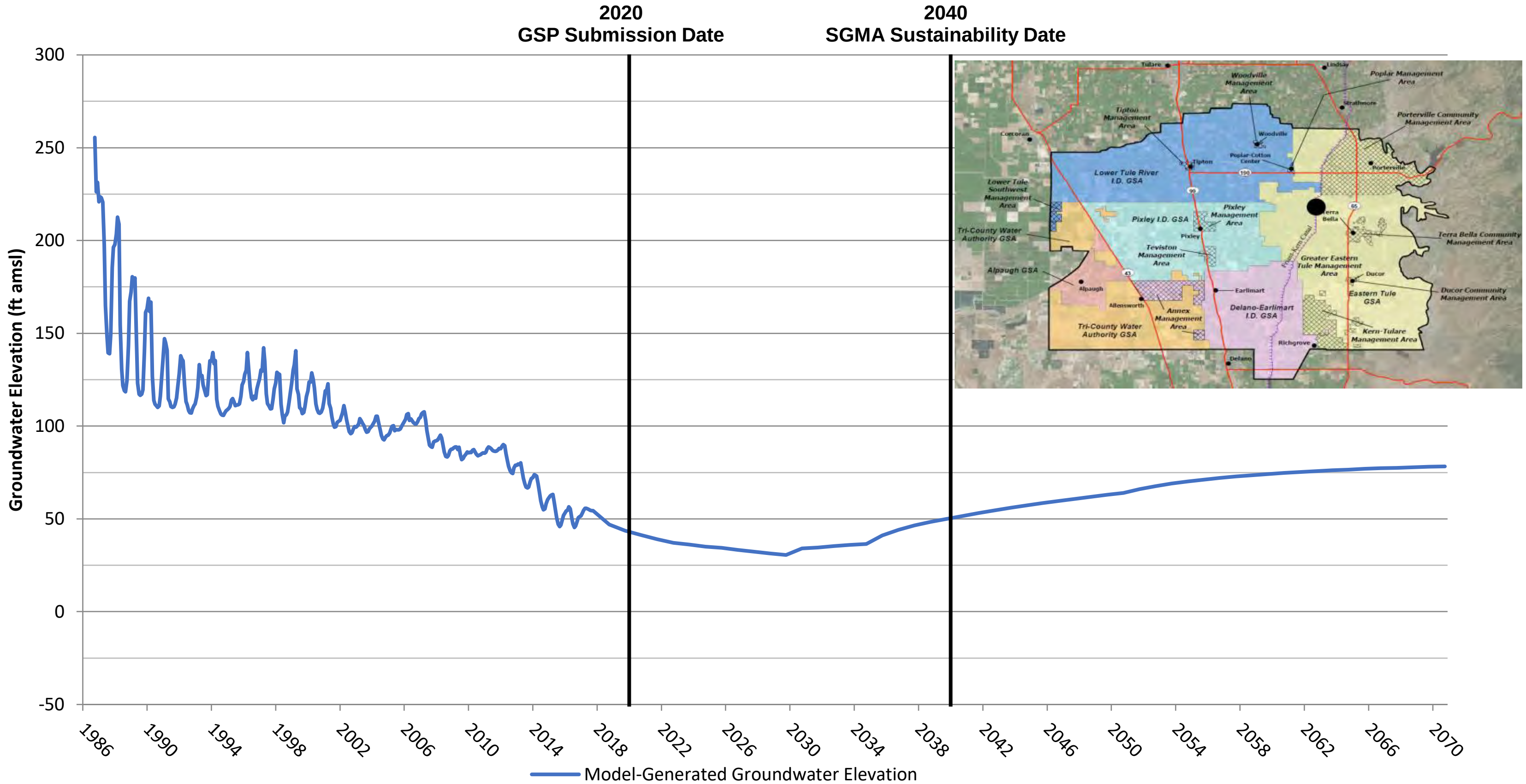
24S/27E-32K01
Lower Aquifer
Perforations: -466 to -1264 (ft amsl)



Eastern Tule GSA
Representative Monitoring Site

Appendix **B**
Figure 11

22S/26E-24
Lower Aquifer
Perforations: -263 to -813 (ft amsl)



Thomas Harder & Co.
Groundwater Consulting

January 2020

Appendix C

Delano-Earlimart Irrigation District GSA

Water Budgets and Hydrographs

Delano-Earlimart Irrigation District GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Inflow (acre-ft)					Total In
	Precipitation	Stream Inflow	Imported Water	Discharge from Wells		
		White River	Delano-Earlimart ID	Agricultural	Municipal	
1986 - 1987	27,000	0	114,782	51,000	1,600	194,000
1987 - 1988	39,000	0	110,345	52,000	1,600	203,000
1988 - 1989	32,000	0	105,980	56,000	1,700	196,000
1989 - 1990	30,000	0	83,837	78,000	1,700	194,000
1990 - 1991	41,000	0	106,877	53,000	1,700	203,000
1991 - 1992	36,000	0	92,567	70,000	1,700	200,000
1992 - 1993	58,000	0	133,359	33,000	1,700	226,000
1993 - 1994	36,000	0	92,394	72,000	1,800	202,000
1994 - 1995	76,000	3,867	124,388	40,000	1,800	246,000
1995 - 1996	40,000	1,276	144,069	35,000	1,800	222,000
1996 - 1997	56,000	6,659	153,967	34,000	1,800	252,000
1997 - 1998	91,000	27,100	119,815	56,000	1,800	296,000
1998 - 1999	46,000	205	124,051	48,000	1,900	220,000
1999 - 2000	44,000	626	134,272	42,000	1,900	223,000
2000 - 2001	33,000	296	117,746	53,000	1,900	206,000
2001 - 2002	31,000	1,067	126,747	44,000	2,000	205,000
2002 - 2003	31,000	646	121,277	43,000	2,000	198,000
2003 - 2004	26,000	0	127,364	35,000	2,100	190,000
2004 - 2005	49,000	1,298	119,847	39,000	2,100	211,000
2005 - 2006	50,000	2,384	121,005	38,000	2,200	214,000
2006 - 2007	21,000	0	79,111	77,000	2,200	179,000
2007 - 2008	24,000	0	106,470	46,000	2,300	179,000
2008 - 2009	25,000	0	111,556	47,000	2,400	186,000
2009 - 2010	41,000	0	118,671	43,000	2,400	205,000
2010 - 2011	60,000	6,543	127,447	36,000	2,500	232,000
2011 - 2012	38,000	0	114,108	39,000	2,500	194,000
2012 - 2013	17,000	0	87,302	64,000	2,600	171,000
2013 - 2014	12,000	0	38,106	111,000	2,600	164,000
2014 - 2015	18,000	0	18,591	129,000	2,700	168,000
2015 - 2016	27,000	0	93,806	57,000	2,800	181,000
2016 - 2017	28,000	10,216	137,773	34,000	2,800	213,000
86/87-16/17 Avg	38,000	2,000	109,900	53,000	2,100	205,000

Delano-Earlimart Irrigation District GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Outflow (acre-ft)										Total Out
	Areal Recharge of Precipitation	Streambed Infiltration	Recharge in Basins	Deep Percolation of Applied Water			Evapotranspiration				
		White River	Imported Water	Imported Water	Agricultural Pumping	Municipal Pumping	Precipitation Crops/Native	Imported Water Agricultural Cons. Use	Ag. Cons. Use from Pumping	Municipal (Landscape ET)	
1986 - 1987	0	0	0	27,100	10,200	1,100	27,000	87,600	41,000	600	195,000
1987 - 1988	0	0	0	23,200	10,300	1,100	39,000	87,100	41,000	600	202,000
1988 - 1989	0	0	0	22,400	11,200	1,100	32,000	83,600	45,000	600	196,000
1989 - 1990	0	0	0	18,000	15,200	1,100	30,000	65,900	63,000	600	194,000
1990 - 1991	0	0	0	20,900	10,600	1,100	41,000	86,000	43,000	600	203,000
1991 - 1992	0	0	0	19,900	13,700	1,100	36,000	72,700	56,000	600	200,000
1992 - 1993	4,000	0	5,600	25,400	6,800	1,100	53,000	102,400	26,000	600	225,000
1993 - 1994	0	0	700	21,400	14,100	1,100	36,000	70,300	58,000	600	202,000
1994 - 1995	15,000	3,900	4,500	23,700	8,100	1,200	61,000	96,300	32,000	600	246,000
1995 - 1996	0	1,300	1,300	37,100	7,700	1,200	40,000	105,800	27,000	600	222,000
1996 - 1997	4,000	6,700	5,300	42,100	7,600	1,200	52,000	106,500	26,000	600	252,000
1997 - 1998	25,000	27,100	2,900	28,200	11,700	1,200	66,000	88,700	44,000	700	296,000
1998 - 1999	0	200	2,700	26,600	10,300	1,200	46,000	94,700	38,000	700	220,000
1999 - 2000	0	600	4,400	29,900	9,100	1,200	44,000	100,000	33,000	700	223,000
2000 - 2001	0	300	600	26,800	11,300	1,200	33,000	90,400	42,000	700	206,000
2001 - 2002	0	1,100	0	28,400	9,500	1,300	31,000	98,300	34,000	700	204,000
2002 - 2003	0	600	0	23,800	7,500	1,300	31,000	97,500	35,000	700	197,000
2003 - 2004	0	0	0	27,700	6,300	1,300	26,000	99,700	29,000	700	191,000
2004 - 2005	1,000	1,300	100	23,700	6,900	1,400	48,000	96,100	32,000	800	211,000
2005 - 2006	1,000	2,400	1,200	23,200	6,800	1,400	49,000	96,700	32,000	800	215,000
2006 - 2007	0	0	100	15,800	12,400	1,500	21,000	63,200	65,000	800	180,000
2007 - 2008	0	0	0	16,500	7,900	1,500	24,000	90,000	38,000	800	179,000
2008 - 2009	0	0	2,500	19,500	7,900	1,500	25,000	89,600	39,000	800	186,000
2009 - 2010	0	0	5,800	20,200	7,400	1,600	41,000	92,600	36,000	900	206,000
2010 - 2011	5,000	6,500	9,400	22,100	6,300	1,600	54,000	96,000	30,000	900	232,000
2011 - 2012	0	0	1,100	21,000	6,800	1,600	38,000	92,000	32,000	900	193,000
2012 - 2013	0	0	0	16,300	10,400	1,700	17,000	71,000	54,000	900	171,000
2013 - 2014	0	0	0	7,100	17,100	1,700	12,000	31,000	94,000	900	164,000
2014 - 2015	0	0	0	2,700	19,700	1,700	18,000	15,900	109,000	1,000	168,000
2015 - 2016	0	0	3,600	13,000	9,400	1,800	27,000	77,100	48,000	1,000	181,000
2016 - 2017	0	10,200	16,400	23,100	6,000	1,800	28,000	98,200	28,000	1,000	213,000
86/87-16/17 Avg	2,000	2,000	2,200	22,500	9,900	1,400	36,000	85,300	44,000	700	206,000

Groundwater Inflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Appendix C
Table 2

Delano-Earlimart Irrigation District GSA
Historical Groundwater Budget 1986/87 to 2016/17

Water Year	Groundwater Inflows (acre-ft): Areal Recharge from Precipitation	White River: Streambed Infiltration	Imported Water Deliveries: Recharge in Basins	Imported Water Deliveries: Return Flow	Agricultural Pumping: Return Flow	Municipal Pumping: Return Flow	Release of Water from Compression of Aquitards	Sub-surface Inflow: From Outside Subbasin	Sub-surface Inflow: From Other GSAs	Total In	Groundwater Outflows (acre-ft): Groundwater Pumping: Municipal	Groundwater Pumping: Agricultural	Groundwater Pumping: Groundwater Banking Extraction	Sub-surface Outflow: To Outside Subbasin	Sub-surface Outflow: To Other GSAs	Total Out	Change in Storage (acre-ft)
1986 - 1987	0	0	0	27,100	10,200	1,100	11,000	3,000	23,000	75,000	1,600	51,000	0	23,000	47,000	123,000	-48,000
1987 - 1988	0	0	0	23,200	10,300	1,100	8,000	3,000	26,000	72,000	1,600	52,000	0	19,000	50,000	123,000	-51,000
1988 - 1989	0	0	0	22,400	11,200	1,100	8,000	4,000	26,000	73,000	1,700	56,000	0	18,000	51,000	127,000	-54,000
1989 - 1990	0	0	0	18,000	15,200	1,100	18,000	5,000	27,000	84,000	1,700	78,000	0	20,000	47,000	147,000	-63,000
1990 - 1991	0	0	0	20,900	10,600	1,100	8,000	5,000	29,000	75,000	1,700	53,000	0	22,000	52,000	129,000	-54,000
1991 - 1992	0	0	0	19,900	13,700	1,100	12,000	7,000	29,000	83,000	1,700	70,000	0	16,000	49,000	137,000	-54,000
1992 - 1993	4,000	0	5,600	25,400	6,800	1,100	2,000	5,000	30,000	80,000	1,700	33,000	0	17,000	52,000	104,000	-24,000
1993 - 1994	0	0	700	21,400	14,100	1,100	12,000	8,000	27,000	84,000	1,800	72,000	0	13,000	44,000	131,000	-47,000
1994 - 1995	15,000	3,900	4,500	23,700	8,100	1,200	3,000	6,000	26,000	91,000	1,800	40,000	0	13,000	47,000	102,000	-11,000
1995 - 1996	0	1,300	1,300	37,100	7,700	1,200	2,000	6,000	34,000	91,000	1,800	35,000	0	14,000	50,000	101,000	-10,000
1996 - 1997	4,000	6,700	5,300	42,100	7,600	1,200	2,000	6,000	33,000	108,000	1,800	34,000	0	17,000	51,000	104,000	4,000
1997 - 1998	25,000	27,100	2,900	28,200	11,700	1,200	3,000	7,000	37,000	143,000	1,800	56,000	0	14,000	48,000	120,000	23,000
1998 - 1999	0	200	2,700	26,600	10,300	1,200	2,000	6,000	37,000	86,000	1,900	48,000	0	14,000	47,000	111,000	-25,000
1999 - 2000	0	600	4,400	29,900	9,100	1,200	2,000	6,000	35,000	88,000	1,900	42,000	0	15,000	50,000	109,000	-21,000
2000 - 2001	0	300	600	26,800	11,300	1,200	6,000	6,000	36,000	88,000	1,900	53,000	0	17,000	50,000	122,000	-34,000
2001 - 2002	0	1,100	0	28,400	9,500	1,300	5,000	6,000	36,000	87,000	2,000	44,000	0	18,000	55,000	119,000	-32,000
2002 - 2003	0	600	0	23,800	7,500	1,300	4,000	6,000	34,000	77,000	2,000	43,000	0	15,000	52,000	112,000	-35,000
2003 - 2004	0	0	0	27,700	6,300	1,300	5,000	6,000	30,000	76,000	2,100	35,000	0	17,000	51,000	105,000	-29,000
2004 - 2005	1,000	1,300	100	23,700	6,900	1,400	4,000	6,000	33,000	77,000	2,100	39,000	0	16,000	49,000	106,000	-29,000
2005 - 2006	1,000	2,400	1,200	23,200	6,800	1,400	3,000	7,000	29,000	75,000	2,200	38,000	0	13,000	44,000	97,000	-22,000
2006 - 2007	0	0	100	15,800	12,400	1,500	18,000	7,000	32,000	87,000	2,200	77,000	0	14,000	40,000	133,000	-46,000
2007 - 2008	0	0	0	16,500	7,900	1,500	8,000	6,000	36,000	76,000	2,300	46,000	0	20,000	51,000	119,000	-43,000
2008 - 2009	0	0	2,500	19,500	7,900	1,500	10,000	6,000	35,000	82,000	2,400	47,000	600	21,000	54,000	125,000	-43,000
2009 - 2010	0	0	5,800	20,200	7,400	1,600	7,000	6,000	39,000	87,000	2,400	43,000	100	21,000	56,000	123,000	-36,000
2010 - 2011	5,000	6,500	9,400	22,100	6,300	1,600	5,000	6,000	33,000	95,000	2,500	36,000	0	18,000	52,000	109,000	-14,000
2011 - 2012	0	0	1,100	21,000	6,800	1,600	9,000	6,000	29,000	75,000	2,500	39,000	3,900	19,000	50,000	114,000	-39,000
2012 - 2013	0	0	0	16,300	10,400	1,700	18,000	6,000	31,000	83,000	2,600	64,000	6,000	17,000	49,000	139,000	-56,000
2013 - 2014	0	0	0	7,100	17,100	1,700	26,000	7,000	35,000	94,000	2,600	111,000	5,600	17,000	44,000	180,000	-86,000
2014 - 2015	0	0	0	2,700	19,700	1,700	20,000	7,000	38,000	89,000	2,700	129,000	1,200	15,000	40,000	188,000	-99,000
2015 - 2016	0	0	3,600	13,000	9,400	1,800	11,000	7,000	41,000	87,000	2,800	57,000	100	16,000	45,000	121,000	-34,000
2016 - 2017	0	10,200	16,400	23,100	6,000	1,800	6,000	6,000	37,000	107,000	2,800	34,000	0	16,000	51,000	104,000	3,000
86/87-16/17 Avg	2,000	2,000	2,200	22,500	9,900	1,400	8,000	6,000	32,000	86,000	2,100	53,000	600	17,000	49,000	122,000	-36,000
																Cumulative Change in Storage	-1,109,000

Groundwater Inflows or Outflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Groundwater Outflows Not Included in Sustainable Yield Estimates

Thomas Harder & Co.
Groundwater Consulting

January 2020

Appendix C
Table 3a

Projected Future Delano-Earlimart Irrigation District GSA Surface Water Budget

Water Year	Surface Water Inflow (acre-ft)						Total In
	Precipitation	Stream Inflow	Imported Water	Discharge from Wells			
		White River	Delano-Earlimart ID	Agricultural	Municipal	Water Bank	
2017 - 2018	38,000	2,224	116,902	36,000	3,700	2,200	197,000
2018 - 2019	38,000	2,224	116,902	36,000	3,700	2,200	197,000
2019 - 2020	38,000	2,224	116,902	36,000	3,700	2,200	197,000
2020 - 2021	38,000	2,224	116,902	36,000	3,700	2,200	197,000
2021 - 2022	38,000	2,224	116,902	36,000	3,700	2,200	197,000
2022 - 2023	38,000	2,224	116,902	36,000	3,700	2,200	197,000
2023 - 2024	38,000	2,224	116,902	36,000	3,700	2,200	197,000
2024 - 2025	38,000	2,224	117,661	33,000	3,700	2,200	195,000
2025 - 2026	38,000	2,224	118,420	31,000	3,700	2,200	193,000
2026 - 2027	38,000	2,224	119,180	29,000	3,700	2,200	192,000
2027 - 2028	38,000	2,224	119,939	27,000	3,700	2,200	191,000
2028 - 2029	38,000	2,224	120,698	25,000	3,700	2,200	190,000
2029 - 2030	38,000	2,224	121,457	23,000	3,700	2,200	188,000
2030 - 2031	38,000	2,224	121,457	21,000	3,700	2,200	186,000
2031 - 2032	38,000	2,224	121,457	20,000	3,700	2,200	185,000
2032 - 2033	38,000	2,224	121,457	18,000	3,700	2,200	183,000
2033 - 2034	38,000	2,224	121,457	17,000	3,700	2,200	182,000
2034 - 2035	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2035 - 2036	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2036 - 2037	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2037 - 2038	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2038 - 2039	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2039 - 2040	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2040 - 2041	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2041 - 2042	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2042 - 2043	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2043 - 2044	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2044 - 2045	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2045 - 2046	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2046 - 2047	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2047 - 2048	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2048 - 2049	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2049 - 2050	38,000	2,224	121,457	15,000	3,700	2,200	180,000
2050 - 2051	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2051 - 2052	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2052 - 2053	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2053 - 2054	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2054 - 2055	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2055 - 2056	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2056 - 2057	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2057 - 2058	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2058 - 2059	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2059 - 2060	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2060 - 2061	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2061 - 2062	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2062 - 2063	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2063 - 2064	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2064 - 2065	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2065 - 2066	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2066 - 2067	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2067 - 2068	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2068 - 2069	38,000	2,152	112,046	25,000	3,700	2,200	181,000
2069 - 2070	38,000	2,152	112,046	25,000	3,700	2,200	181,000
17/18-69/70 Avg	38,000	2,200	117,100	23,000	3,700	2,200	184,000

Projected Future Delano-Earlimart Irrigation District GSA Surface Water Budget

Water Year	Surface Water Outflow (acre-ft)										Total Out
	Areal Recharge of Precipitation	Streambed Infiltration	Recharge in Basins	Deep Percolation of Applied Water			Evapotranspiration				
		White River	Imported Water	Imported Water	Agricultural Pumping	Municipal Pumping	Precipitation Crops/Native	Imported Water Agricultural Cons. Use	Ag. Cons. Use from Pumping	Municipal (Landscape ET)	
2017 - 2018	2,000	2,200	2,200	21,400	6,300	2,400	36,000	95,500	29,000	1,300	198,000
2018 - 2019	2,000	2,200	2,200	21,400	6,300	2,400	36,000	95,500	29,000	1,300	198,000
2019 - 2020	2,000	2,200	2,200	21,400	6,300	2,400	36,000	95,500	29,000	1,300	198,000
2020 - 2021	2,000	2,200	2,200	21,400	6,300	2,400	36,000	95,500	29,000	1,300	198,000
2021 - 2022	2,000	2,200	2,200	21,400	6,300	2,400	36,000	95,500	29,000	1,300	198,000
2022 - 2023	2,000	2,200	2,200	21,400	6,300	2,400	36,000	95,500	29,000	1,300	198,000
2023 - 2024	2,000	2,200	2,200	21,400	6,300	2,400	36,000	95,500	29,000	1,300	198,000
2024 - 2025	2,000	2,200	2,200	21,500	5,900	2,400	36,000	96,100	28,000	1,300	198,000
2025 - 2026	2,000	2,200	2,200	21,600	5,500	2,400	36,000	96,800	26,000	1,300	196,000
2026 - 2027	2,000	2,200	2,200	21,700	5,100	2,400	36,000	97,400	24,000	1,300	194,000
2027 - 2028	2,000	2,200	2,200	21,800	4,700	2,400	36,000	98,100	22,000	1,300	193,000
2028 - 2029	2,000	2,200	2,200	22,000	4,200	2,400	36,000	98,700	20,000	1,300	191,000
2029 - 2030	2,000	2,200	2,200	22,100	3,800	2,400	36,000	99,400	19,000	1,300	190,000
2030 - 2031	2,000	2,200	2,200	22,100	3,500	2,400	36,000	99,400	18,000	1,300	189,000
2031 - 2032	2,000	2,200	2,200	22,100	3,200	2,400	36,000	99,400	16,000	1,300	187,000
2032 - 2033	2,000	2,200	2,200	22,100	2,900	2,400	36,000	99,400	15,000	1,300	186,000
2033 - 2034	2,000	2,200	2,200	22,100	2,600	2,400	36,000	99,400	14,000	1,300	184,000
2034 - 2035	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2035 - 2036	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2036 - 2037	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2037 - 2038	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2038 - 2039	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2039 - 2040	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2040 - 2041	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2041 - 2042	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2042 - 2043	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2043 - 2044	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2044 - 2045	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2045 - 2046	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2046 - 2047	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2047 - 2048	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2048 - 2049	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2049 - 2050	2,000	2,200	2,200	22,100	2,300	2,400	36,000	99,400	13,000	1,300	183,000
2050 - 2051	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2051 - 2052	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2052 - 2053	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2053 - 2054	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2054 - 2055	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2055 - 2056	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2056 - 2057	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2057 - 2058	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2058 - 2059	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2059 - 2060	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2060 - 2061	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2061 - 2062	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2062 - 2063	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2063 - 2064	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2064 - 2065	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2065 - 2066	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2066 - 2067	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2067 - 2068	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2068 - 2069	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
2069 - 2070	2,000	2,200	2,200	20,700	3,700	2,400	36,000	91,300	21,000	1,300	183,000
17/18-69/70 Avg	2,000	2,200	2,200	21,400	3,700	2,400	36,000	95,600	19,000	1,300	186,000

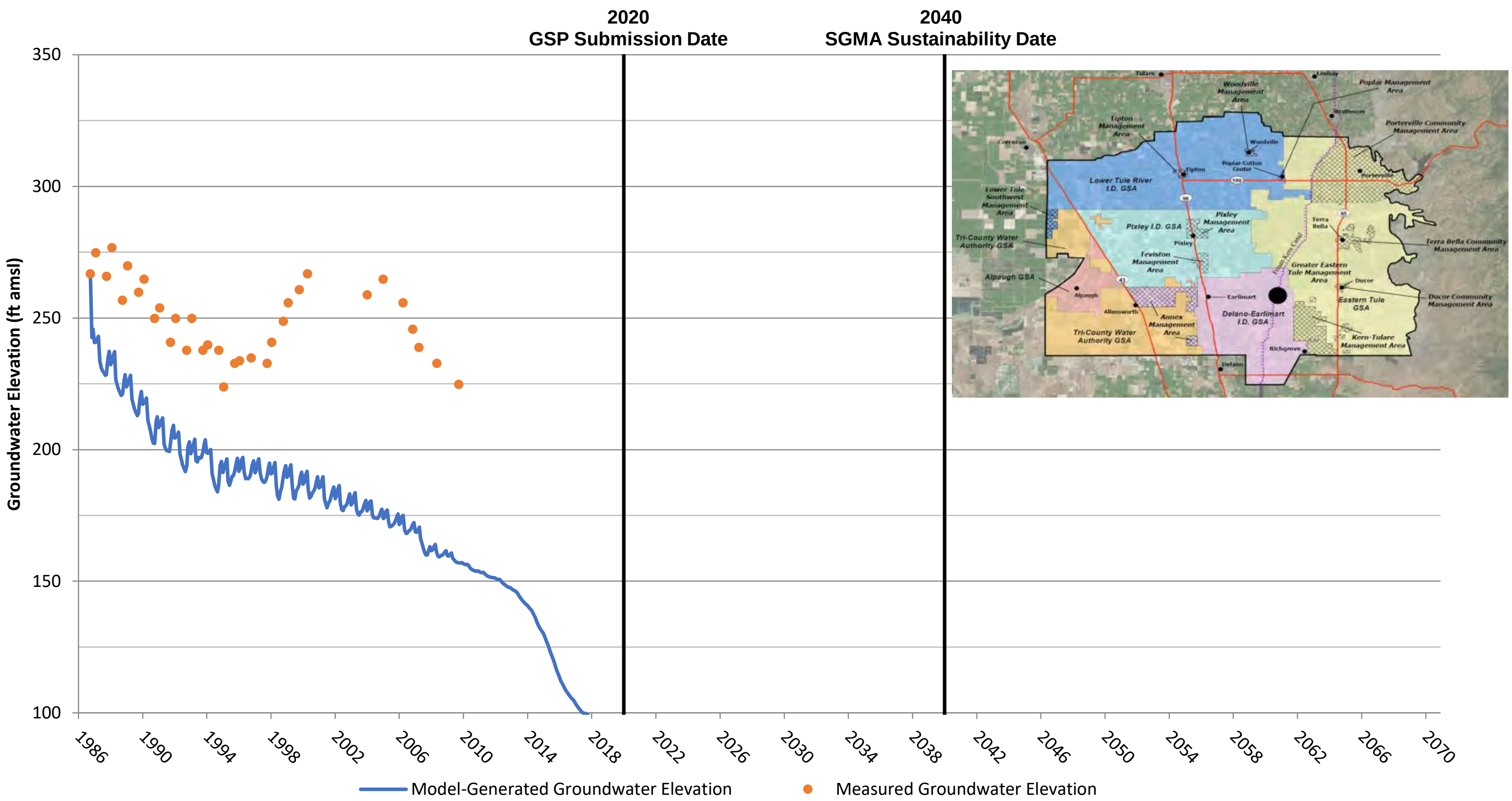
Projected Future Delano-Earlimart Irrigation District GSA Groundwater Budget

Water Year	Groundwater Inflows (acre-ft)										Groundwater Outflows (acre-ft)						Change in Storage (acre-ft)
	Areal Recharge from Precipitation	White River	Imported Water Deliveries		Agricultural Pumping	Municipal Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow		Total In	Groundwater Pumping			Sub-surface Outflow		Total Out	
		Streambed Infiltration	Recharge in Basins	Return Flow	Return Flow	Return Flow		From Outside Subbasin	From Other GSAs		Municipal	Agricultural	Groundwater Banking Extraction	To Outside Subbasin	To Other GSAs		
2017 - 2018	2,000	2,200	2,200	21,400	6,300	2,400	6,000	5,000	28,000	76,000	3,700	36,000	2,200	19,000	52,000	113,000	-37,000
2018 - 2019	2,000	2,200	2,200	21,400	6,300	2,400	7,000	5,000	28,000	77,000	3,700	36,000	2,200	19,000	50,000	111,000	-34,000
2019 - 2020	2,000	2,200	2,200	21,400	6,300	2,400	7,000	5,000	28,000	77,000	3,700	36,000	2,200	19,000	49,000	110,000	-33,000
2020 - 2021	2,000	2,200	2,200	21,400	6,300	2,400	7,000	5,000	28,000	77,000	3,700	36,000	2,200	19,000	48,000	109,000	-32,000
2021 - 2022	2,000	2,200	2,200	21,400	6,300	2,400	7,000	5,000	27,000	76,000	3,700	36,000	2,200	18,000	47,000	107,000	-31,000
2022 - 2023	2,000	2,200	2,200	21,400	6,300	2,400	7,000	5,000	26,000	75,000	3,700	36,000	2,200	18,000	45,000	105,000	-30,000
2023 - 2024	2,000	2,200	2,200	21,400	6,300	2,400	8,000	5,000	26,000	76,000	3,700	36,000	2,200	17,000	46,000	105,000	-29,000
2024 - 2025	2,000	2,200	2,200	21,500	5,900	2,400	7,000	5,000	25,000	73,000	3,700	33,000	2,200	17,000	43,000	99,000	-26,000
2025 - 2026	2,000	2,200	2,200	21,600	5,500	2,400	6,000	5,000	22,000	69,000	3,700	31,000	2,200	16,000	40,000	93,000	-24,000
2026 - 2027	2,000	2,200	2,200	21,700	5,100	2,400	6,000	5,000	20,000	67,000	3,700	29,000	2,200	16,000	39,000	90,000	-23,000
2027 - 2028	2,000	2,200	2,200	21,800	4,700	2,400	5,000	5,000	18,000	63,000	3,700	27,000	2,200	16,000	37,000	86,000	-23,000
2028 - 2029	2,000	2,200	2,200	22,000	4,200	2,400	5,000	5,000	16,000	61,000	3,700	25,000	2,200	15,000	36,000	82,000	-21,000
2029 - 2030	2,000	2,200	2,200	22,100	3,800	2,400	4,000	5,000	15,000	59,000	3,700	23,000	2,200	14,000	32,000	75,000	-16,000
2030 - 2031	2,000	2,200	2,200	22,100	3,500	2,400	4,000	5,000	14,000	57,000	3,700	21,000	2,200	14,000	31,000	72,000	-15,000
2031 - 2032	2,000	2,200	2,200	22,100	3,200	2,400	3,000	5,000	13,000	55,000	3,700	20,000	2,200	14,000	31,000	71,000	-16,000
2032 - 2033	2,000	2,200	2,200	22,100	2,900	2,400	3,000	4,000	12,000	53,000	3,700	18,000	2,200	13,000	30,000	67,000	-14,000
2033 - 2034	2,000	2,200	2,200	22,100	2,600	2,400	3,000	4,000	12,000	53,000	3,700	17,000	2,200	13,000	31,000	67,000	-14,000
2034 - 2035	2,000	2,200	2,200	22,100	2,300	2,400	2,000	5,000	12,000	52,000	3,700	15,000	2,200	13,000	29,000	63,000	-11,000
2035 - 2036	2,000	2,200	2,200	22,100	2,300	2,400	2,000	5,000	13,000	53,000	3,700	15,000	2,200	13,000	28,000	62,000	-9,000
2036 - 2037	2,000	2,200	2,200	22,100	2,300	2,400	2,000	5,000	13,000	53,000	3,700	15,000	2,200	13,000	28,000	62,000	-9,000
2037 - 2038	2,000	2,200	2,200	22,100	2,300	2,400	2,000	5,000	13,000	53,000	3,700	15,000	2,200	13,000	27,000	61,000	-8,000
2038 - 2039	2,000	2,200	2,200	22,100	2,300	2,400	2,000	5,000	14,000	54,000	3,700	15,000	2,200	13,000	27,000	61,000	-7,000
2039 - 2040	2,000	2,200	2,200	22,100	2,300	2,400	2,000	5,000	14,000	54,000	3,700	15,000	2,200	13,000	25,000	59,000	-5,000
2040 - 2041	2,000	2,200	2,200	22,100	2,300	2,400	2,000	5,000	14,000	54,000	3,700	15,000	2,200	12,000	25,000	58,000	-4,000
2041 - 2042	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	14,000	53,000	3,700	15,000	2,200	12,000	24,000	57,000	-4,000
2042 - 2043	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	14,000	53,000	3,700	15,000	2,200	12,000	24,000	57,000	-4,000
2043 - 2044	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	14,000	53,000	3,700	15,000	2,200	12,000	24,000	57,000	-4,000
2044 - 2045	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	15,000	54,000	3,700	15,000	2,200	12,000	24,000	57,000	-3,000
2045 - 2046	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	15,000	54,000	3,700	15,000	2,200	12,000	24,000	57,000	-3,000
2046 - 2047	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	15,000	54,000	3,700	15,000	2,200	12,000	24,000	57,000	-3,000
2047 - 2048	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	15,000	54,000	3,700	15,000	2,200	12,000	24,000	57,000	-3,000
2048 - 2049	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	15,000	54,000	3,700	15,000	2,200	12,000	24,000	57,000	-3,000
2049 - 2050	2,000	2,200	2,200	22,100	2,300	2,400	1,000	5,000	15,000	54,000	3,700	15,000	2,200	12,000	24,000	57,000	-3,000
2050 - 2051	2,000	2,200	2,200	20,700	3,700	2,400	2,000	5,000	16,000	56,000	3,700	25,000	2,200	11,000	23,000	65,000	-9,000
2051 - 2052	2,000	2,200	2,200	20,700	3,700	2,400	2,000	5,000	17,000	57,000	3,700	25,000	2,200	11,000	22,000	64,000	-7,000
2052 - 2053	2,000	2,200	2,200	20,700	3,700	2,400	2,000	5,000	17,000	57,000	3,700	25,000	2,200	11,000	22,000	64,000	-7,000
2053 - 2054	2,000	2,200	2,200	20,700	3,700	2,400	2,000	5,000	17,000	57,000	3,700	25,000	2,200	11,000	22,000	64,000	-7,000
2054 - 2055	2,000	2,200	2,200	20,700	3,700	2,400	2,000	5,000	17,000	57,000	3,700	25,000	2,200	11,000	22,000	64,000	-7,000
2055 - 2056	2,000	2,200	2,200	20,700	3,700	2,400	2,000	5,000	18,000	58,000	3,700	25,000	2,200	11,000	21,000	63,000	-5,000
2056 - 2057	2,000	2,200	2,200	20,700	3,700	2,400	2,000	5,000	18,000	58,000	3,700	25,000	2,200	11,000	21,000	63,000	-5,000
2057 - 2058	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	18,000	57,000	3,700	25,000	2,200	10,000	21,000	62,000	-5,000
2058 - 2059	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	18,000	57,000	3,700	25,000	2,200	10,000	21,000	62,000	-5,000
2059 - 2060	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	18,000	57,000	3,700	25,000	2,200	10,000	21,000	62,000	-5,000
2060 - 2061	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2061 - 2062	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2062 - 2063	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2063 - 2064	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2064 - 2065	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2065 - 2066	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2066 - 2067	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2067 - 2068	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2068 - 2069	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
2069 - 2070	2,000	2,200	2,200	20,700	3,700	2,400	1,000	5,000	19,000	58,000	3,700	25,000	2,200	10,000	21,000	62,000	-4,000
17/18-69/70 Avg	2,000	2,200	2,200	21,400	3,700	2,400	3,000	5,000	18,000	60,000	3,700	23,000	2,200	13,000	29,000	71,000	-11,000

Delano-Earlimart Irrigation District GSA
Representative Monitoring Site

Appendix **C**
Figure **1**

23S/26E-34Q01
Upper Aquifer
Perforations: 390 to 38 (ft amsl)

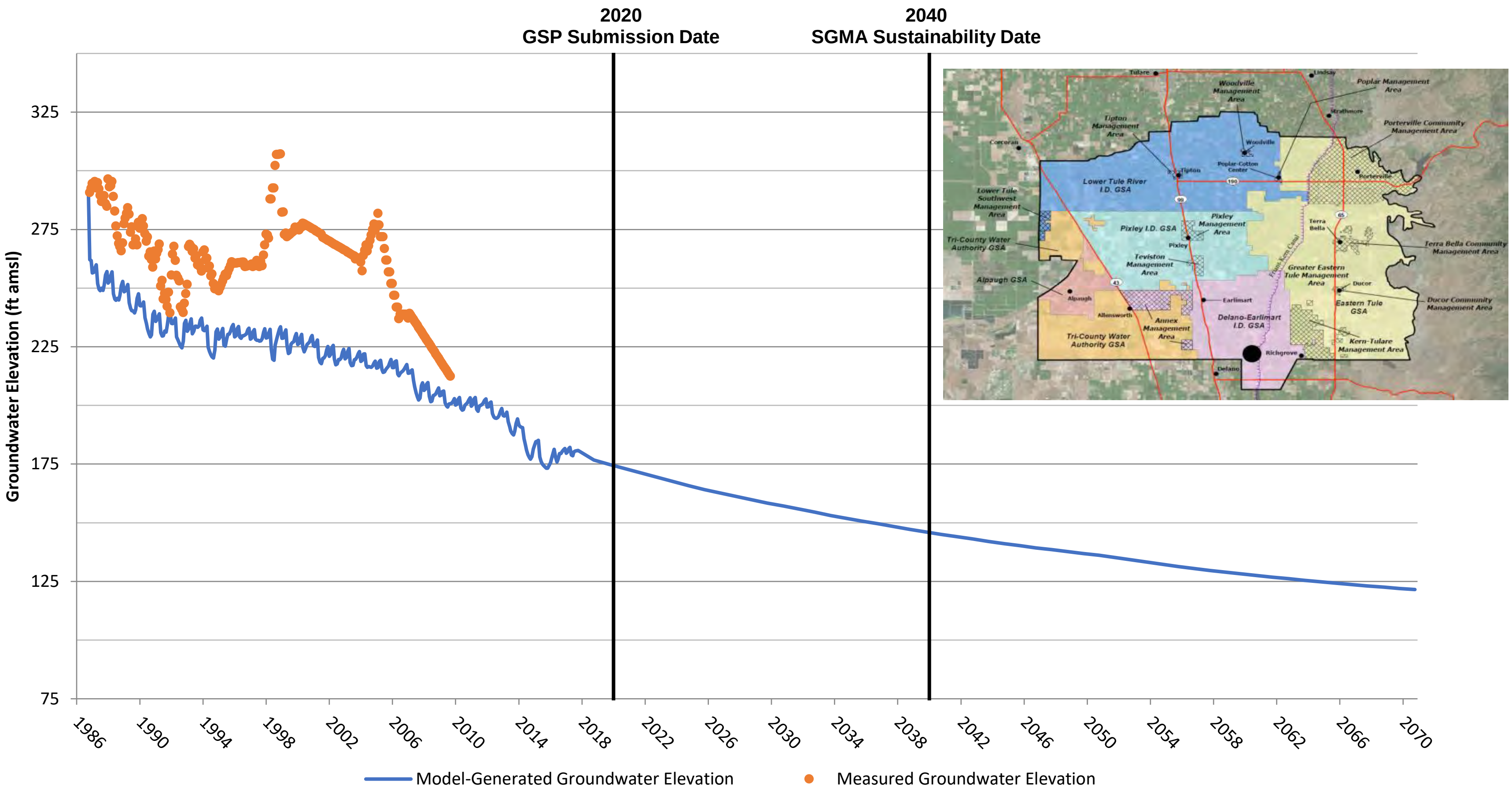


Tule Subbasin
Basin Setting

Delano-Earlimart Irrigation District GSA
Representative Monitoring Site

Appendix **C**
Figure 2

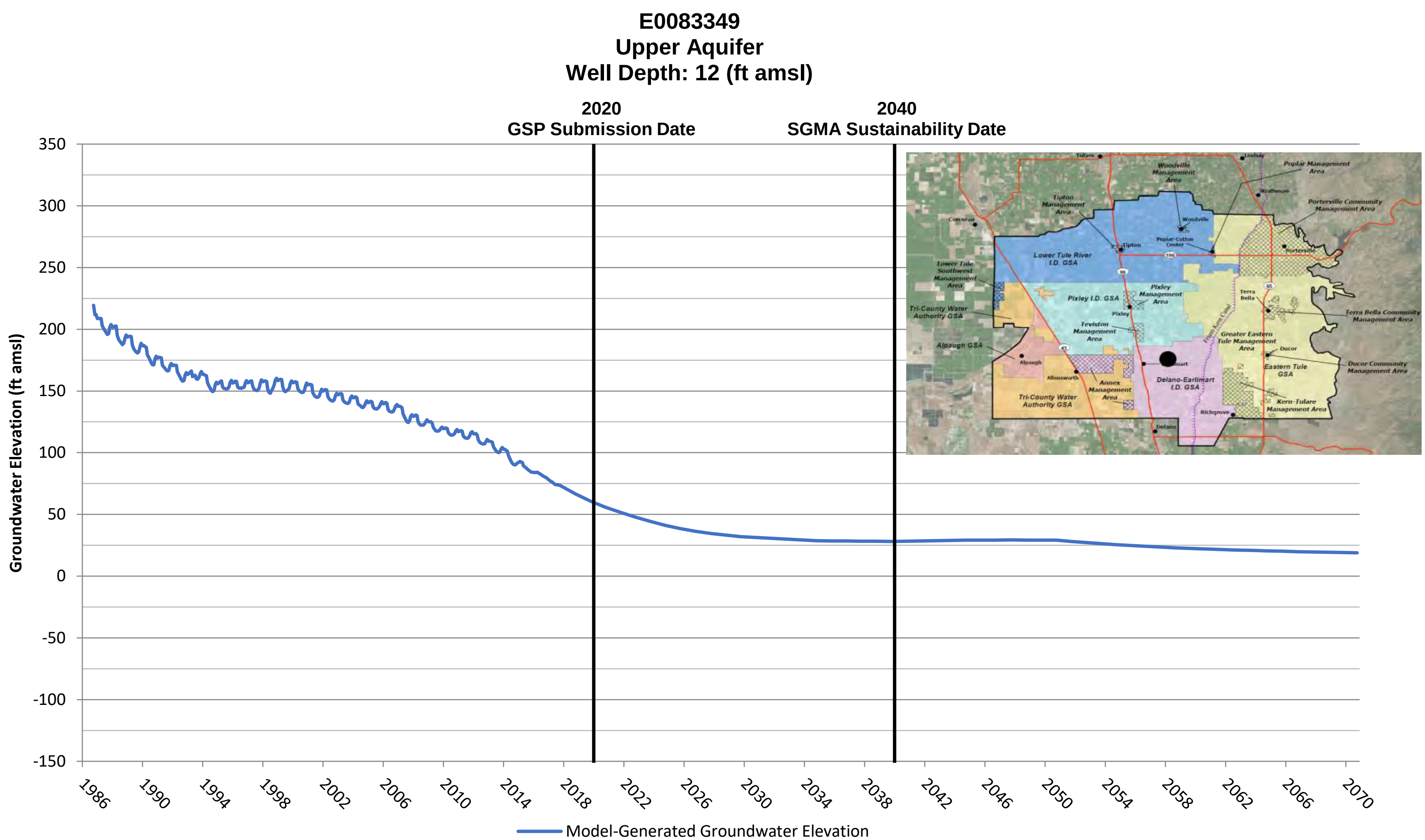
24S/26E-32G01
Upper Aquifer
Bore Depth: -69 (ft amsl)



Thomas Harder & Co.
Groundwater Consulting

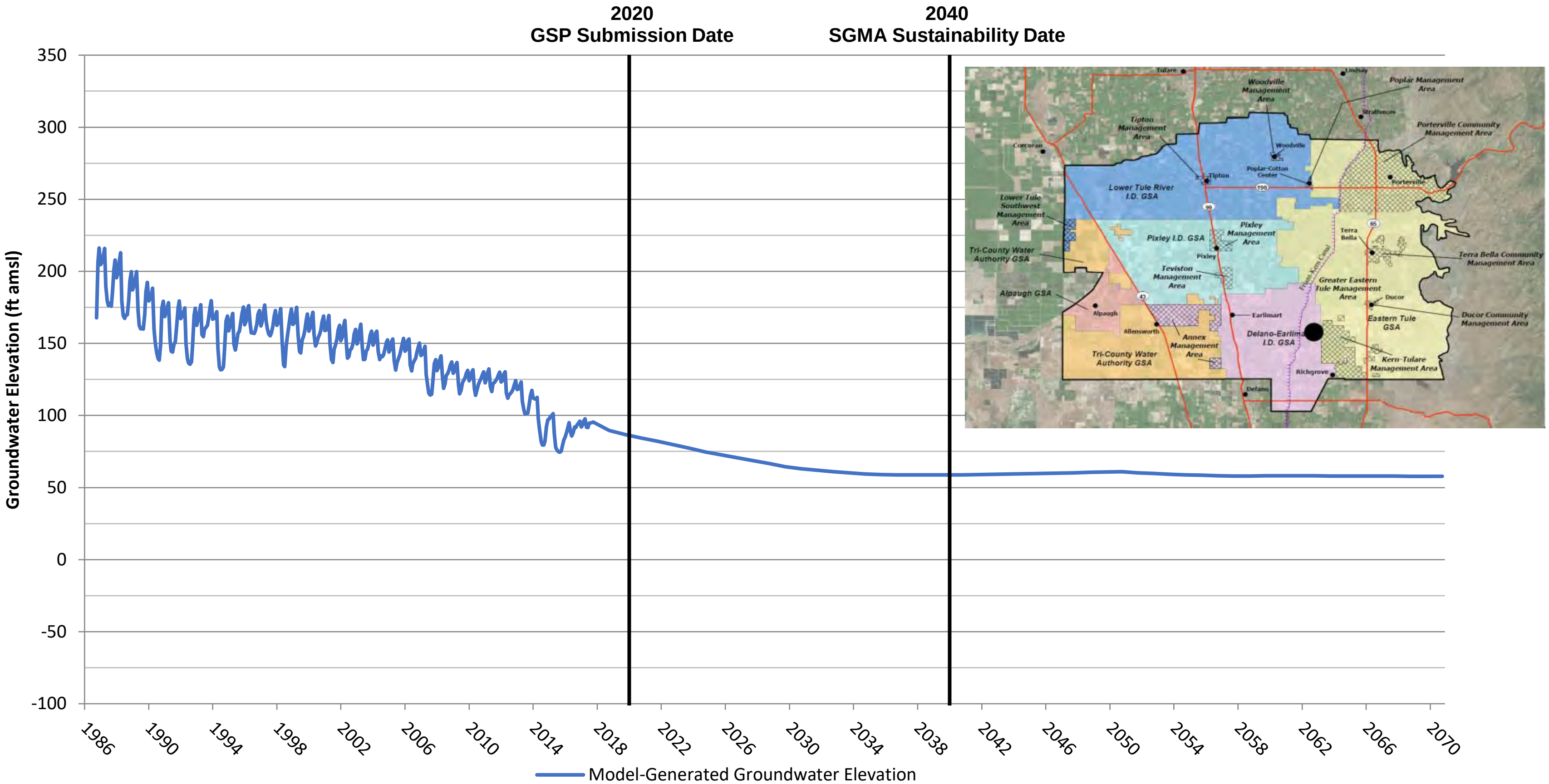
January 2020

Delano-Earlimart Irrigation District GSA
Representative Monitoring Site



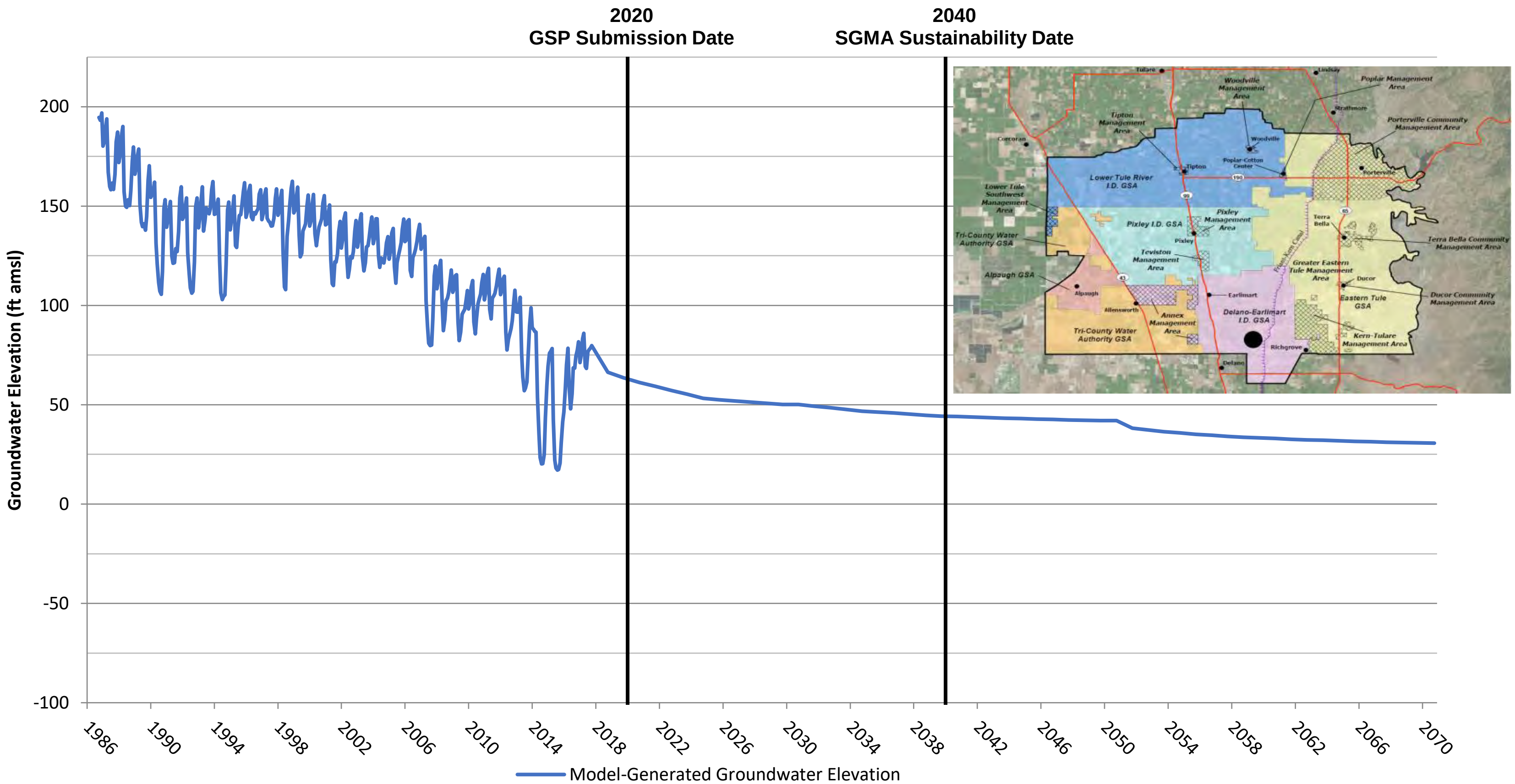
Delano-Earlimart Irrigation District GSA
Representative Monitoring Site

E0070434
Lower Aquifer
Well Depth: -323 (ft amsl)



Delano-Earlimart Irrigation District GSA
Representative Monitoring Site

E0094489
Lower Aquifer
Perforations: -157 to -777 (ft amsl)



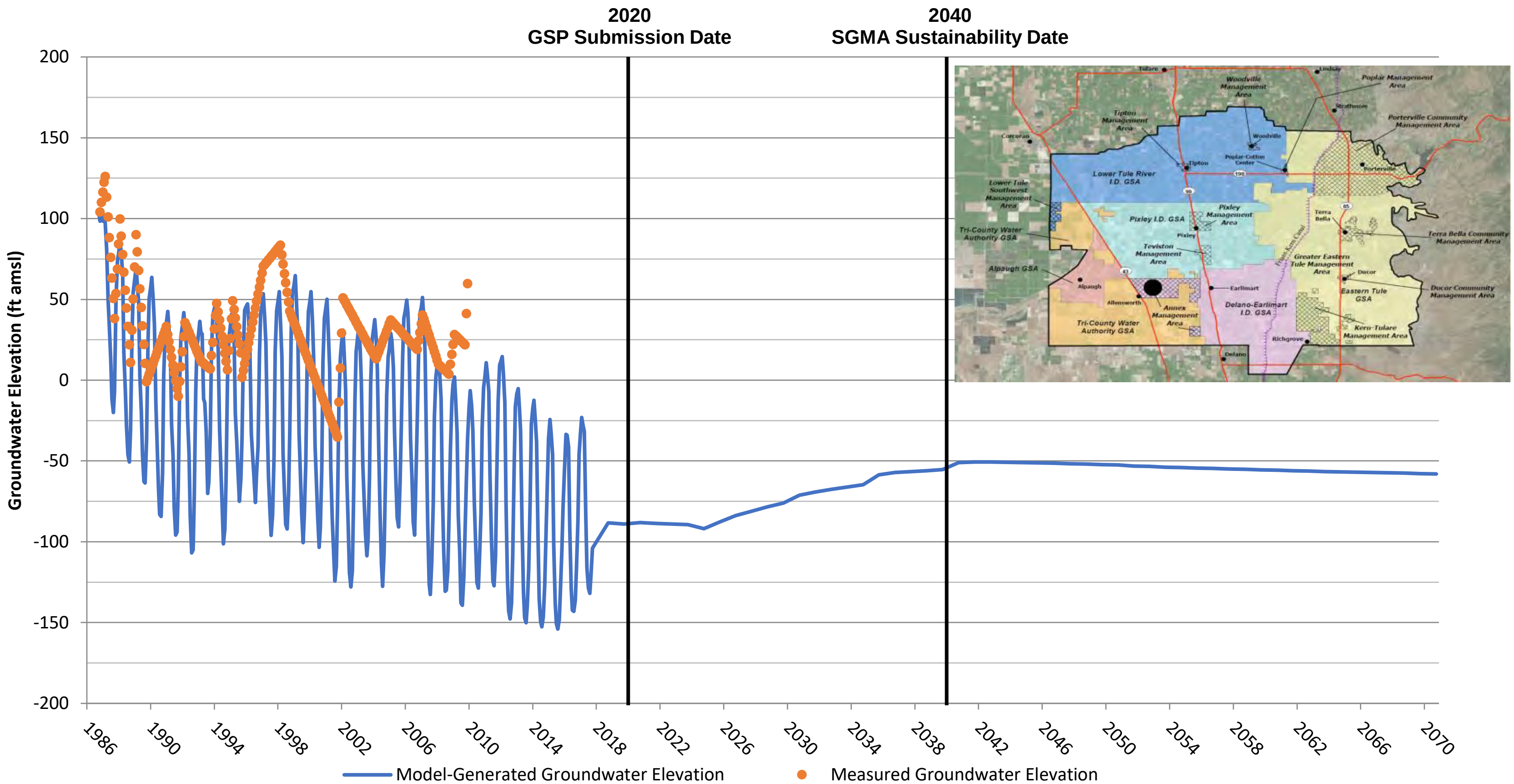
Thomas Harder & Co.
Groundwater Consulting

January 2020

Delano-Earlimart Irrigation District GSA
Representative Monitoring Site

Appendix **C**
Figure **6**

24S/24E-03A01
Lower Aquifer
Perforations: -582 to -1,380 (ft amsl)



Appendix D

Pixley Irrigation District GSA

Water Budgets and Hydrographs

Appendix D
Table 1a

Pixley Irrigation District GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Inflow (acre-ft)					Total In
	Precipitation	Stream Inflow	Imported Water	Discharge from Wells		
		Deer Creek	Pixley ID	Agricultural	Municipal	
1986 - 1987	28,000	0	9,356	153,000	700	191,000
1987 - 1988	40,000	0	0	154,000	700	195,000
1988 - 1989	32,000	0	5,289	150,000	700	188,000
1989 - 1990	31,000	0	0	174,000	700	206,000
1990 - 1991	42,000	0	0	177,000	700	220,000
1991 - 1992	36,000	0	0	167,000	700	204,000
1992 - 1993	58,000	0	96,890	112,000	700	268,000
1993 - 1994	37,000	0	7,793	177,000	700	222,000
1994 - 1995	77,000	10,445	55,365	148,000	700	292,000
1995 - 1996	41,000	8,989	60,931	120,000	700	232,000
1996 - 1997	57,000	13,322	37,048	143,000	700	251,000
1997 - 1998	92,000	74,587	41,823	138,000	700	347,000
1998 - 1999	47,000	4,770	34,736	156,000	700	243,000
1999 - 2000	45,000	4,791	40,076	160,000	700	251,000
2000 - 2001	33,000	0	9,098	159,000	700	202,000
2001 - 2002	32,000	0	13,588	150,000	800	196,000
2002 - 2003	31,000	1,697	32,195	131,000	800	197,000
2003 - 2004	26,000	0	9,839	137,000	800	174,000
2004 - 2005	50,000	7,994	59,211	104,000	800	222,000
2005 - 2006	51,000	9,156	60,634	132,000	900	254,000
2006 - 2007	21,000	0	7,200	143,000	900	172,000
2007 - 2008	24,000	0	12,243	126,000	900	163,000
2008 - 2009	26,000	0	23,620	142,000	900	193,000
2009 - 2010	41,000	0	32,972	115,000	900	190,000
2010 - 2011	61,000	20,157	48,391	132,000	1,000	263,000
2011 - 2012	38,000	0	5,914	179,000	1,000	224,000
2012 - 2013	18,000	0	5,012	179,000	1,000	203,000
2013 - 2014	12,000	0	0	184,000	1,000	197,000
2014 - 2015	18,000	0	0	184,000	1,000	203,000
2015 - 2016	27,000	0	3,442	119,000	1,100	151,000
2016 - 2017	29,000	13,754	82,363	92,000	1,100	218,000
86/87-16/17 Avg	39,000	5,500	25,600	146,000	800	217,000

Pixley Irrigation District GSA
Historical Surface Water Budget 1986/87 to 2016/17

Surface Water Outflow (acre-ft)

Water Year	Areal Recharge of Precipitation	Streambed Infiltration: Deer Creek: Trenton Weir to Homeland Canal Infiltration	Canal Loss: Deer Creek	Canal Loss: Imported Water	Recharge in Basins: Deer Creek	Recharge in Basins: Imported Water	Deep Percolation of Applied Water: Deer Creek	Deep Percolation of Applied Water: Imported Water	Deep Percolation of Applied Water: Agricultural Pumping	Deep Percolation of Applied Water: Municipal Pumping	Evapotranspiration: Precipitation Crops/Native	Evapotranspiration: Deer Creek: Agricultural Cons. Use	Evapotranspiration: Imported Water: Agricultural Cons. Use	Evapotranspiration: Ag. Cons. Use from Pumping	Evapotranspiration: Municipal (Landscape ET)	Surface Outflow: Deer Creek	Total Out
1986 - 1987	0	0	0	8,200	0	0	0	300	38,900	500	28,000	0	900	114,000	200	0	191,000
1987 - 1988	0	0	0	0	0	0	0	0	39,200	500	40,000	0	0	115,000	200	0	195,000
1988 - 1989	0	0	0	1,700	0	0	0	900	38,300	500	32,000	0	2,700	112,000	200	0	188,000
1989 - 1990	0	0	0	0	0	0	0	0	44,400	500	31,000	0	0	130,000	200	0	206,000
1990 - 1991	0	0	0	0	0	0	0	0	45,000	500	42,000	0	0	132,000	300	0	220,000
1991 - 1992	0	0	0	0	0	0	0	0	42,500	500	36,000	0	0	124,000	300	0	203,000
1992 - 1993	3,000	0	0	43,400	0	0	0	13,600	28,400	500	56,000	0	39,900	83,000	300	0	268,000
1993 - 1994	0	0	0	7,800	0	0	0	0	45,100	500	37,000	0	0	132,000	300	0	223,000
1994 - 1995	13,000	1,000	3,800	19,700	1,800	5,900	1,000	7,600	37,800	500	64,000	2,900	22,200	111,000	300	0	293,000
1995 - 1996	0	700	2,800	18,100	700	4,500	1,200	9,800	30,700	500	41,000	3,600	28,600	90,000	300	0	233,000
1996 - 1997	2,000	1,800	6,900	12,900	1,900	1,900	700	5,700	36,500	500	55,000	2,000	16,600	107,000	300	0	252,000
1997 - 1998	23,000	12,700	48,800	14,900	900	2,400	3,100	6,200	35,300	500	69,000	9,100	18,200	103,000	300	0	347,000
1998 - 1999	0	600	2,500	12,300	400	1,200	300	5,400	39,700	500	47,000	1,000	15,800	116,000	300	0	243,000
1999 - 2000	0	600	2,400	13,000	500	700	300	6,700	40,800	500	45,000	900	19,600	119,000	300	0	250,000
2000 - 2001	0	0	0	2,600	0	100	0	1,600	40,500	500	33,000	0	4,800	119,000	300	0	202,000
2001 - 2002	0	0	0	4,000	0	0	0	2,400	38,300	500	32,000	0	7,100	112,000	300	0	197,000
2002 - 2003	0	100	400	10,900	300	1,700	200	4,400	29,500	500	31,000	700	15,200	102,000	300	0	197,000
2003 - 2004	0	0	0	3,000	0	0	0	1,500	30,500	500	26,000	0	5,300	107,000	300	0	174,000
2004 - 2005	0	400	1,500	14,900	2,900	8,400	700	8,000	23,200	500	50,000	2,500	27,900	81,000	300	0	222,000
2005 - 2006	0	900	3,400	15,400	3,200	8,500	400	8,200	29,300	600	50,000	1,300	28,500	102,000	300	0	252,000
2006 - 2007	0	0	0	2,800	0	0	0	1,000	31,800	600	21,000	0	3,500	111,000	300	0	172,000
2007 - 2008	0	0	0	3,800	0	1,000	0	1,700	28,100	600	24,000	0	5,800	98,000	300	0	163,000
2008 - 2009	0	0	0	7,400	0	1,300	0	3,300	31,700	600	26,000	0	11,600	111,000	300	0	193,000
2009 - 2010	0	0	0	11,000	0	9,000	0	3,700	25,600	600	41,000	0	12,900	89,000	300	0	193,000
2010 - 2011	4,000	1,300	5,000	9,200	9,700	8,500	1,400	7,000	29,300	600	57,000	4,700	24,300	102,000	300	0	264,000
2011 - 2012	0	0	0	1,800	0	1,800	0	500	39,900	600	38,000	0	1,800	139,000	300	0	224,000
2012 - 2013	0	0	0	1,700	0	100	0	700	39,900	600	18,000	0	2,500	139,000	400	0	203,000
2013 - 2014	0	0	0	0	0	0	0	0	41,000	700	12,000	0	0	143,000	400	0	197,000
2014 - 2015	0	0	0	0	0	0	0	0	41,000	700	18,000	0	0	143,000	400	0	203,000
2015 - 2016	0	0	0	1,200	0	100	0	500	26,500	700	27,000	0	1,700	92,000	400	0	150,000
2016 - 2017	0	800	3,100	20,600	3,700	10,600	1,400	11,400	20,600	700	29,000	4,800	39,800	72,000	400	0	219,000
86/87-16/17 Avg	1,000	700	2,600	8,500	800	2,200	300	3,600	35,100	600	37,000	1,100	11,500	111,000	300	0	216,000

Groundwater Inflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Appendix D
Table 2

Pixley Irrigation District GSA
Historical Groundwater Budget 1986/87 to 2016/17

Water Year	Groundwater Inflows (acre-ft): Areal Recharge from Precipitation	Native Deer Creek: Trenton Weir to Homeland Canal Infiltration	Native Deer Creek: Canal Loss	Native Deer Creek: Recharge in Basins	Native Deer Creek: Return Flow	Imported Water Deliveries: Canal Loss	Imported Water Deliveries: Recharge in Basins	Imported Water Deliveries: Return Flow	Agricultural Pumping: Return Flow	Municipal Pumping: Return Flow	Release of Water from Compression of Aquitards	Sub-surface Inflow: From Outside Subbasin	Sub-surface Inflow: From Other GSAs	Total In	Groundwater Outflows (acre-ft): Groundwater Pumping: Municipal	Groundwater Pumping: Agricultural	Sub-surface Outflow: To Outside Subbasin	Sub-surface Outflow: To Other GSAs	Total Out	Change in Storage (acre-ft)
1986 - 1987	0	0	0	0	0	8,200	0	300	38,900	500	23,000	0	136,000	207,000	700	153,000	0	54,000	208,000	-1,000
1987 - 1988	0	0	0	0	0	0	0	0	39,200	500	21,000	0	131,000	192,000	700	154,000	0	62,000	217,000	-25,000
1988 - 1989	0	0	0	0	0	1,700	0	900	38,300	500	22,000	0	128,000	191,000	700	150,000	0	64,000	215,000	-24,000
1989 - 1990	0	0	0	0	0	0	0	0	44,400	500	39,000	0	124,000	208,000	700	174,000	0	60,000	235,000	-27,000
1990 - 1991	0	0	0	0	0	0	0	0	45,000	500	39,000	0	134,000	219,000	700	177,000	0	65,000	243,000	-24,000
1991 - 1992	0	0	0	0	0	0	0	0	42,500	500	39,000	0	132,000	214,000	700	167,000	0	70,000	238,000	-24,000
1992 - 1993	3,000	0	0	0	0	43,400	0	13,600	28,400	500	4,000	0	144,000	237,000	700	112,000	0	78,000	191,000	46,000
1993 - 1994	0	0	0	0	0	7,800	0	0	45,100	500	20,000	0	135,000	208,000	700	177,000	0	62,000	240,000	-32,000
1994 - 1995	13,000	1,000	3,800	1,800	1,000	19,700	5,900	7,600	37,800	500	4,000	0	146,000	242,000	700	148,000	0	62,000	211,000	31,000
1995 - 1996	0	700	2,800	700	1,200	18,100	4,500	9,800	30,700	500	1,000	0	144,000	214,000	700	120,000	0	72,000	193,000	21,000
1996 - 1997	2,000	1,800	6,900	1,900	700	12,900	1,900	5,700	36,500	500	3,000	0	154,000	228,000	700	143,000	0	72,000	216,000	12,000
1997 - 1998	23,000	12,700	48,800	900	3,100	14,900	2,400	6,200	35,300	500	0	0	150,000	298,000	700	138,000	0	81,000	220,000	78,000
1998 - 1999	0	600	2,500	400	300	12,300	1,200	5,400	39,700	500	2,000	0	159,000	224,000	700	156,000	0	82,000	239,000	-15,000
1999 - 2000	0	600	2,400	500	300	13,000	700	6,700	40,800	500	3,000	0	156,000	225,000	700	160,000	0	79,000	240,000	-15,000
2000 - 2001	0	0	0	0	0	2,600	100	1,600	40,500	500	8,000	0	147,000	200,000	700	159,000	0	82,000	242,000	-42,000
2001 - 2002	0	0	0	0	0	4,000	0	2,400	38,300	500	14,000	0	144,000	203,000	800	150,000	0	85,000	236,000	-33,000
2002 - 2003	0	100	400	300	200	10,900	1,700	4,400	29,500	500	7,000	0	146,000	201,000	800	131,000	0	82,000	214,000	-13,000
2003 - 2004	0	0	0	0	0	3,000	0	1,500	30,500	500	17,000	0	130,000	183,000	800	137,000	0	68,000	206,000	-23,000
2004 - 2005	0	400	1,500	2,900	700	14,900	8,400	8,000	23,200	500	1,000	0	129,000	191,000	800	104,000	0	67,000	172,000	19,000
2005 - 2006	0	900	3,400	3,200	400	15,400	8,500	8,200	29,300	600	1,000	0	138,000	209,000	900	132,000	0	58,000	191,000	18,000
2006 - 2007	0	0	0	0	0	2,800	0	1,000	31,800	600	14,000	0	115,000	165,000	900	143,000	0	61,000	205,000	-40,000
2007 - 2008	0	0	0	0	0	3,800	1,000	1,700	28,100	600	23,000	0	122,000	180,000	900	126,000	0	82,000	209,000	-29,000
2008 - 2009	0	0	0	0	0	7,400	1,300	3,300	31,700	600	33,000	0	128,000	205,000	900	142,000	0	86,000	229,000	-24,000
2009 - 2010	0	0	0	0	0	11,000	9,000	3,700	25,600	600	14,000	0	143,000	207,000	900	115,000	0	94,000	210,000	-3,000
2010 - 2011	4,000	1,300	5,000	9,700	1,400	9,200	8,500	7,000	29,300	600	7,000	0	146,000	229,000	1,000	132,000	0	77,000	210,000	19,000
2011 - 2012	0	0	0	0	0	1,800	1,800	500	39,900	600	27,000	0	141,000	213,000	1,000	179,000	0	71,000	251,000	-38,000
2012 - 2013	0	0	0	0	0	1,700	100	700	39,900	600	40,000	0	126,000	209,000	1,000	179,000	0	70,000	250,000	-41,000
2013 - 2014	0	0	0	0	0	0	0	0	41,000	700	45,000	0	116,000	203,000	1,000	184,000	0	68,000	253,000	-50,000
2014 - 2015	0	0	0	0	0	0	0	0	41,000	700	47,000	0	115,000	204,000	1,000	184,000	0	69,000	254,000	-50,000
2015 - 2016	0	0	0	0	0	1,200	100	500	26,500	700	35,000	0	115,000	179,000	1,100	119,000	0	79,000	199,000	-20,000
2016 - 2017	0	800	3,100	3,700	1,400	20,600	10,600	11,400	20,600	700	11,000	0	130,000	214,000	1,100	92,000	0	78,000	171,000	43,000
86/87-16/17 Avg	1,000	700	2,600	800	300	8,500	2,200	3,600	35,100	600	18,000	0	136,000	209,000	800	146,000	0	72,000	219,000	-10,000

Cumulative Change in Storage -306,000

Groundwater Inflows or Outflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Groundwater Outflows Not Included in Sustainable Yield Estimates

Appendix D
Table 3a

Projected Future Pixley Irrigation District GSA Surface Water Budget

Water Year	Surface Water Inflow (acre-ft)					Total In
	Precipitation	Stream Inflow	Imported Water	Discharge from Wells		
		Deer Creek	Pixley ID	Agricultural	Municipal	
2017 - 2018	39,000	6,678	31,763	130,000	1,100	209,000
2018 - 2019	39,000	6,678	31,763	130,000	1,100	209,000
2019 - 2020	39,000	6,678	31,763	119,000	1,100	198,000
2020 - 2021	39,000	6,678	31,763	119,000	1,100	198,000
2021 - 2022	39,000	6,678	31,763	119,000	1,100	198,000
2022 - 2023	39,000	6,678	31,763	119,000	1,100	198,000
2023 - 2024	39,000	6,678	31,763	119,000	1,100	198,000
2024 - 2025	39,000	6,678	31,763	108,000	1,100	187,000
2025 - 2026	39,000	6,678	31,763	108,000	1,100	187,000
2026 - 2027	39,000	6,678	31,763	108,000	1,100	187,000
2027 - 2028	39,000	6,678	31,763	108,000	1,100	187,000
2028 - 2029	39,000	6,678	31,763	108,000	1,100	187,000
2029 - 2030	39,000	6,678	31,763	97,000	1,100	176,000
2030 - 2031	39,000	6,678	31,763	97,000	1,100	176,000
2031 - 2032	39,000	6,678	31,763	97,000	1,100	176,000
2032 - 2033	39,000	6,678	31,763	97,000	1,100	176,000
2033 - 2034	39,000	6,678	31,763	97,000	1,100	176,000
2034 - 2035	39,000	6,678	31,763	67,000	1,100	146,000
2035 - 2036	39,000	6,678	31,763	67,000	1,100	146,000
2036 - 2037	39,000	6,678	31,763	67,000	1,100	146,000
2037 - 2038	39,000	6,678	31,763	67,000	1,100	146,000
2038 - 2039	39,000	6,678	31,763	67,000	1,100	146,000
2039 - 2040	39,000	6,678	31,763	45,000	1,100	124,000
2040 - 2041	39,000	6,678	31,763	45,000	1,100	124,000
2041 - 2042	39,000	6,678	31,763	45,000	1,100	124,000
2042 - 2043	39,000	6,678	31,763	45,000	1,100	124,000
2043 - 2044	39,000	6,678	31,763	45,000	1,100	124,000
2044 - 2045	39,000	6,678	31,763	45,000	1,100	124,000
2045 - 2046	39,000	6,678	31,763	45,000	1,100	124,000
2046 - 2047	39,000	6,678	31,763	45,000	1,100	124,000
2047 - 2048	39,000	6,678	31,763	45,000	1,100	124,000
2048 - 2049	39,000	6,678	31,763	45,000	1,100	124,000
2049 - 2050	39,000	6,678	31,763	45,000	1,100	124,000
2050 - 2051	39,000	6,517	31,763	45,000	1,100	123,000
2051 - 2052	39,000	6,517	31,763	45,000	1,100	123,000
2052 - 2053	39,000	6,517	31,763	45,000	1,100	123,000
2053 - 2054	39,000	6,517	31,763	45,000	1,100	123,000
2054 - 2055	39,000	6,517	31,763	45,000	1,100	123,000
2055 - 2056	39,000	6,517	31,763	45,000	1,100	123,000
2056 - 2057	39,000	6,517	31,763	45,000	1,100	123,000
2057 - 2058	39,000	6,517	31,763	45,000	1,100	123,000
2058 - 2059	39,000	6,517	31,763	45,000	1,100	123,000
2059 - 2060	39,000	6,517	31,763	45,000	1,100	123,000
2060 - 2061	39,000	6,517	31,763	45,000	1,100	123,000
2061 - 2062	39,000	6,517	31,763	45,000	1,100	123,000
2062 - 2063	39,000	6,517	31,763	45,000	1,100	123,000
2063 - 2064	39,000	6,517	31,763	45,000	1,100	123,000
2064 - 2065	39,000	6,517	31,763	45,000	1,100	123,000
2065 - 2066	39,000	6,517	31,763	45,000	1,100	123,000
2066 - 2067	39,000	6,517	31,763	45,000	1,100	123,000
2067 - 2068	39,000	6,517	31,763	45,000	1,100	123,000
2068 - 2069	39,000	6,517	31,763	45,000	1,100	123,000
2069 - 2070	39,000	6,517	31,763	45,000	1,100	123,000
17/18-69/70 Avg	39,000	6,600	31,800	68,000	1,100	147,000

Projected Future Pixley Irrigation District GSA Surface Water Budget

Water Year	Surface Water Outflow (acre-ft)																Total Out
	Areal Recharge of Precipitation	Streambed Infiltration	Canal Loss		Recharge in Basins		Deep Percolation of Applied Water				Evapotranspiration					Surface Outflow	
		Deer Creek Trenton Weir to Homeland Canal Infiltration	Deer Creek	Imported Water	Deer Creek	Imported Water	Deer Creek	Imported Water	Agricultural Pumping	Municipal Pumping	Precipitation Crops/Native	Deer Creek Agricultural Cons. Use	Imported Water Agricultural Cons. Use	Ag. Cons. Use from Pumping	Municipal (Landscape ET)	Deer Creek	
2017 - 2018	1,000	600	2,100	12,700	500	2,300	800	3,700	28,900	700	37,000	2,700	13,000	101,000	400	0	207,000
2018 - 2019	1,000	600	2,100	12,700	500	2,300	800	3,700	28,900	700	37,000	2,700	13,000	101,000	400	0	207,000
2019 - 2020	1,000	600	2,100	12,700	500	2,300	800	3,700	26,400	700	37,000	2,700	13,000	92,000	400	0	196,000
2020 - 2021	1,000	600	2,100	12,700	500	2,300	800	3,700	26,400	700	37,000	2,700	13,000	92,000	400	0	196,000
2021 - 2022	1,000	600	2,100	12,700	500	2,300	800	3,700	26,400	700	37,000	2,700	13,000	92,000	400	0	196,000
2022 - 2023	1,000	600	2,100	12,700	500	2,300	800	3,700	26,400	700	37,000	2,700	13,000	92,000	400	0	196,000
2023 - 2024	1,000	600	2,100	12,700	500	2,300	800	3,700	26,400	700	37,000	2,700	13,000	92,000	400	0	196,000
2024 - 2025	1,000	600	2,100	12,700	500	2,300	800	3,700	24,000	700	37,000	2,700	13,000	84,000	400	0	186,000
2025 - 2026	1,000	600	2,100	12,700	500	2,300	800	3,700	24,000	700	37,000	2,700	13,000	84,000	400	0	186,000
2026 - 2027	1,000	600	2,100	12,700	500	2,300	800	3,700	24,000	700	37,000	2,700	13,000	84,000	400	0	186,000
2027 - 2028	1,000	600	2,100	12,700	500	2,300	800	3,700	24,000	700	37,000	2,700	13,000	84,000	400	0	186,000
2028 - 2029	1,000	600	2,100	12,700	500	2,300	800	3,700	24,000	700	37,000	2,700	13,000	84,000	400	0	186,000
2029 - 2030	1,000	600	2,100	12,700	500	2,300	800	3,700	21,500	700	37,000	2,700	13,000	75,000	400	0	174,000
2030 - 2031	1,000	600	2,100	12,700	500	2,300	800	3,700	21,500	700	37,000	2,700	13,000	75,000	400	0	174,000
2031 - 2032	1,000	600	2,100	12,700	500	2,300	800	3,700	21,500	700	37,000	2,700	13,000	75,000	400	0	174,000
2032 - 2033	1,000	600	2,100	12,700	500	2,300	800	3,700	21,500	700	37,000	2,700	13,000	75,000	400	0	174,000
2033 - 2034	1,000	600	2,100	12,700	500	2,300	800	3,700	21,500	700	37,000	2,700	13,000	75,000	400	0	174,000
2034 - 2035	1,000	600	2,100	12,700	500	2,300	800	3,700	15,000	700	37,000	2,700	13,000	52,000	400	0	145,000
2035 - 2036	1,000	600	2,100	12,700	500	2,300	800	3,700	15,000	700	37,000	2,700	13,000	52,000	400	0	145,000
2036 - 2037	1,000	600	2,100	12,700	500	2,300	800	3,700	15,000	700	37,000	2,700	13,000	52,000	400	0	145,000
2037 - 2038	1,000	600	2,100	12,700	500	2,300	800	3,700	15,000	700	37,000	2,700	13,000	52,000	400	0	145,000
2038 - 2039	1,000	600	2,100	12,700	500	2,300	800	3,700	15,000	700	37,000	2,700	13,000	52,000	400	0	145,000
2039 - 2040	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2040 - 2041	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2041 - 2042	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2042 - 2043	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2043 - 2044	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2044 - 2045	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2045 - 2046	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2046 - 2047	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2047 - 2048	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2048 - 2049	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2049 - 2050	1,000	600	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	123,000
2050 - 2051	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2051 - 2052	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2052 - 2053	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2053 - 2054	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2054 - 2055	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2055 - 2056	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2056 - 2057	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2057 - 2058	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2058 - 2059	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2059 - 2060	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2060 - 2061	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2061 - 2062	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2062 - 2063	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2063 - 2064	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2064 - 2065	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2065 - 2066	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2066 - 2067	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2067 - 2068	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2068 - 2069	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
2069 - 2070	1,000	500	2,100	12,700	500	2,300	800	3,700	10,000	700	37,000	2,700	13,000	35,000	400	0	122,000
17/18-69/70 Avg	1,000	600	2,100	12,700	500	2,300	800	3,700	15,100	700	37,000	2,700	13,000	53,000	400	0	146,000

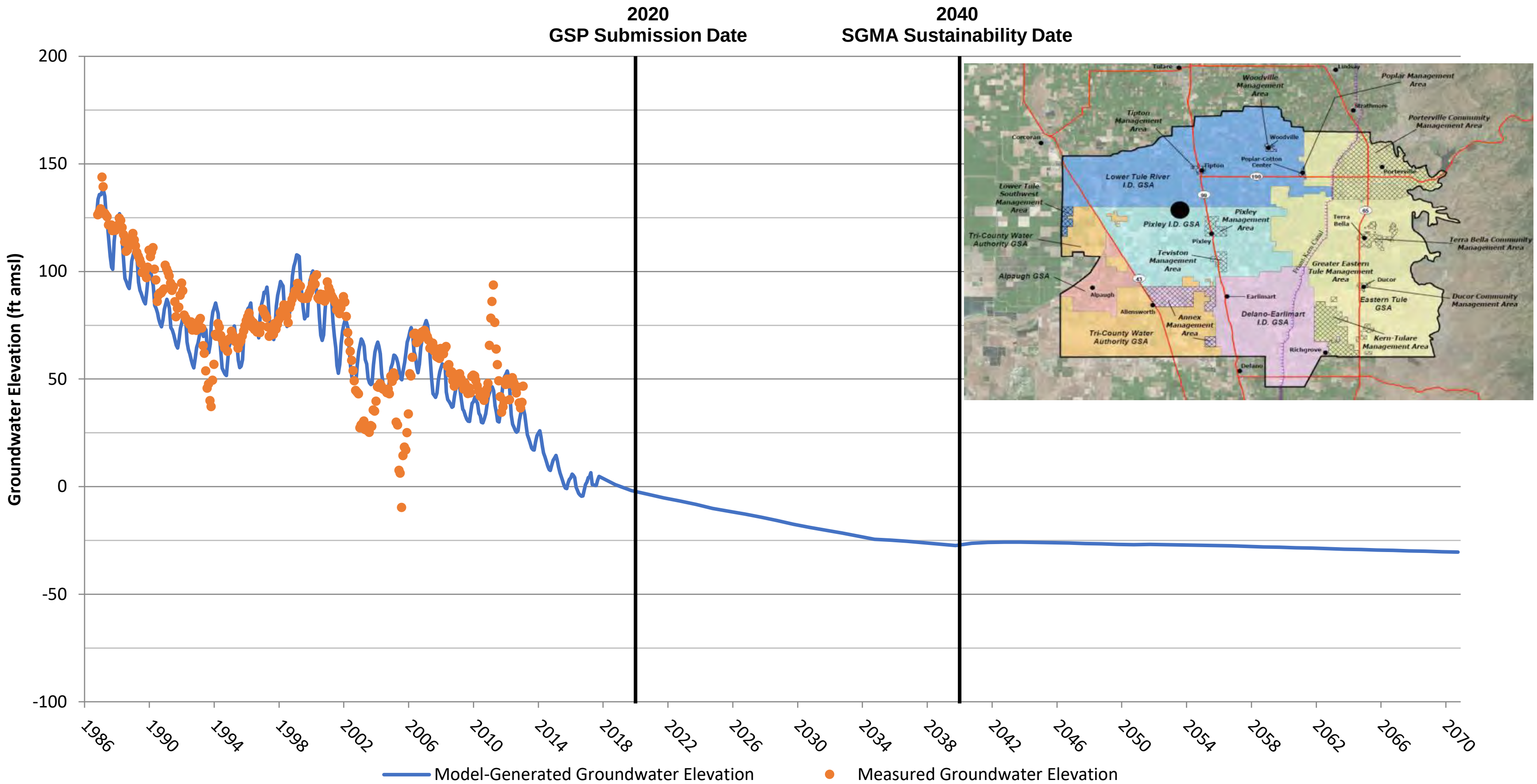
Appendix D
Table 4

Projected Future Pixley Irrigation District GSA Groundwater Budget

Water Year	Groundwater Inflows (acre-ft)														Groundwater Outflows (acre-ft)					Change in Storage (acre-ft)
	Areal Recharge from Precipitation	Native Deer Creek				Imported Water Deliveries			Agricultural Pumping	Municipal Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow		Total In	Groundwater Pumping		Sub-surface Outflow		Total Out	
		Trenton Weir to Homeland Canal Infiltration	Canal Loss	Recharge in Basins	Return Flow	Canal Loss	Recharge in Basins	Return Flow	Return Flow	Return Flow		From Outside Subbasin	From Other GSAs		Municipal	Agricultural	To Outside Subbasin	To Other GSAs		
2017 - 2018	1,000	600	2,100	500	800	12,700	2,300	3,700	28,900	700	9,000	0	123,000	185,000	1,100	130,000	0	70,000	201,000	-16,000
2018 - 2019	1,000	600	2,100	500	800	12,700	2,300	3,700	28,900	700	11,000	0	121,000	185,000	1,100	130,000	0	69,000	200,000	-15,000
2019 - 2020	1,000	600	2,100	500	800	12,700	2,300	3,700	26,400	700	12,000	0	116,000	179,000	1,100	119,000	0	70,000	190,000	-11,000
2020 - 2021	1,000	600	2,100	500	800	12,700	2,300	3,700	26,400	700	13,000	0	114,000	178,000	1,100	119,000	0	69,000	189,000	-11,000
2021 - 2022	1,000	600	2,100	500	800	12,700	2,300	3,700	26,400	700	14,000	0	112,000	177,000	1,100	119,000	0	69,000	189,000	-12,000
2022 - 2023	1,000	600	2,100	500	800	12,700	2,300	3,700	26,400	700	15,000	0	111,000	177,000	1,100	119,000	0	68,000	188,000	-11,000
2023 - 2024	1,000	600	2,100	500	800	12,700	2,300	3,700	26,400	700	16,000	0	110,000	177,000	1,100	119,000	0	69,000	189,000	-12,000
2024 - 2025	1,000	600	2,100	500	800	12,700	2,300	3,700	24,000	700	14,000	0	104,000	166,000	1,100	108,000	0	68,000	177,000	-11,000
2025 - 2026	1,000	600	2,100	500	800	12,700	2,300	3,700	24,000	700	13,000	0	102,000	163,000	1,100	108,000	0	65,000	174,000	-11,000
2026 - 2027	1,000	600	2,100	500	800	12,700	2,300	3,700	24,000	700	13,000	0	99,000	160,000	1,100	108,000	0	63,000	172,000	-12,000
2027 - 2028	1,000	600	2,100	500	800	12,700	2,300	3,700	24,000	700	13,000	0	98,000	159,000	1,100	108,000	0	61,000	170,000	-11,000
2028 - 2029	1,000	600	2,100	500	800	12,700	2,300	3,700	24,000	700	13,000	0	95,000	156,000	1,100	108,000	0	59,000	168,000	-12,000
2029 - 2030	1,000	600	2,100	500	800	12,700	2,300	3,700	21,500	700	11,000	0	90,000	147,000	1,100	97,000	0	58,000	156,000	-9,000
2030 - 2031	1,000	600	2,100	500	800	12,700	2,300	3,700	21,500	700	11,000	0	89,000	146,000	1,100	97,000	0	57,000	155,000	-9,000
2031 - 2032	1,000	600	2,100	500	800	12,700	2,300	3,700	21,500	700	11,000	0	88,000	145,000	1,100	97,000	0	56,000	154,000	-9,000
2032 - 2033	1,000	600	2,100	500	800	12,700	2,300	3,700	21,500	700	11,000	0	87,000	144,000	1,100	97,000	0	55,000	153,000	-9,000
2033 - 2034	1,000	600	2,100	500	800	12,700	2,300	3,700	21,500	700	11,000	0	87,000	144,000	1,100	97,000	0	55,000	153,000	-9,000
2034 - 2035	1,000	600	2,100	500	800	12,700	2,300	3,700	15,000	700	7,000	0	78,000	124,000	1,100	67,000	0	57,000	125,000	-1,000
2035 - 2036	1,000	600	2,100	500	800	12,700	2,300	3,700	15,000	700	6,000	0	77,000	122,000	1,100	67,000	0	56,000	124,000	-2,000
2036 - 2037	1,000	600	2,100	500	800	12,700	2,300	3,700	15,000	700	6,000	0	76,000	121,000	1,100	67,000	0	56,000	124,000	-3,000
2037 - 2038	1,000	600	2,100	500	800	12,700	2,300	3,700	15,000	700	6,000	0	75,000	120,000	1,100	67,000	0	55,000	123,000	-3,000
2038 - 2039	1,000	600	2,100	500	800	12,700	2,300	3,700	15,000	700	6,000	0	75,000	120,000	1,100	67,000	0	55,000	123,000	-3,000
2039 - 2040	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	3,000	0	70,000	107,000	1,100	45,000	0	57,000	103,000	4,000
2040 - 2041	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	3,000	0	68,000	105,000	1,100	45,000	0	56,000	102,000	3,000
2041 - 2042	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	3,000	0	67,000	104,000	1,100	45,000	0	56,000	102,000	2,000
2042 - 2043	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	3,000	0	67,000	104,000	1,100	45,000	0	56,000	102,000	2,000
2043 - 2044	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	3,000	0	66,000	103,000	1,100	45,000	0	56,000	102,000	1,000
2044 - 2045	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	3,000	0	66,000	103,000	1,100	45,000	0	56,000	102,000	1,000
2045 - 2046	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	3,000	0	65,000	102,000	1,100	45,000	0	55,000	101,000	1,000
2046 - 2047	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2047 - 2048	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2048 - 2049	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2049 - 2050	1,000	600	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2050 - 2051	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2051 - 2052	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2052 - 2053	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2053 - 2054	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2054 - 2055	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2055 - 2056	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	65,000	101,000	1,100	45,000	0	55,000	101,000	0
2056 - 2057	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2057 - 2058	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2058 - 2059	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2059 - 2060	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2060 - 2061	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2061 - 2062	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2062 - 2063	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2063 - 2064	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2064 - 2065	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2065 - 2066	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2066 - 2067	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2067 - 2068	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2068 - 2069	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
2069 - 2070	1,000	500	2,100	500	800	12,700	2,300	3,700	10,000	700	2,000	0	64,000	100,000	1,100	45,000	0	54,000	100,000	0
17/18-69/70 Avg	1,000	600	2,100	500	800	12,700	2,300	3,700	15,100	700	6,000	0	78,000	124,000	1,100	68,000	0	58,000	127,000	-3,000

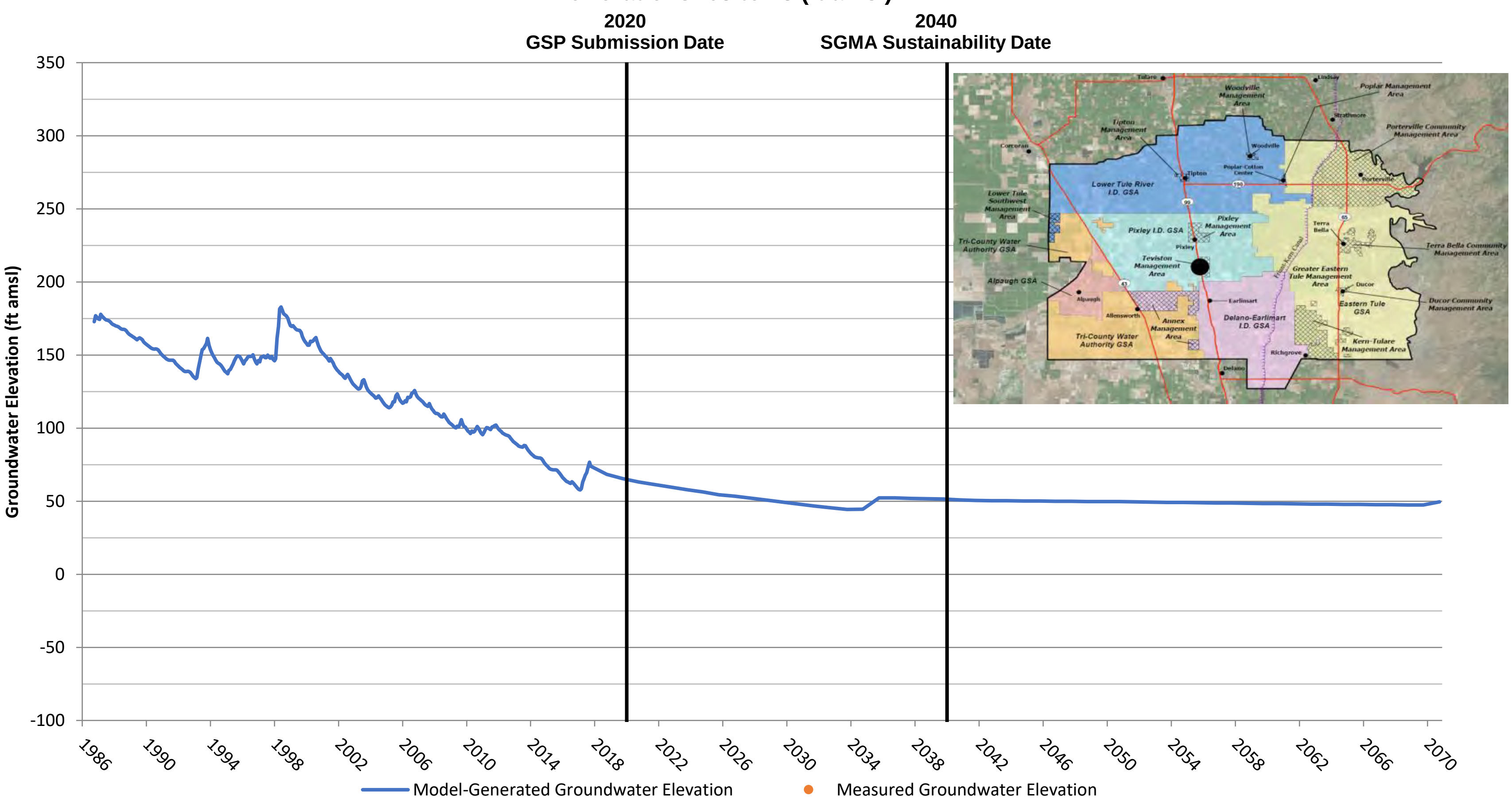
Pixley Irrigation District GSA
Representative Monitoring Site

22S/24E-23J01
Upper Aquifer
Bore Depth: -145 (ft amsl)



Pixley Irrigation District GSA
Representative Monitoring Site

23S/25E-16N04
Upper Layer
Perforations: 63 to 23 (ft amsl)



Thomas Harder & Co.
Groundwater Consulting

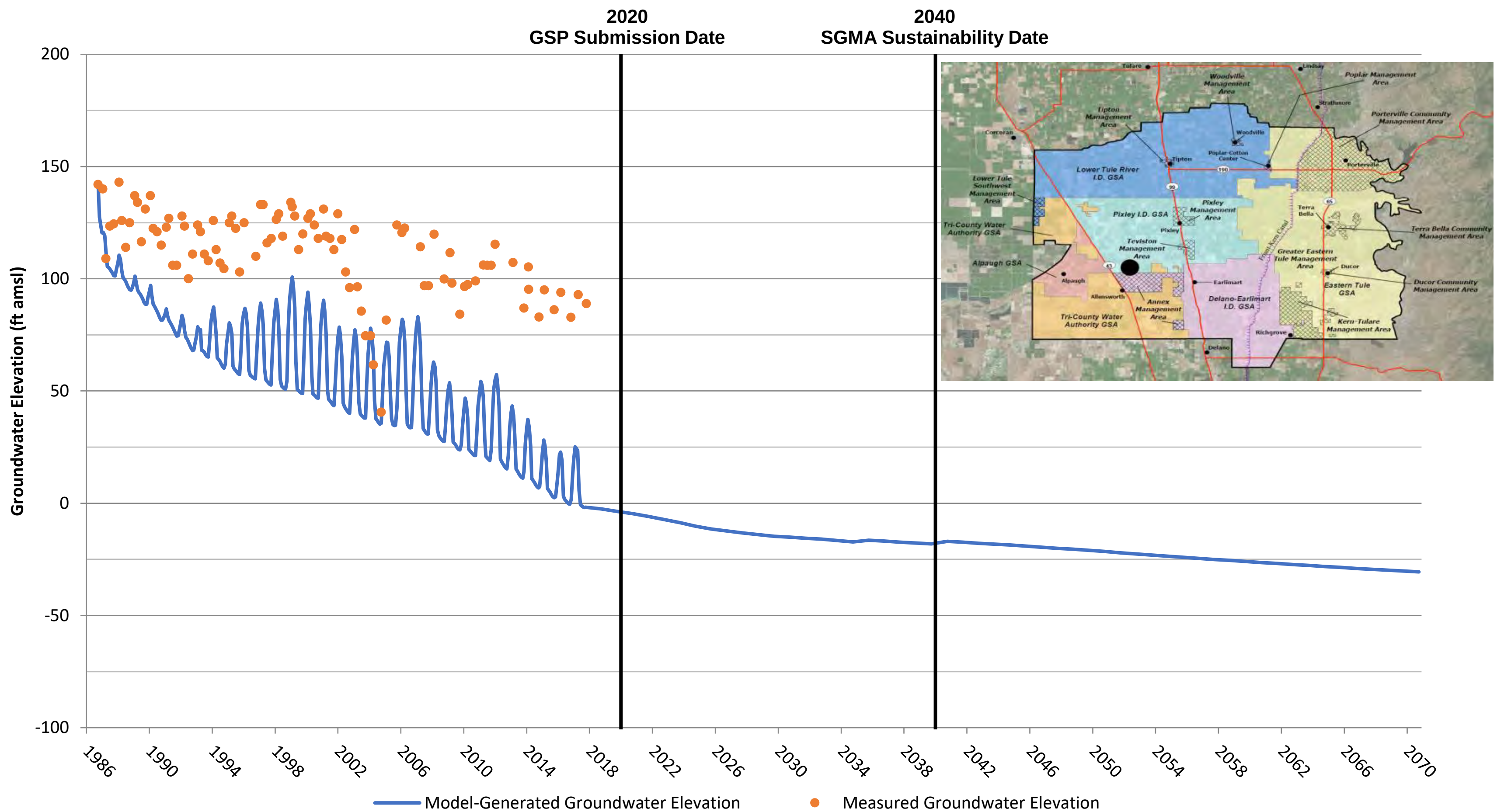
January 2020

Tule Subbasin
Basin Setting

Pixley Irrigation District GSA
Representative Monitoring Site

Appendix **D**
Figure **3**

23S/24E-28J02
Upper Aquifer



Thomas Harder & Co.
Groundwater Consulting

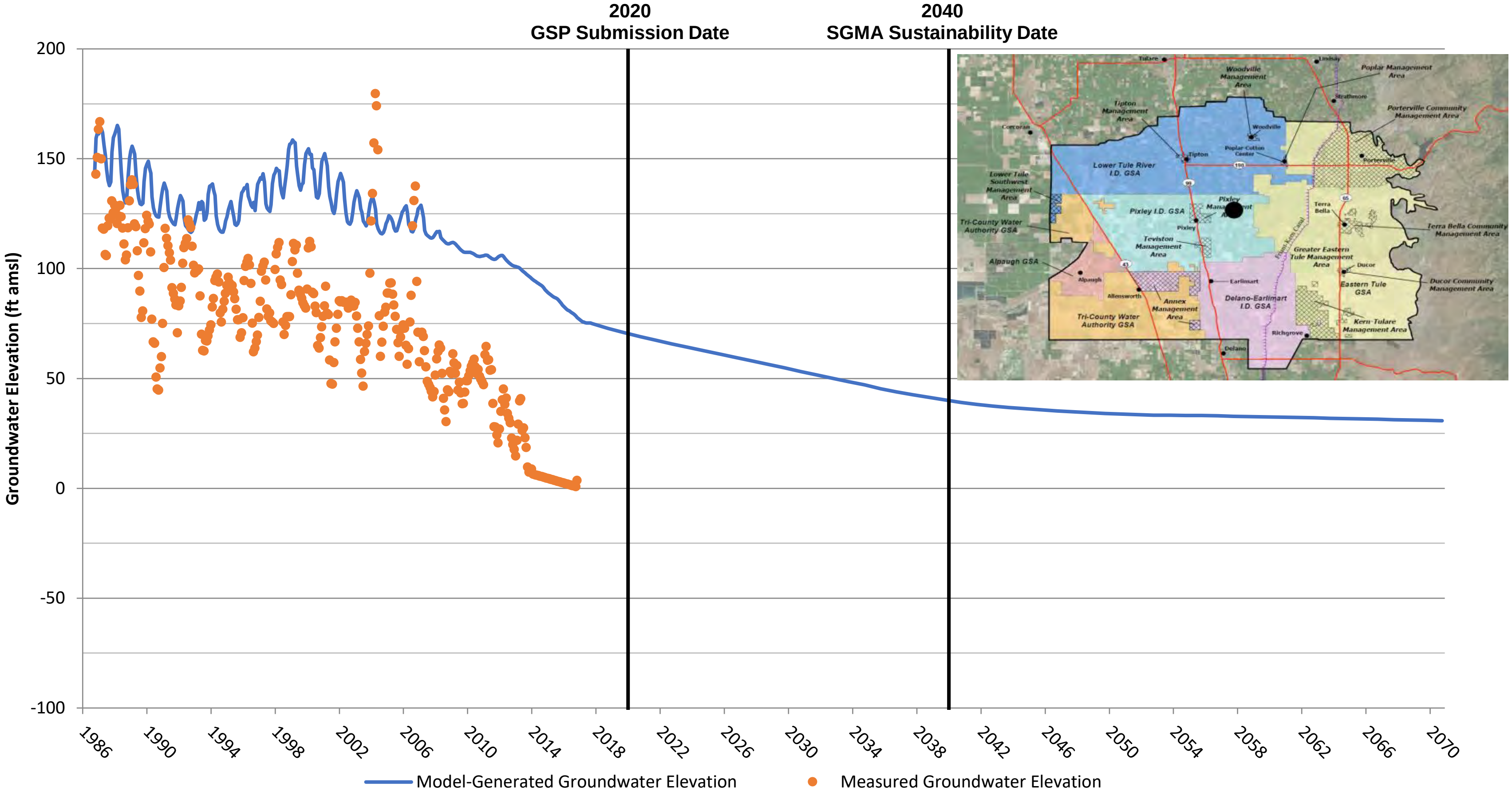
January 2020

Tule Subbasin
Basin Setting

Pixley Irrigation District GSA
Representative Monitoring Site

Appendix **D**
Figure **4**

22S/25E-25N01
Upper Aquifer
Bore Depth: -128 (ft amsl)

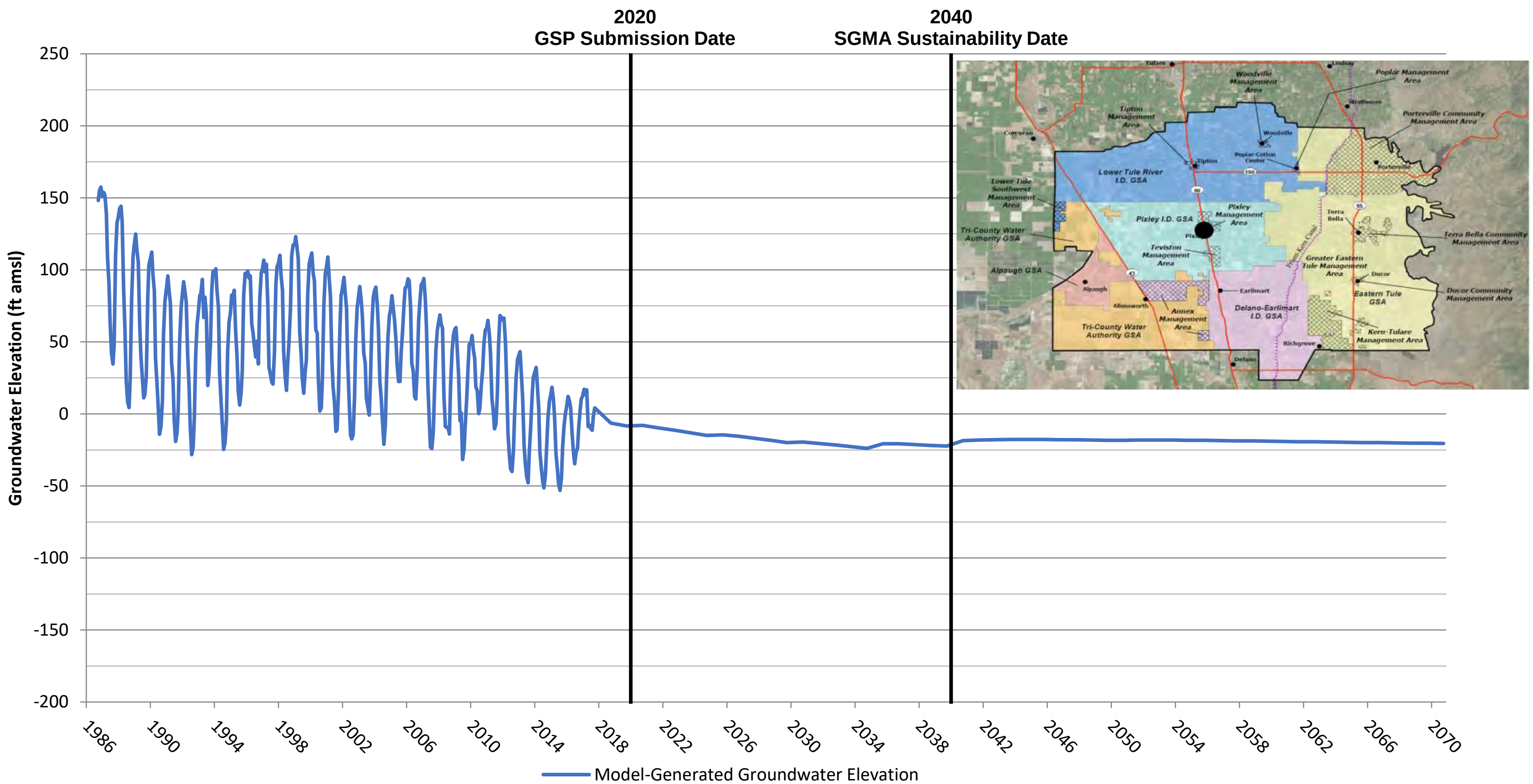


Thomas Harder & Co.
Groundwater Consulting

January 2020

Pixley Irrigation District GSA
Representative Monitoring Site

22S/25E-32K01
Lower Aquifer
Perforations: -231 to -431 (ft amsl)



Appendix E

Tri-County Water Authority GSA

Water Budgets and Hydrographs

Appendix E
Table 1a

Tri-County Water Authority GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Inflow (acre-ft)					Total In
	Precipitation	Imported Water			Discharge from Wells	
		Atwell Island WD	Alpaugh ID	Angiola WD	Agricultural	
1986 - 1987	21,000	711	45	7,278	49,000	78,000
1987 - 1988	30,000	0	0	3,530	53,000	87,000
1988 - 1989	24,000	0	0	6,026	51,000	81,000
1989 - 1990	23,000	0	0	3,847	53,000	80,000
1990 - 1991	31,000	0	0	925	56,000	88,000
1991 - 1992	27,000	0	0	1,611	55,000	84,000
1992 - 1993	44,000	4,121	700	3,420	49,000	101,000
1993 - 1994	28,000	1,283	206	3,640	51,000	84,000
1994 - 1995	57,000	3,462	473	8,918	44,000	114,000
1995 - 1996	30,000	3,379	637	12,551	57,000	104,000
1996 - 1997	42,000	0	0	12,383	63,000	117,000
1997 - 1998	69,000	0	0	7,460	68,000	144,000
1998 - 1999	35,000	0	0	9,778	66,000	111,000
1999 - 2000	33,000	162	0	8,118	67,000	108,000
2000 - 2001	25,000	0	0	3,824	72,000	101,000
2001 - 2002	24,000	0	0	2,932	73,000	100,000
2002 - 2003	23,000	0	6	4,728	67,000	95,000
2003 - 2004	19,000	0	0	3,434	58,000	80,000
2004 - 2005	37,000	0	830	11,741	48,000	98,000
2005 - 2006	38,000	0	923	10,909	49,000	99,000
2006 - 2007	16,000	0	0	6,641	55,000	78,000
2007 - 2008	18,000	0	0	2,165	59,000	79,000
2008 - 2009	19,000	0	122	191	60,000	79,000
2009 - 2010	31,000	0	153	3,243	57,000	91,000
2010 - 2011	45,000	0	627	6,476	63,000	115,000
2011 - 2012	28,000	0	54	3,156	67,000	98,000
2012 - 2013	13,000	0	0	1,492	70,000	84,000
2013 - 2014	9,000	0	0	1,048	70,000	80,000
2014 - 2015	13,000	0	0	575	70,000	84,000
2015 - 2016	20,000	0	0	587	70,000	91,000
2016 - 2017	21,000	0	136	12,146	58,000	91,000
86/87-16/17 Avg	29,000	400	200	5,300	60,000	95,000

Appendix E
Table 1b

Tri-County Water Authority GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Outflow (acre-ft)						Total Out
	Areal Recharge of Precipitation	Deep Percolation of Applied Water		Evapotranspiration			
		Imported Water	Agricultural Pumping	Precipitation Crops/Native	Imported Water Agricultural Cons. Use	Ag. Cons. Use from Pumping	
1986 - 1987	0	2,300	11,700	21,000	5,800	37,000	78,000
1987 - 1988	0	900	12,900	30,000	2,600	40,000	86,000
1988 - 1989	0	1,600	12,300	24,000	4,500	38,000	80,000
1989 - 1990	0	1,000	12,800	23,000	2,800	40,000	80,000
1990 - 1991	0	300	13,700	31,000	600	42,000	88,000
1991 - 1992	0	400	13,300	27,000	1,200	42,000	84,000
1992 - 1993	0	2,200	11,800	44,000	6,000	37,000	101,000
1993 - 1994	0	1,300	12,400	28,000	3,800	39,000	85,000
1994 - 1995	5,000	3,300	10,500	52,000	9,500	33,000	113,000
1995 - 1996	0	4,200	13,700	30,000	12,300	44,000	104,000
1996 - 1997	0	3,200	15,100	42,000	9,200	48,000	118,000
1997 - 1998	12,000	1,900	16,400	56,000	5,500	52,000	144,000
1998 - 1999	0	2,500	15,800	35,000	7,300	50,000	111,000
1999 - 2000	0	2,100	16,200	33,000	6,200	51,000	109,000
2000 - 2001	0	1,000	17,300	25,000	2,800	54,000	100,000
2001 - 2002	0	800	17,600	24,000	2,200	55,000	100,000
2002 - 2003	0	1,100	13,200	23,000	3,600	54,000	95,000
2003 - 2004	0	1,000	11,200	19,000	2,400	46,000	80,000
2004 - 2005	0	4,500	9,100	37,000	8,000	39,000	98,000
2005 - 2006	0	4,300	9,100	38,000	7,500	40,000	99,000
2006 - 2007	0	2,700	11,600	16,000	3,900	43,000	77,000
2007 - 2008	0	900	12,500	18,000	1,200	46,000	79,000
2008 - 2009	0	100	12,900	19,000	200	47,000	79,000
2009 - 2010	0	1,100	11,800	31,000	2,300	45,000	91,000
2010 - 2011	0	3,500	12,200	45,000	3,600	51,000	115,000
2011 - 2012	0	1,900	13,800	28,000	1,300	53,000	98,000
2012 - 2013	0	900	16,600	13,000	600	54,000	85,000
2013 - 2014	0	800	15,600	9,000	200	54,000	80,000
2014 - 2015	0	300	15,700	13,000	300	54,000	83,000
2015 - 2016	0	300	15,700	20,000	300	54,000	90,000
2016 - 2017	0	4,200	11,300	21,000	8,000	46,000	91,000
86/87-16/17 Avg	1,000	1,800	13,400	28,000	4,100	46,000	94,000

Groundwater Inflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Tri-County Water Authority GSA
Historical Groundwater Budget 1986/87 to 2016/17

Water Year	Groundwater Inflows (acre-ft)						Total In	Groundwater Outflows (acre-ft)				Total Out	Change in Storage (acre-ft)
	Areal Recharge from Precipitation	Imported Water Deliveries	Agricultural Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow			Groundwater Pumping		Sub-surface Outflow			
		Return Flow	Return Flow		From Outside Subbasin	From Other GSAs		Agricultural	Exports	To Outside Subbasin	To Other GSAs		
1986 - 1987	0	2,300	11,700	19,000	10,000	79,000	122,000	49,000	6,550	16,000	47,000	119,000	3,000
1987 - 1988	0	900	12,900	15,000	12,000	89,000	130,000	53,000	18,240	12,000	48,000	131,000	-1,000
1988 - 1989	0	1,600	12,300	13,000	12,000	85,000	124,000	51,000	12,130	11,000	51,000	125,000	-1,000
1989 - 1990	0	1,000	12,800	17,000	14,000	85,000	130,000	53,000	23,840	11,000	49,000	137,000	-7,000
1990 - 1991	0	300	13,700	18,000	15,000	90,000	137,000	56,000	18,120	16,000	50,000	140,000	-3,000
1991 - 1992	0	400	13,300	18,000	13,000	95,000	140,000	55,000	23,840	13,000	56,000	148,000	-8,000
1992 - 1993	0	2,200	11,800	10,000	9,000	100,000	133,000	49,000	6,610	16,000	58,000	130,000	3,000
1993 - 1994	0	1,300	12,400	12,000	14,000	91,000	131,000	51,000	11,220	12,000	58,000	132,000	-1,000
1994 - 1995	5,000	3,300	10,500	8,000	13,000	83,000	123,000	44,000	1,320	13,000	54,000	112,000	11,000
1995 - 1996	0	4,200	13,700	5,000	15,000	94,000	132,000	57,000	0	12,000	54,000	123,000	9,000
1996 - 1997	0	3,200	15,100	7,000	20,000	97,000	142,000	63,000	0	12,000	60,000	135,000	7,000
1997 - 1998	12,000	1,900	16,400	6,000	20,000	105,000	161,000	68,000	0	12,000	61,000	141,000	20,000
1998 - 1999	0	2,500	15,800	6,000	20,000	101,000	145,000	66,000	0	12,000	63,000	141,000	4,000
1999 - 2000	0	2,100	16,200	6,000	20,000	101,000	145,000	67,000	4,900	11,000	63,000	146,000	-1,000
2000 - 2001	0	1,000	17,300	11,000	17,000	105,000	151,000	72,000	13,310	11,000	63,000	159,000	-8,000
2001 - 2002	0	800	17,600	12,000	17,000	109,000	156,000	73,000	18,930	11,000	65,000	168,000	-12,000
2002 - 2003	0	1,100	13,200	8,000	19,000	100,000	141,000	67,000	13,050	10,000	64,000	154,000	-13,000
2003 - 2004	0	1,000	11,200	9,000	18,000	89,000	128,000	58,000	20,360	11,000	56,000	145,000	-17,000
2004 - 2005	0	4,500	9,100	4,000	13,000	86,000	117,000	48,000	4,000	15,000	51,000	118,000	-1,000
2005 - 2006	0	4,300	9,100	3,000	17,000	77,000	110,000	49,000	150	12,000	49,000	110,000	0
2006 - 2007	0	2,700	11,600	9,000	19,000	82,000	124,000	55,000	21,570	11,000	49,000	137,000	-13,000
2007 - 2008	0	900	12,500	14,000	13,000	100,000	140,000	59,000	23,950	16,000	59,000	158,000	-18,000
2008 - 2009	0	100	12,900	18,000	13,000	112,000	156,000	60,000	27,390	18,000	66,000	171,000	-15,000
2009 - 2010	0	1,100	11,800	15,000	13,000	119,000	160,000	57,000	17,760	24,000	71,000	170,000	-10,000
2010 - 2011	0	3,500	12,200	10,000	15,000	110,000	151,000	63,000	4,180	18,000	63,000	148,000	3,000
2011 - 2012	0	1,900	13,800	14,000	18,000	103,000	151,000	67,000	21,980	15,000	60,000	164,000	-13,000
2012 - 2013	0	900	16,600	17,000	19,000	93,000	147,000	70,000	23,730	9,000	59,000	162,000	-15,000
2013 - 2014	0	800	15,600	18,000	18,000	89,000	141,000	70,000	20,900	9,000	60,000	160,000	-19,000
2014 - 2015	0	300	15,700	20,000	18,000	88,000	142,000	70,000	20,100	9,000	60,000	159,000	-17,000
2015 - 2016	0	300	15,700	18,000	20,000	99,000	153,000	70,000	21,690	10,000	61,000	163,000	-10,000
2016 - 2017	0	4,200	11,300	12,000	17,000	107,000	152,000	58,000	4,520	17,000	69,000	149,000	3,000
36/87-16/17 Avg	1,000	1,800	13,400	12,000	16,000	96,000	140,000	60,000	13,000	13,000	58,000	144,000	-4,000
											Cumulative Change in Storage		-140,000

Groundwater Inflows or Outflows to be Included in Sustainable Yield Estimates (blue)
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates (pink)
Groundwater Outflows Not Included in Sustainable Yield Estimates (yellow)

Appendix E
Table 3a

Projected Future Tri-County Water Authority GSA Surface Water Budget

Water Year	Surface Water Inflow (acre-ft)						Total In
	Precipitation	Imported Water				Discharge from Wells	
		Atwell Island WD	Alpaugh ID	Angiola WD	Private	Agricultural	
2017 - 2018	29,000	0	0	5,911	0	63,000	98,000
2018 - 2019	29,000	0	0	5,911	0	63,000	98,000
2019 - 2020	29,000	0	0	7,961	0	61,000	98,000
2020 - 2021	29,000	0	0	9,211	0	60,000	98,000
2021 - 2022	29,000	0	0	10,461	0	59,000	98,000
2022 - 2023	29,000	0	0	13,590	0	58,000	101,000
2023 - 2024	29,000	0	0	18,926	0	58,000	106,000
2024 - 2025	29,000	0	0	24,261	1,500	52,000	107,000
2025 - 2026	29,000	0	0	29,597	1,500	45,000	105,000
2026 - 2027	29,000	0	0	34,933	1,500	39,000	104,000
2027 - 2028	29,000	0	0	40,268	1,500	32,000	103,000
2028 - 2029	29,000	0	0	43,725	1,500	26,000	100,000
2029 - 2030	29,000	0	0	43,430	1,500	20,000	94,000
2030 - 2031	29,000	0	0	43,430	1,500	19,000	93,000
2031 - 2032	29,000	0	0	43,430	1,500	18,000	92,000
2032 - 2033	29,000	0	0	43,430	1,500	17,000	91,000
2033 - 2034	29,000	0	0	43,430	1,500	15,000	89,000
2034 - 2035	29,000	0	0	43,430	1,500	14,000	88,000
2035 - 2036	29,000	0	0	43,430	1,500	14,000	88,000
2036 - 2037	29,000	0	0	43,430	1,500	14,000	88,000
2037 - 2038	29,000	0	0	43,430	1,500	14,000	88,000
2038 - 2039	29,000	0	0	43,430	1,500	14,000	88,000
2039 - 2040	29,000	0	0	43,430	1,500	14,000	88,000
2040 - 2041	29,000	0	0	43,430	1,500	14,000	88,000
2041 - 2042	29,000	0	0	43,430	1,500	14,000	88,000
2042 - 2043	29,000	0	0	43,430	1,500	14,000	88,000
2043 - 2044	29,000	0	0	43,430	1,500	14,000	88,000
2044 - 2045	29,000	0	0	43,430	1,500	14,000	88,000
2045 - 2046	29,000	0	0	43,430	1,500	14,000	88,000
2046 - 2047	29,000	0	0	43,430	1,500	14,000	88,000
2047 - 2048	29,000	0	0	43,430	1,500	14,000	88,000
2048 - 2049	29,000	0	0	43,430	1,500	14,000	88,000
2049 - 2050	29,000	0	0	43,430	1,500	14,000	88,000
2050 - 2051	29,000	0	0	43,209	1,500	13,000	87,000
2051 - 2052	29,000	0	0	43,209	1,500	13,000	87,000
2052 - 2053	29,000	0	0	43,209	1,500	13,000	87,000
2053 - 2054	29,000	0	0	43,209	1,500	13,000	87,000
2054 - 2055	29,000	0	0	43,209	1,500	13,000	87,000
2055 - 2056	29,000	0	0	43,209	1,500	13,000	87,000
2056 - 2057	29,000	0	0	43,209	1,500	13,000	87,000
2057 - 2058	29,000	0	0	43,209	1,500	13,000	87,000
2058 - 2059	29,000	0	0	43,209	1,500	13,000	87,000
2059 - 2060	29,000	0	0	43,209	1,500	13,000	87,000
2060 - 2061	29,000	0	0	43,209	1,500	13,000	87,000
2061 - 2062	29,000	0	0	43,209	1,500	13,000	87,000
2062 - 2063	29,000	0	0	43,209	1,500	13,000	87,000
2063 - 2064	29,000	0	0	43,209	1,500	13,000	87,000
2064 - 2065	29,000	0	0	43,209	1,500	13,000	87,000
2065 - 2066	29,000	0	0	43,209	1,500	13,000	87,000
2066 - 2067	29,000	0	0	43,209	1,500	13,000	87,000
2067 - 2068	29,000	0	0	43,209	1,500	13,000	87,000
2068 - 2069	29,000	0	0	45,214	1,500	13,000	89,000
2069 - 2070	29,000	0	0	24,476	1,500	13,000	68,000
17/18-69/70 Avg	29,000	0	0	37,800	1,300	22,000	90,000

Projected Future Tri-County Water Authority GSA Surface Water Budget

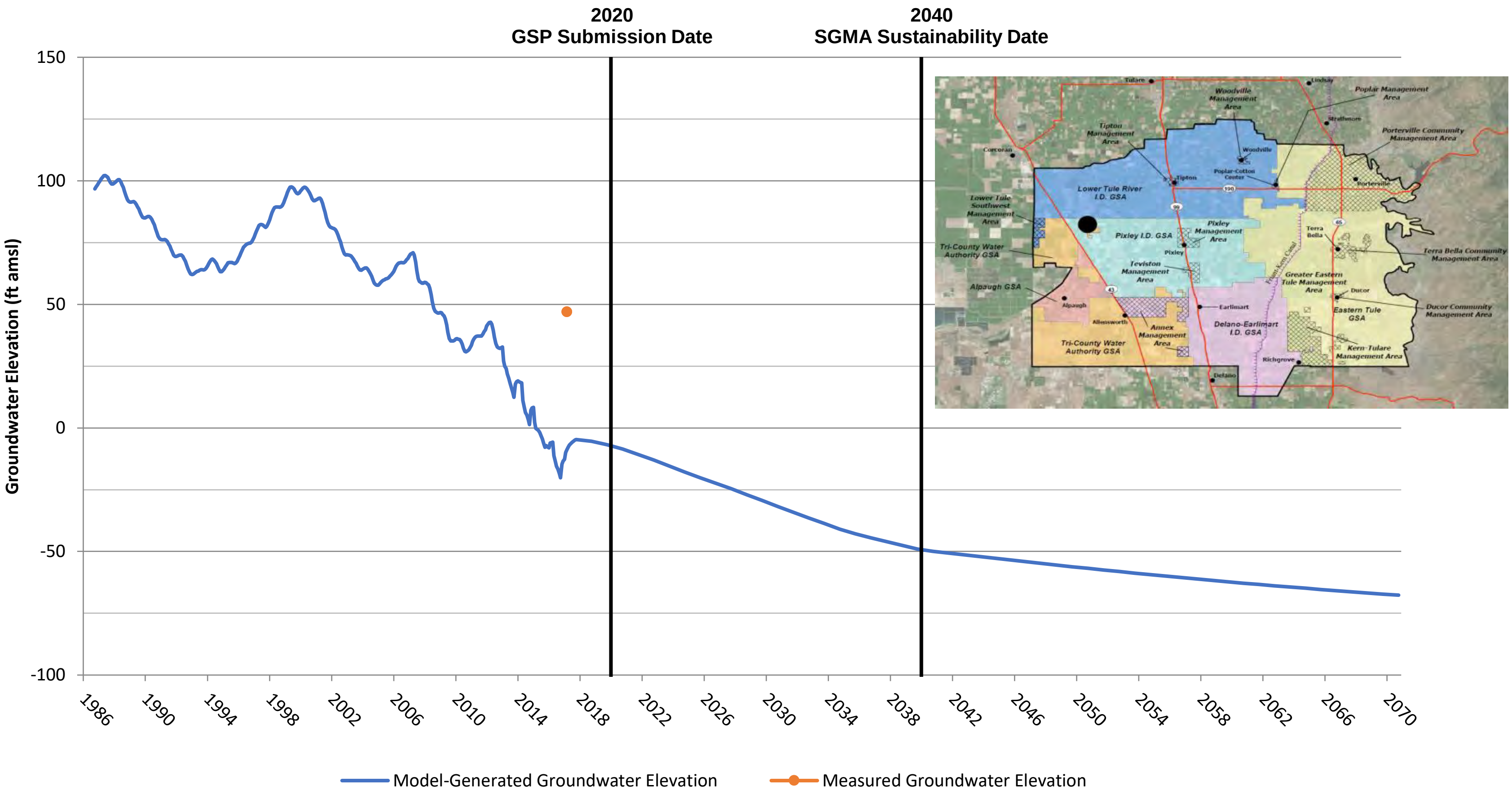
Water Year	Surface Water Outflow (acre-ft)							Total Out
	Areal Recharge of Precipitation	Recharge in Basins	Deep Percolation of Applied Water		Evapotranspiration			
		Imported Water	Imported Water	Agricultural Pumping	Precipitation Crops/Native	Imported Water Agricultural Cons. Use	Ag. Cons. Use from Pumping	
2017 - 2018	1,000	0	1,900	12,200	29,000	4,000	50,000	98,000
2018 - 2019	1,000	0	1,900	12,200	29,000	4,000	50,000	98,000
2019 - 2020	1,000	0	2,200	11,900	29,000	5,400	49,000	99,000
2020 - 2021	1,000	0	2,400	11,700	29,000	6,200	48,000	98,000
2021 - 2022	1,000	0	2,600	11,500	29,000	7,000	47,000	98,000
2022 - 2023	1,000	0	2,700	11,300	29,000	7,800	47,000	99,000
2023 - 2024	1,000	0	2,700	11,300	29,000	7,800	47,000	99,000
2024 - 2025	1,000	2,000	3,700	10,100	29,000	12,100	41,000	99,000
2025 - 2026	1,000	2,000	4,700	8,900	29,000	16,500	36,000	98,000
2026 - 2027	1,000	2,000	5,700	7,800	29,000	20,900	31,000	97,000
2027 - 2028	1,000	2,000	6,700	6,600	29,000	25,200	26,000	97,000
2028 - 2029	1,000	2,000	7,600	5,400	29,000	29,600	20,000	95,000
2029 - 2030	1,000	2,000	8,600	4,300	29,000	33,700	15,000	94,000
2030 - 2031	1,000	2,000	8,600	4,100	29,000	33,700	15,000	93,000
2031 - 2032	1,000	2,000	8,600	3,900	29,000	33,700	14,000	92,000
2032 - 2033	1,000	2,000	8,600	3,700	29,000	33,700	13,000	91,000
2033 - 2034	1,000	2,000	8,600	3,500	29,000	33,700	12,000	90,000
2034 - 2035	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2035 - 2036	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2036 - 2037	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2037 - 2038	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2038 - 2039	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2039 - 2040	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2040 - 2041	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2041 - 2042	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2042 - 2043	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2043 - 2044	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2044 - 2045	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2045 - 2046	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2046 - 2047	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2047 - 2048	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2048 - 2049	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2049 - 2050	1,000	2,000	8,600	3,300	29,000	33,700	11,000	89,000
2050 - 2051	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2051 - 2052	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2052 - 2053	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2053 - 2054	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2054 - 2055	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2055 - 2056	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2056 - 2057	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2057 - 2058	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2058 - 2059	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2059 - 2060	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2060 - 2061	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2061 - 2062	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2062 - 2063	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2063 - 2064	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2064 - 2065	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2065 - 2066	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2066 - 2067	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2067 - 2068	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2068 - 2069	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
2069 - 2070	1,000	2,000	8,500	3,000	29,000	33,500	10,000	87,000
17/18-69/70 Avg	1,000	2,000	7,500	4,800	29,000	28,800	18,000	91,000

Projected Future Tri-County Water Authority GSA Groundwater Budget

Water Year	Groundwater Inflows (acre-ft)							Total In	Groundwater Outflows (acre-ft)				Total Out	Change in Storage (acre-ft)
	Areal Recharge from Precipitation	Imported Water Deliveries		Agricultural Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow			Groundwater Pumping		Sub-surface Outflow			
		Return Flow	Recharge in Basins	Return Flow		From Outside Subbasin	From Other GSAs		Agricultural	Exports	To Outside Subbasin	To Other GSAs		
2017 - 2018	1,000	1,900	0	12,200	13,000	14,000	99,000	141,000	63,000	11,280	13,000	61,000	148,000	-7,000
2018 - 2019	1,000	1,900	0	12,200	13,000	14,000	96,000	138,000	63,000	11,280	13,000	61,000	148,000	-10,000
2019 - 2020	1,000	2,200	0	11,900	13,000	13,000	96,000	137,000	61,000	11,280	13,000	62,000	147,000	-10,000
2020 - 2021	1,000	2,400	0	11,700	13,000	12,000	94,000	134,000	60,000	11,280	13,000	62,000	146,000	-12,000
2021 - 2022	1,000	2,600	0	11,500	13,000	10,000	93,000	131,000	59,000	11,280	13,000	61,000	144,000	-13,000
2022 - 2023	1,000	2,700	0	11,300	13,000	10,000	91,000	129,000	58,000	11,280	14,000	61,000	144,000	-15,000
2023 - 2024	1,000	2,700	0	11,300	13,000	10,000	92,000	130,000	58,000	11,280	14,000	61,000	144,000	-14,000
2024 - 2025	1,000	3,700	1,500	10,100	12,000	8,000	90,000	126,000	52,000	11,280	15,000	61,000	139,000	-13,000
2025 - 2026	1,000	4,700	1,500	8,900	11,000	8,000	86,000	121,000	45,000	11,280	18,000	60,000	134,000	-13,000
2026 - 2027	1,000	5,700	1,500	7,800	10,000	8,000	84,000	118,000	39,000	11,280	20,000	60,000	130,000	-12,000
2027 - 2028	1,000	6,700	1,500	6,600	10,000	8,000	82,000	116,000	32,000	11,280	22,000	61,000	126,000	-10,000
2028 - 2029	1,000	7,600	1,500	5,400	9,000	8,000	81,000	114,000	26,000	11,280	24,000	62,000	123,000	-9,000
2029 - 2030	1,000	8,600	1,500	4,300	8,000	9,000	82,000	114,000	20,000	11,280	25,000	64,000	120,000	-6,000
2030 - 2031	1,000	8,600	1,500	4,100	8,000	9,000	81,000	113,000	19,000	11,280	25,000	66,000	121,000	-8,000
2031 - 2032	1,000	8,600	1,500	3,900	8,000	9,000	82,000	114,000	18,000	11,280	25,000	67,000	121,000	-7,000
2032 - 2033	1,000	8,600	1,500	3,700	8,000	9,000	82,000	114,000	17,000	11,280	24,000	69,000	121,000	-7,000
2033 - 2034	1,000	8,600	1,500	3,500	7,000	9,000	83,000	114,000	15,000	11,280	23,000	71,000	120,000	-6,000
2034 - 2035	1,000	8,600	1,500	3,300	6,000	9,000	86,000	115,000	14,000	11,280	24,000	72,000	121,000	-6,000
2035 - 2036	1,000	8,600	1,500	3,300	6,000	9,000	85,000	114,000	14,000	11,280	23,000	73,000	121,000	-7,000
2036 - 2037	1,000	8,600	1,500	3,300	6,000	10,000	84,000	114,000	14,000	11,280	22,000	73,000	120,000	-6,000
2037 - 2038	1,000	8,600	1,500	3,300	6,000	10,000	84,000	114,000	14,000	11,280	21,000	74,000	120,000	-6,000
2038 - 2039	1,000	8,600	1,500	3,300	6,000	11,000	83,000	114,000	14,000	11,280	20,000	74,000	119,000	-5,000
2039 - 2040	1,000	8,600	1,500	3,300	5,000	11,000	85,000	115,000	14,000	11,280	21,000	75,000	121,000	-6,000
2040 - 2041	1,000	8,600	1,500	3,300	5,000	11,000	85,000	115,000	14,000	11,280	21,000	74,000	120,000	-5,000
2041 - 2042	1,000	8,600	1,500	3,300	5,000	11,000	85,000	115,000	14,000	11,280	21,000	74,000	120,000	-5,000
2042 - 2043	1,000	8,600	1,500	3,300	5,000	11,000	85,000	115,000	14,000	11,280	21,000	74,000	120,000	-5,000
2043 - 2044	1,000	8,600	1,500	3,300	5,000	11,000	85,000	115,000	14,000	11,280	21,000	74,000	120,000	-5,000
2044 - 2045	1,000	8,600	1,500	3,300	5,000	11,000	85,000	115,000	14,000	11,280	21,000	74,000	120,000	-5,000
2045 - 2046	1,000	8,600	1,500	3,300	5,000	11,000	85,000	115,000	14,000	11,280	21,000	74,000	120,000	-5,000
2046 - 2047	1,000	8,600	1,500	3,300	5,000	11,000	84,000	114,000	14,000	11,280	21,000	74,000	120,000	-6,000
2047 - 2048	1,000	8,600	1,500	3,300	5,000	11,000	85,000	115,000	14,000	11,280	21,000	74,000	120,000	-5,000
2048 - 2049	1,000	8,600	1,500	3,300	4,000	11,000	84,000	113,000	14,000	11,280	21,000	73,000	119,000	-6,000
2049 - 2050	1,000	8,600	1,500	3,300	4,000	11,000	84,000	113,000	14,000	11,280	21,000	73,000	119,000	-6,000
2050 - 2051	1,000	8,500	1,500	3,000	4,000	11,000	83,000	112,000	13,000	11,280	21,000	73,000	118,000	-6,000
2051 - 2052	1,000	8,500	1,500	3,000	4,000	11,000	83,000	112,000	13,000	11,280	21,000	73,000	118,000	-6,000
2052 - 2053	1,000	8,500	1,500	3,000	4,000	11,000	83,000	112,000	13,000	11,280	21,000	72,000	117,000	-5,000
2053 - 2054	1,000	8,500	1,500	3,000	4,000	11,000	82,000	111,000	13,000	11,280	21,000	72,000	117,000	-6,000
2054 - 2055	1,000	8,500	1,500	3,000	4,000	11,000	82,000	111,000	13,000	11,280	20,000	72,000	116,000	-5,000
2055 - 2056	1,000	8,500	1,500	3,000	4,000	11,000	82,000	111,000	13,000	11,280	21,000	72,000	117,000	-6,000
2056 - 2057	1,000	8,500	1,500	3,000	4,000	11,000	82,000	111,000	13,000	11,280	20,000	72,000	116,000	-5,000
2057 - 2058	1,000	8,500	1,500	3,000	4,000	11,000	82,000	111,000	13,000	11,280	20,000	72,000	116,000	-5,000
2058 - 2059	1,000	8,500	1,500	3,000	4,000	11,000	82,000	111,000	13,000	11,280	20,000	72,000	116,000	-5,000
2059 - 2060	1,000	8,500	1,500	3,000	4,000	12,000	82,000	112,000	13,000	11,280	20,000	72,000	116,000	-4,000
2060 - 2061	1,000	8,500	1,500	3,000	4,000	11,000	82,000	111,000	13,000	11,280	20,000	72,000	116,000	-5,000
2061 - 2062	1,000	8,500	1,500	3,000	4,000	12,000	82,000	112,000	13,000	11,280	20,000	71,000	115,000	-3,000
2062 - 2063	1,000	8,500	1,500	3,000	4,000	12,000	82,000	112,000	13,000	11,280	20,000	71,000	115,000	-3,000
2063 - 2064	1,000	8,500	1,500	3,000	4,000	12,000	82,000	112,000	13,000	11,280	20,000	72,000	116,000	-4,000
2064 - 2065	1,000	8,500	1,500	3,000	4,000	12,000	81,000	111,000	13,000	11,280	20,000	71,000	115,000	-4,000
2065 - 2066	1,000	8,500	1,500	3,000	4,000	12,000	81,000	111,000	13,000	11,280	20,000	71,000	115,000	-4,000
2066 - 2067	1,000	8,500	1,500	3,000	4,000	12,000	81,000	111,000	13,000	11,280	20,000	71,000	115,000	-4,000
2067 - 2068	1,000	8,500	1,500	3,000	4,000	12,000	81,000	111,000	13,000	11,280	20,000	71,000	115,000	-4,000
2068 - 2069	1,000	8,500	1,500	3,000	4,000	12,000	81,000	111,000	13,000	11,280	19,000	71,000	114,000	-3,000
2069 - 2070	1,000	8,500	1,500	3,000	4,000	12,000	81,000	111,000	13,000	11,280	19,000	71,000	114,000	-3,000
17/18-69/70 Avg	1,000	7,500	1,300	4,800	7,000	11,000	85,000	118,000	22,000	11,300	20,000	69,000	122,000	-4,000

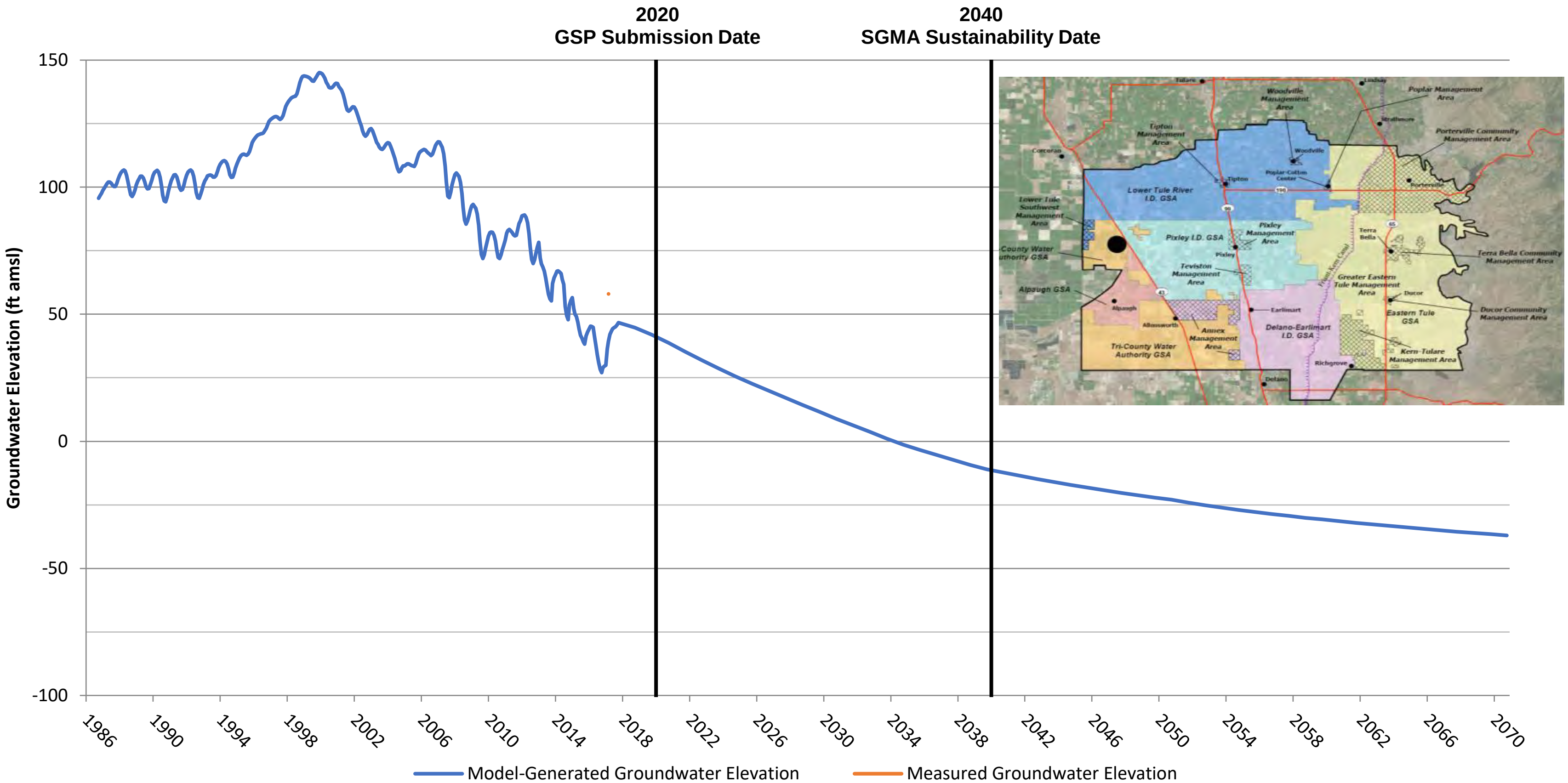
Tri-County Water Authority GSA
Representative Monitoring Site

Angiola E20
Upper Aquifer
Perforations: -26 to -266 (ft amsl)



Tri-County Water Authority GSA
Representative Monitoring Site

Angiola W14
Upper Aquifer
Perforations: -43 to -283 (ft amsl)



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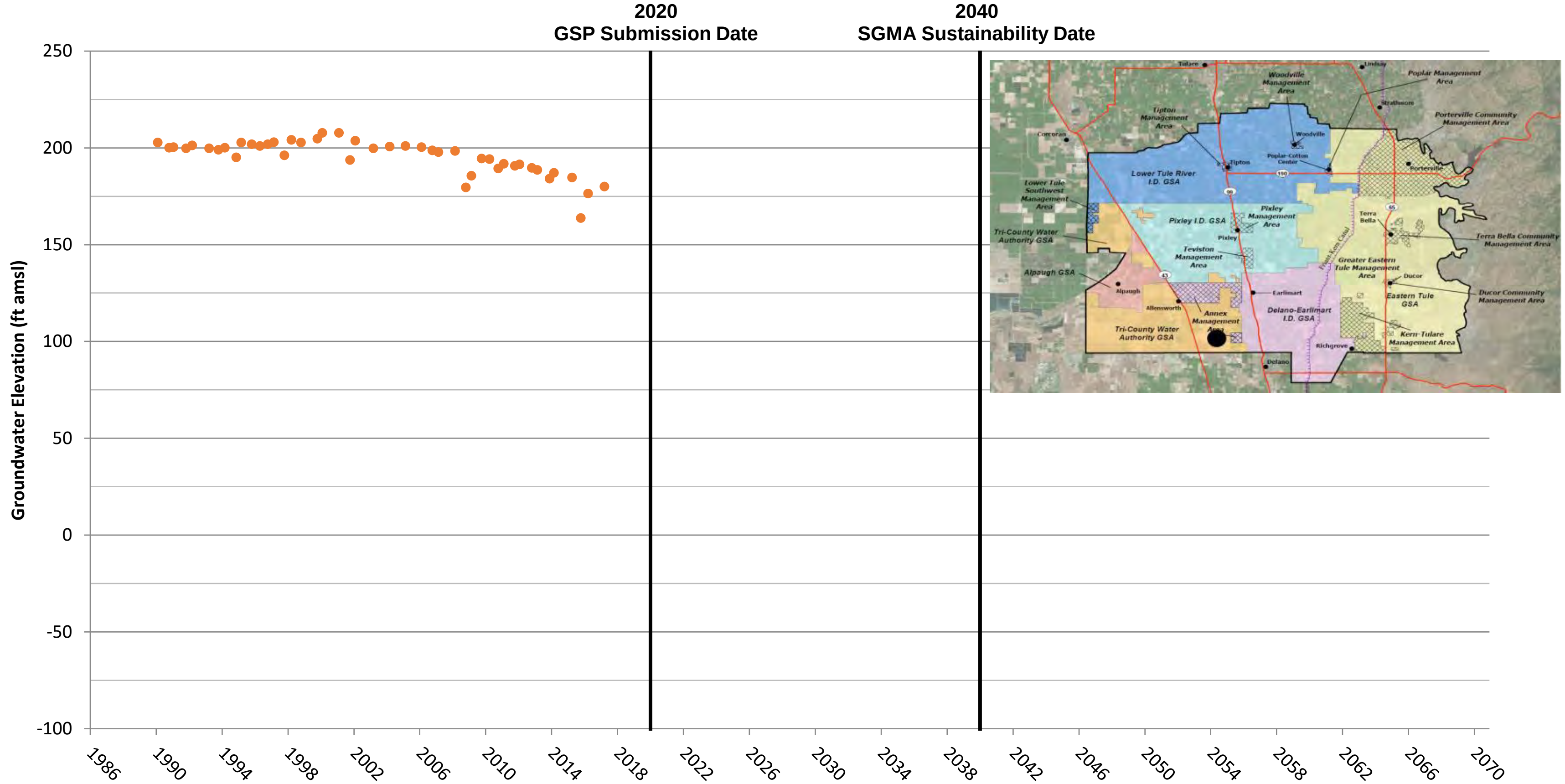
Tri-County Water Authority GSA
Representative Monitoring Site

Appendix **E**
Figure **3**

24S/24E-25J01
Upper Aquifer
Perforations: 201 to 0 (ft amsl)



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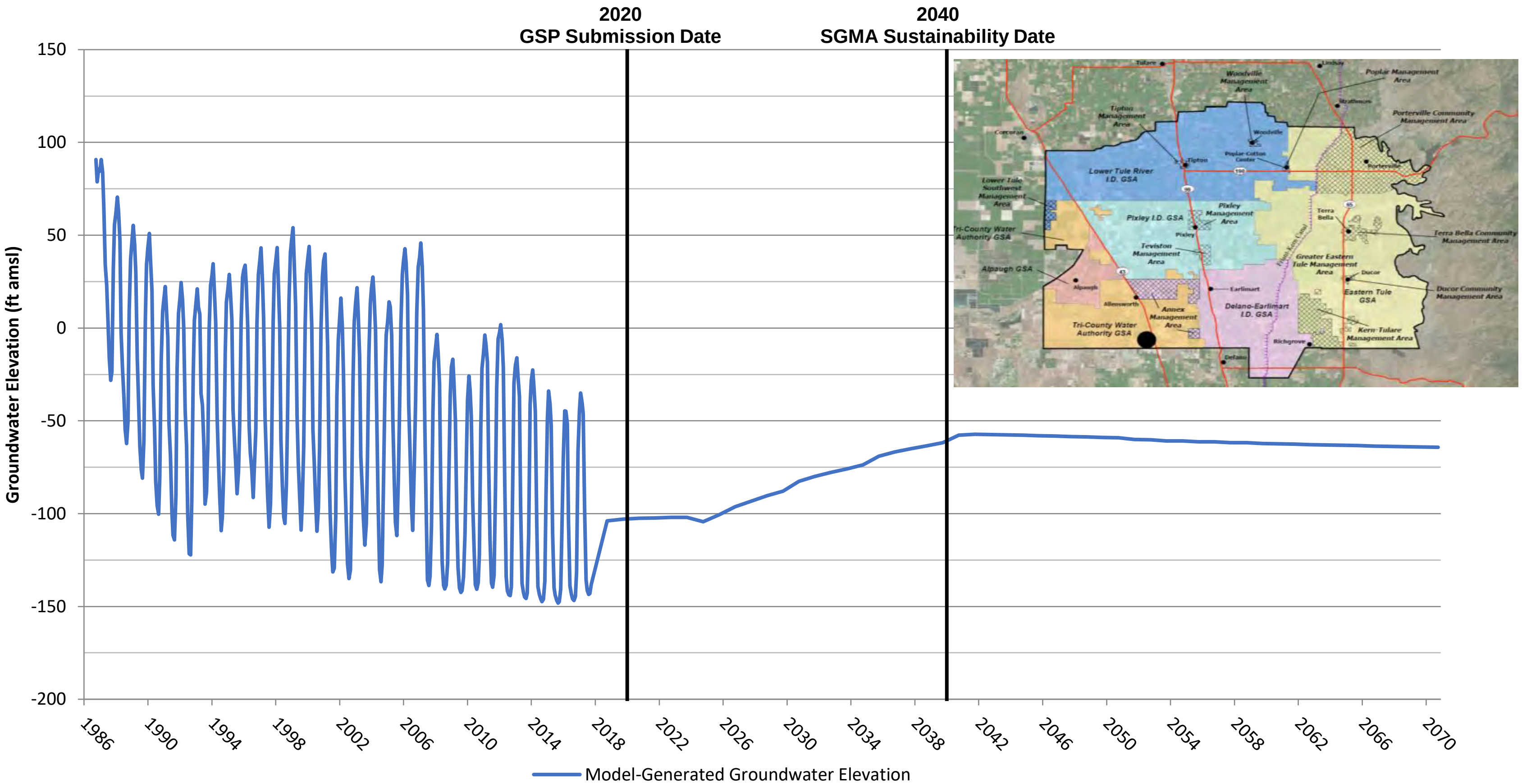
Tri-County Water Authority GSA
Representative Monitoring Site

Appendix **E**
Figure **4**

E0346058
Lower Aquifer
Well Depth: -1,029 (ft amsl)



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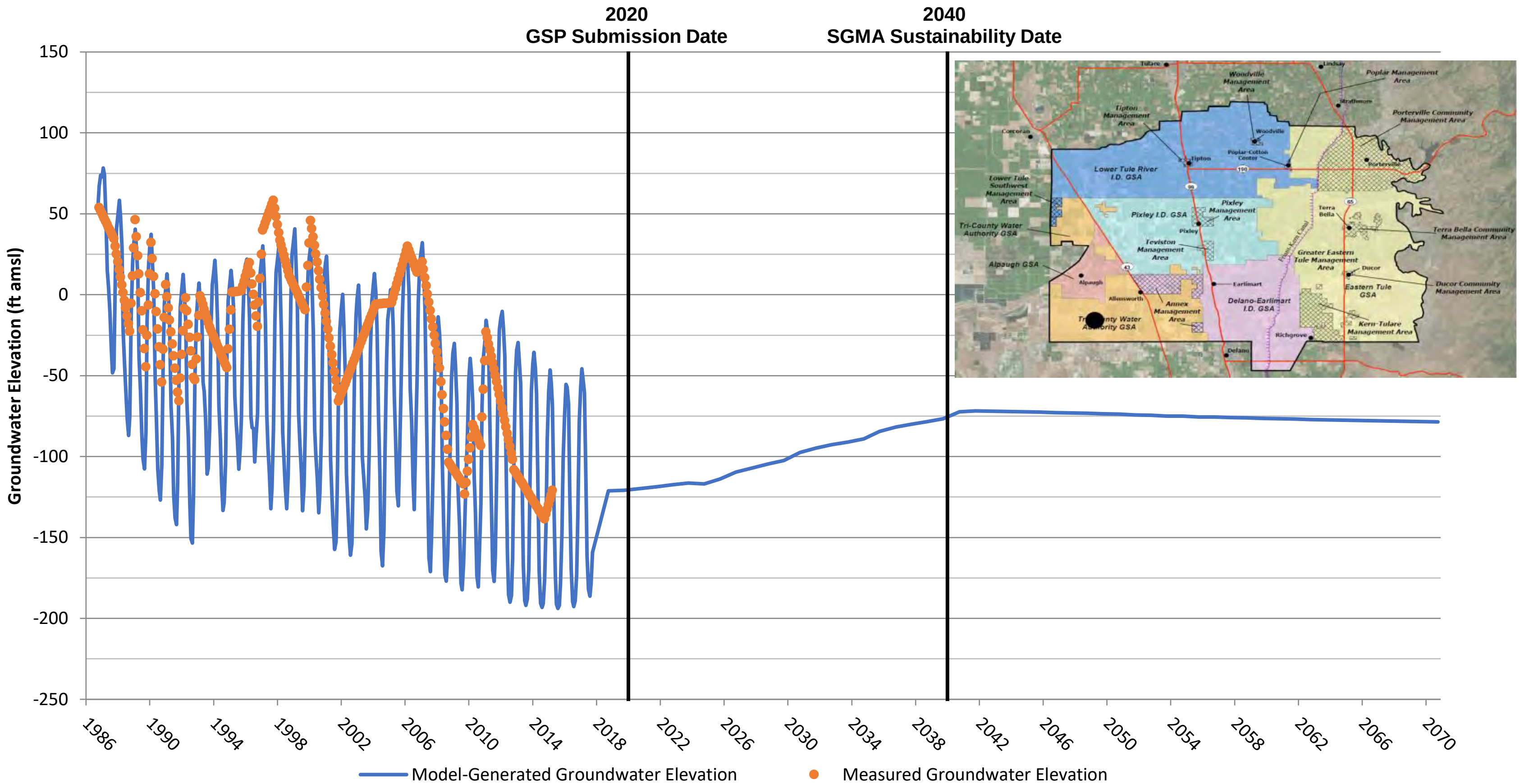
Tri-County Water Authority GSA
Representative Monitoring Site

24S/23E-22R02
Lower Aquifer
Perforations: -813 to -793 (ft amsl)



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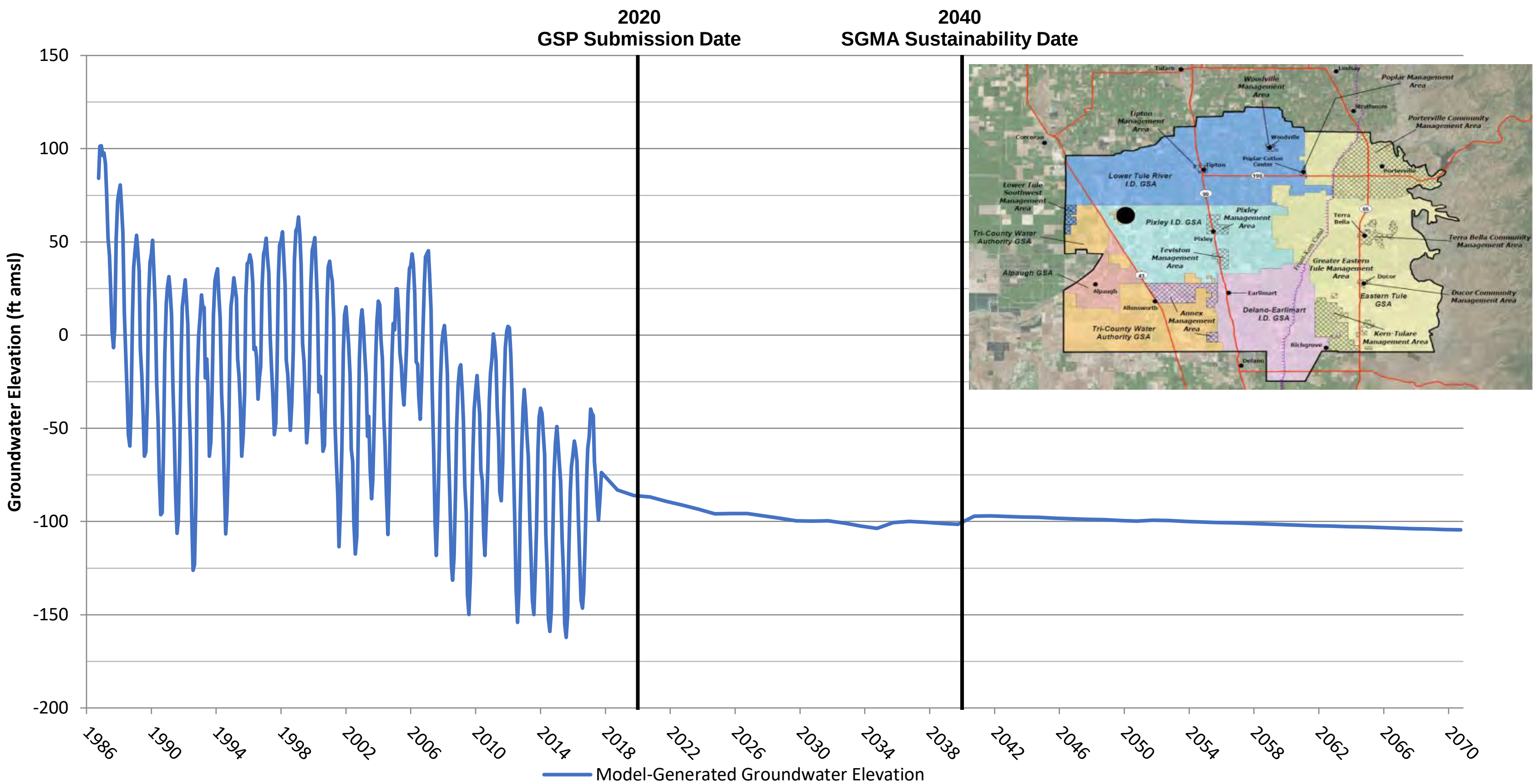
January 20**20**

Tri-County Water Authority GSA
Representative Monitoring Site

Angiola E22
Lower Aquifer
Perforations: -421 to -901 (ft amsl)



Appendix F

Alpaugh Irrigation District GSA

Water Budgets and Hydrographs

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Groundwater Consulting

Alpaugh GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Inflow (acre-ft)					Total In
	Precipitation	Imported Water		Discharge from Wells		
		Alpaugh ID	Atwell Island WD	Agricultural	Municipal	
1986 - 1987	5,000	748	397	35,000	200	41,000
1987 - 1988	7,000	0	0	36,000	200	43,000
1988 - 1989	6,000	0	0	36,000	200	42,000
1989 - 1990	6,000	0	0	36,000	200	42,000
1990 - 1991	7,000	0	0	36,000	200	43,000
1991 - 1992	6,000	0	0	36,000	200	42,000
1992 - 1993	10,000	11,519	2,302	22,000	200	46,000
1993 - 1994	7,000	3,398	717	32,000	200	43,000
1994 - 1995	14,000	7,790	1,934	26,000	200	50,000
1995 - 1996	7,000	10,493	1,888	21,000	200	41,000
1996 - 1997	10,000	0	0	33,000	200	43,000
1997 - 1998	16,000	0	0	33,000	200	49,000
1998 - 1999	8,000	0	0	33,000	200	41,000
1999 - 2000	8,000	0	91	33,000	200	41,000
2000 - 2001	6,000	0	0	33,000	200	39,000
2001 - 2002	6,000	0	0	33,000	200	39,000
2002 - 2003	6,000	98	0	33,000	200	39,000
2003 - 2004	5,000	0	0	30,000	200	35,000
2004 - 2005	9,000	13,660	0	17,000	300	40,000
2005 - 2006	9,000	15,189	0	16,000	300	40,000
2006 - 2007	4,000	0	0	30,000	300	34,000
2007 - 2008	4,000	0	0	30,000	300	34,000
2008 - 2009	5,000	2,009	0	28,000	300	35,000
2009 - 2010	7,000	2,518	0	27,000	300	37,000
2010 - 2011	11,000	10,324	0	10,000	300	32,000
2011 - 2012	7,000	889	0	18,000	300	26,000
2012 - 2013	3,000	0	0	19,000	300	22,000
2013 - 2014	2,000	0	0	19,000	300	21,000
2014 - 2015	3,000	0	0	19,000	300	22,000
2015 - 2016	5,000	0	0	19,000	300	24,000
2016 - 2017	5,000	2,232	0	16,000	300	24,000
86/87-16/17 Avg	7,000	2,600	200	27,000	200	37,000

Alpaugh GSA
Historical Surface Water Budget 1986/87 to 2016/17

Water Year	Surface Water Outflow (acre-ft)								Total Out
	Areal Recharge of Precip-itation	Deep Percolation of Applied			Evapotranspiration				
		Imported Water	Agri-cultural Pumping	Municipal Pumping	Precipitation Crops/Native	Imported Water Agricultural Cons. Use	Ag. Cons. Use from Pumping	Municipal (Landscape ET)	
1986 - 1987	0	300	8,600	100	5,000	900	26,000	100	41,000
1987 - 1988	0	0	8,900	100	7,000	0	27,000	100	43,000
1988 - 1989	0	0	8,900	100	6,000	0	27,000	100	42,000
1989 - 1990	0	0	8,900	100	6,000	0	27,000	100	42,000
1990 - 1991	0	0	8,900	100	7,000	0	27,000	100	43,000
1991 - 1992	0	0	8,900	100	6,000	0	27,000	100	42,000
1992 - 1993	0	3,500	5,500	100	10,000	10,400	16,000	100	46,000
1993 - 1994	0	1,000	7,900	100	7,000	3,100	24,000	100	43,000
1994 - 1995	1,000	2,400	6,500	100	12,000	7,300	20,000	100	49,000
1995 - 1996	0	3,100	5,300	100	7,000	9,300	16,000	100	41,000
1996 - 1997	0	0	8,400	100	10,000	0	25,000	100	44,000
1997 - 1998	3,000	0	8,400	100	13,000	0	25,000	100	50,000
1998 - 1999	0	0	8,400	100	8,000	0	25,000	100	42,000
1999 - 2000	0	0	8,300	100	8,000	100	25,000	100	42,000
2000 - 2001	0	0	8,400	100	6,000	0	25,000	100	40,000
2001 - 2002	0	0	8,400	100	6,000	0	25,000	100	40,000
2002 - 2003	0	0	7,500	200	6,000	100	25,000	100	39,000
2003 - 2004	0	0	6,900	200	5,000	0	23,000	100	35,000
2004 - 2005	0	3,700	3,900	200	9,000	10,000	13,000	100	40,000
2005 - 2006	0	4,700	3,700	200	9,000	10,500	13,000	100	41,000
2006 - 2007	0	0	6,800	200	4,000	0	23,000	100	34,000
2007 - 2008	0	0	6,800	200	4,000	0	23,000	100	34,000
2008 - 2009	0	500	6,400	200	5,000	1,500	21,000	100	35,000
2009 - 2010	0	600	6,200	200	7,000	1,900	21,000	100	37,000
2010 - 2011	0	3,100	2,400	200	11,000	7,200	8,000	100	32,000
2011 - 2012	0	400	4,100	200	7,000	500	14,000	100	26,000
2012 - 2013	0	0	4,200	200	3,000	0	14,000	100	22,000
2013 - 2014	0	0	4,200	200	2,000	0	14,000	100	21,000
2014 - 2015	0	0	4,200	200	3,000	0	14,000	100	22,000
2015 - 2016	0	0	4,200	200	5,000	0	14,000	100	24,000
2016 - 2017	0	500	3,700	200	5,000	1,700	13,000	100	24,000
86/87-16/17 Avg	0	800	6,600	100	7,000	2,100	21,000	100	38,000

Groundwater Inflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Surface Water or ET Outflows Not Included in Groundwater Recharge or Sustainable Yield Estimates

Appendix F
Table 2

Alpaugh GSA
Historical Groundwater Budget 1986/87 to 2016/17

Water Year	Groundwater Inflows (acre-ft)							Total In	Groundwater Outflows (acre-ft)				Total Out	Change in Storage (acre-ft)
	Areal Recharge from Precipitation	Imported Water Deliveries	Agricultural Pumping	Municipal Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow			Groundwater Pumping		Sub-surface Outflow			
		Return Flow	Return Flow	Return Flow		From Outside Subbasin	From Other GSAs		Municipal	Agricultural	To Outside Subbasin	To Other GSAs		
1986 - 1987	0	300	8,600	100	3,000	10,000	32,000	54,000	200	35,000	2,000	12,000	49,000	5,000
1987 - 1988	0	0	8,900	100	3,000	9,000	35,000	56,000	200	36,000	2,000	14,000	52,000	4,000
1988 - 1989	0	0	8,900	100	3,000	9,000	38,000	59,000	200	36,000	2,000	15,000	53,000	6,000
1989 - 1990	0	0	8,900	100	3,000	9,000	35,000	56,000	200	36,000	2,000	15,000	53,000	3,000
1990 - 1991	0	0	8,900	100	4,000	10,000	36,000	59,000	200	36,000	2,000	17,000	55,000	4,000
1991 - 1992	0	0	8,900	100	4,000	8,000	40,000	61,000	200	36,000	3,000	18,000	57,000	4,000
1992 - 1993	0	3,500	5,500	100	2,000	5,000	36,000	52,000	200	22,000	5,000	22,000	49,000	3,000
1993 - 1994	0	1,000	7,900	100	3,000	8,000	37,000	57,000	200	32,000	3,000	20,000	55,000	2,000
1994 - 1995	1,000	2,400	6,500	100	2,000	8,000	32,000	52,000	200	26,000	3,000	20,000	49,000	3,000
1995 - 1996	0	3,100	5,300	100	1,000	10,000	29,000	49,000	200	21,000	2,000	23,000	46,000	3,000
1996 - 1997	0	0	8,400	100	1,000	14,000	36,000	60,000	200	33,000	2,000	24,000	59,000	1,000
1997 - 1998	3,000	0	8,400	100	1,000	15,000	38,000	66,000	200	33,000	2,000	26,000	61,000	5,000
1998 - 1999	0	0	8,400	100	1,000	13,000	38,000	61,000	200	33,000	2,000	24,000	59,000	2,000
1999 - 2000	0	0	8,300	100	1,000	13,000	38,000	60,000	200	33,000	2,000	24,000	59,000	1,000
2000 - 2001	0	0	8,400	100	2,000	11,000	40,000	62,000	200	33,000	3,000	24,000	60,000	2,000
2001 - 2002	0	0	8,400	100	2,000	9,000	41,000	61,000	200	33,000	3,000	25,000	61,000	0
2002 - 2003	0	0	7,500	200	2,000	9,000	40,000	59,000	200	33,000	3,000	24,000	60,000	-1,000
2003 - 2004	0	0	6,900	200	2,000	11,000	33,000	53,000	200	30,000	2,000	21,000	53,000	0
2004 - 2005	0	3,700	3,900	200	0	11,000	26,000	45,000	300	17,000	2,000	26,000	45,000	0
2005 - 2006	0	4,700	3,700	200	0	11,000	25,000	45,000	300	16,000	2,000	25,000	43,000	2,000
2006 - 2007	0	0	6,800	200	1,000	14,000	29,000	51,000	300	30,000	1,000	21,000	52,000	-1,000
2007 - 2008	0	0	6,800	200	3,000	7,000	38,000	55,000	300	30,000	3,000	24,000	57,000	-2,000
2008 - 2009	0	500	6,400	200	4,000	5,000	42,000	58,000	300	28,000	6,000	26,000	60,000	-2,000
2009 - 2010	0	600	6,200	200	3,000	6,000	45,000	61,000	300	27,000	6,000	28,000	61,000	0
2010 - 2011	0	3,100	2,400	200	2,000	8,000	33,000	49,000	300	10,000	6,000	31,000	47,000	2,000
2011 - 2012	0	400	4,100	200	3,000	8,000	32,000	48,000	300	18,000	6,000	26,000	50,000	-2,000
2012 - 2013	0	0	4,200	200	3,000	6,000	33,000	46,000	300	19,000	6,000	24,000	49,000	-3,000
2013 - 2014	0	0	4,200	200	4,000	5,000	32,000	45,000	300	19,000	6,000	23,000	48,000	-3,000
2014 - 2015	0	0	4,200	200	4,000	5,000	31,000	44,000	300	19,000	6,000	23,000	48,000	-4,000
2015 - 2016	0	0	4,200	200	3,000	6,000	33,000	46,000	300	19,000	5,000	25,000	49,000	-3,000
2016 - 2017	0	500	3,700	200	2,000	8,000	37,000	51,000	300	16,000	6,000	29,000	51,000	0
36/87-16/17 Avg	0	800	6,600	100	2,000	9,000	35,000	54,000	200	27,000	3,000	23,000	53,000	1,000
													Cumulative Change in Storage	31,000

Groundwater Inflows or Outflows to be Included in Sustainable Yield Estimates
Groundwater Inflows to be Excluded from the Sustainable Yield Estimates
Groundwater Outflows Not Included in Sustainable Yield Estimates

Appendix F
Table 3a

Projected Future Alpaugh GSA Surface Water Budget

Water Year	Surface Water Inflow (acre-ft)						Total In
	Precipitation	Stream Inflow	Imported Water		Discharge from Wells		
		Deer Creek	Alpaugh ID	Atwell Island WD	Agricultural	Municipal	
2017 - 2018	7,000	280	3,680	0	15,000	300	26,000
2018 - 2019	7,000	280	3,680	0	15,000	300	26,000
2019 - 2020	7,000	280	3,680	0	15,000	300	26,000
2020 - 2021	7,000	280	3,680	0	15,000	300	26,000
2021 - 2022	7,000	280	3,680	0	14,000	300	25,000
2022 - 2023	7,000	280	3,680	0	14,000	300	25,000
2023 - 2024	7,000	280	3,680	0	13,000	300	24,000
2024 - 2025	7,000	280	3,680	0	13,000	300	24,000
2025 - 2026	7,000	1,380	4,813	0	10,000	300	23,000
2026 - 2027	7,000	1,380	4,751	0	10,000	300	23,000
2027 - 2028	7,000	1,380	4,689	0	10,000	300	23,000
2028 - 2029	7,000	1,380	4,627	0	9,000	300	22,000
2029 - 2030	7,000	1,380	4,565	0	9,000	300	22,000
2030 - 2031	7,000	1,380	5,737	0	8,000	300	22,000
2031 - 2032	7,000	1,380	5,737	0	8,000	300	22,000
2032 - 2033	7,000	1,380	5,737	0	8,000	300	22,000
2033 - 2034	7,000	1,380	5,737	0	8,000	300	22,000
2034 - 2035	7,000	1,380	5,737	0	8,000	300	22,000
2035 - 2036	7,000	1,380	6,970	0	7,000	300	23,000
2036 - 2037	7,000	1,380	6,970	0	7,000	300	23,000
2037 - 2038	7,000	1,380	6,970	0	7,000	300	23,000
2038 - 2039	7,000	1,380	6,970	0	7,000	300	23,000
2039 - 2040	7,000	1,380	6,970	0	7,000	300	23,000
2040 - 2041	7,000	1,380	7,793	0	6,000	300	22,000
2041 - 2042	7,000	1,380	7,793	0	6,000	300	22,000
2042 - 2043	7,000	1,380	7,793	0	6,000	300	22,000
2043 - 2044	7,000	1,380	7,793	0	6,000	300	22,000
2044 - 2045	7,000	1,380	7,793	0	6,000	300	22,000
2045 - 2046	7,000	1,380	7,793	0	6,000	300	22,000
2046 - 2047	7,000	1,380	7,793	0	6,000	300	22,000
2047 - 2048	7,000	1,380	7,793	0	6,000	300	22,000
2048 - 2049	7,000	1,380	7,793	0	6,000	300	22,000
2049 - 2050	7,000	1,380	7,793	0	6,000	300	22,000
2050 - 2051	7,000	1,380	7,793	0	6,000	300	22,000
2051 - 2052	7,000	1,380	7,793	0	6,000	300	22,000
2052 - 2053	7,000	1,380	7,793	0	6,000	300	22,000
2053 - 2054	7,000	1,380	7,793	0	6,000	300	22,000
2054 - 2055	7,000	1,380	7,793	0	6,000	300	22,000
2055 - 2056	7,000	1,380	7,793	0	6,000	300	22,000
2056 - 2057	7,000	1,380	7,793	0	6,000	300	22,000
2057 - 2058	7,000	1,380	7,793	0	6,000	300	22,000
2058 - 2059	7,000	1,380	7,793	0	6,000	300	22,000
2059 - 2060	7,000	1,380	7,793	0	6,000	300	22,000
2060 - 2061	7,000	1,380	7,793	0	6,000	300	22,000
2061 - 2062	7,000	1,380	7,793	0	6,000	300	22,000
2062 - 2063	7,000	1,380	7,793	0	6,000	300	22,000
2063 - 2064	7,000	1,380	7,793	0	6,000	300	22,000
2064 - 2065	7,000	1,380	7,793	0	6,000	300	22,000
2065 - 2066	7,000	1,380	7,793	0	6,000	300	22,000
2066 - 2067	7,000	1,380	7,793	0	6,000	300	22,000
2067 - 2068	7,000	1,380	7,793	0	6,000	300	22,000
2068 - 2069	7,000	1,380	7,793	0	6,000	300	22,000
2069 - 2070	7,000	1,380	7,793	0	6,000	300	22,000
17/18-69/70 Avg	7,000	1,200	6,600	0	8,000	300	23,000

Projected Future Alpaugh GSA Surface Water Budget

Water Year	Surface Water Outflow (acre-ft)										Total Out
	Areal Recharge of Precip-itation	Deep Percolation of Applied Water				Evapotranspiration					
		Imported Water	Deer Creek	Agri-cultural Pumping	Municipal Pumping	Precipitation Crops/Native	Imported Water (Agricultural Cons. Use)	Deer Creek (Agricultural Cons. Use)	Ag. Cons. Use from Pumping	Municipal (Landscape ET)	
2017 - 2018	0	800	100	3,300	200	7,000	2,800	200	11,000	100	26,000
2018 - 2019	0	800	100	3,300	200	7,000	2,800	200	11,000	100	26,000
2019 - 2020	0	800	100	3,300	200	7,000	2,800	200	11,000	100	26,000
2020 - 2021	0	800	100	3,300	200	7,000	2,800	200	11,000	100	26,000
2021 - 2022	0	800	100	3,200	200	7,000	2,800	200	11,000	100	25,000
2022 - 2023	0	800	100	3,200	200	7,000	2,800	200	11,000	100	25,000
2023 - 2024	0	800	100	3,100	200	7,000	2,800	200	10,000	100	24,000
2024 - 2025	0	800	100	3,000	200	7,000	2,800	200	10,000	100	24,000
2025 - 2026	0	1,100	300	2,400	200	7,000	3,700	1,100	8,000	100	24,000
2026 - 2027	0	1,100	300	2,300	200	7,000	3,700	1,100	8,000	100	24,000
2027 - 2028	0	1,100	300	2,200	200	7,000	3,600	1,100	7,000	100	23,000
2028 - 2029	0	1,100	300	2,100	200	7,000	3,600	1,100	7,000	100	23,000
2029 - 2030	0	1,000	300	2,100	200	7,000	3,500	1,100	7,000	100	22,000
2030 - 2031	0	1,300	300	1,800	200	7,000	4,400	1,100	6,000	100	22,000
2031 - 2032	0	1,300	300	1,800	200	7,000	4,400	1,100	6,000	100	22,000
2032 - 2033	0	1,300	300	1,800	200	7,000	4,400	1,100	6,000	100	22,000
2033 - 2034	0	1,300	300	1,800	200	7,000	4,400	1,100	6,000	100	22,000
2034 - 2035	0	1,300	300	1,800	200	7,000	4,400	1,100	6,000	100	22,000
2035 - 2036	0	1,600	300	1,500	200	7,000	5,400	1,100	5,000	100	22,000
2036 - 2037	0	1,600	300	1,500	200	7,000	5,400	1,100	5,000	100	22,000
2037 - 2038	0	1,600	300	1,500	200	7,000	5,400	1,100	5,000	100	22,000
2038 - 2039	0	1,600	300	1,500	200	7,000	5,400	1,100	5,000	100	22,000
2039 - 2040	0	1,600	300	1,500	200	7,000	5,400	1,100	5,000	100	22,000
2040 - 2041	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2041 - 2042	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2042 - 2043	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2043 - 2044	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2044 - 2045	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2045 - 2046	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2046 - 2047	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2047 - 2048	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2048 - 2049	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2049 - 2050	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2050 - 2051	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2051 - 2052	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2052 - 2053	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2053 - 2054	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2054 - 2055	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2055 - 2056	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2056 - 2057	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2057 - 2058	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2058 - 2059	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2059 - 2060	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2060 - 2061	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2061 - 2062	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2062 - 2063	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2063 - 2064	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2064 - 2065	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2065 - 2066	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2066 - 2067	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2067 - 2068	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2068 - 2069	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
2069 - 2070	0	1,800	300	1,400	200	7,000	6,000	1,100	5,000	100	23,000
17/18-69/70 Avg	0	1,500	300	1,800	200	7,000	5,100	1,000	6,000	100	23,000

Projected Future Alpaugh GSA Groundwater Budget

Water Year	Groundwater Inflows (acre-ft)								Total In	Groundwater Outflows (acre-ft)				Total Out	Change in Storage (acre-ft)
	Areal Recharge from Precipitation	Imported Water Deliveries	Deer Creek	Agricultural Pumping	Municipal Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow			Groundwater Pumping		Sub-surface Outflow			
		Return Flow	Return Flow	Return Flow	Return Flow		From Outside Subbasin	From Other GSAs		Municipal	Agricultural	To Outside Subbasin	To Other GSAs		
2017 - 2018	0	800	100	3,300	200	3,000	5,000	29,000	41,000	300	15,000	3,000	25,000	43,000	-2,000
2018 - 2019	0	800	100	3,300	200	3,000	4,000	29,000	40,000	300	15,000	4,000	24,000	43,000	-3,000
2019 - 2020	0	800	100	3,300	200	3,000	4,000	28,000	39,000	300	15,000	4,000	23,000	42,000	-3,000
2020 - 2021	0	800	100	3,300	200	3,000	3,000	28,000	38,000	300	15,000	4,000	22,000	41,000	-3,000
2021 - 2022	0	800	100	3,200	200	3,000	3,000	27,000	37,000	300	14,000	4,000	21,000	39,000	-2,000
2022 - 2023	0	800	100	3,200	200	3,000	3,000	27,000	37,000	300	14,000	5,000	21,000	40,000	-3,000
2023 - 2024	0	800	100	3,100	200	3,000	2,000	27,000	36,000	300	13,000	5,000	20,000	38,000	-2,000
2024 - 2025	0	800	100	3,000	200	3,000	2,000	27,000	36,000	300	13,000	5,000	20,000	38,000	-2,000
2025 - 2026	0	1,100	300	2,400	200	3,000	2,000	25,000	34,000	300	10,000	6,000	19,000	35,000	-1,000
2026 - 2027	0	1,100	300	2,300	200	3,000	2,000	26,000	35,000	300	10,000	7,000	19,000	36,000	-1,000
2027 - 2028	0	1,100	300	2,200	200	3,000	2,000	26,000	35,000	300	10,000	8,000	19,000	37,000	-2,000
2028 - 2029	0	1,100	300	2,100	200	3,000	2,000	27,000	36,000	300	9,000	8,000	19,000	36,000	0
2029 - 2030	0	1,000	300	2,100	200	3,000	2,000	30,000	39,000	300	9,000	9,000	20,000	38,000	1,000
2030 - 2031	0	1,300	300	1,800	200	2,000	2,000	30,000	38,000	300	8,000	10,000	21,000	39,000	-1,000
2031 - 2032	0	1,300	300	1,800	200	2,000	2,000	32,000	40,000	300	8,000	10,000	22,000	40,000	0
2032 - 2033	0	1,300	300	1,800	200	2,000	2,000	33,000	41,000	300	8,000	11,000	23,000	42,000	-1,000
2033 - 2034	0	1,300	300	1,800	200	2,000	2,000	35,000	43,000	300	8,000	11,000	24,000	43,000	0
2034 - 2035	0	1,300	300	1,800	200	2,000	2,000	36,000	44,000	300	8,000	12,000	24,000	44,000	0
2035 - 2036	0	1,600	300	1,500	200	2,000	2,000	37,000	45,000	300	7,000	12,000	25,000	44,000	1,000
2036 - 2037	0	1,600	300	1,500	200	2,000	2,000	37,000	45,000	300	7,000	12,000	26,000	45,000	0
2037 - 2038	0	1,600	300	1,500	200	2,000	2,000	38,000	46,000	300	7,000	13,000	26,000	46,000	0
2038 - 2039	0	1,600	300	1,500	200	2,000	2,000	38,000	46,000	300	7,000	13,000	26,000	46,000	0
2039 - 2040	0	1,600	300	1,500	200	1,000	2,000	39,000	46,000	300	7,000	13,000	26,000	46,000	0
2040 - 2041	0	1,800	300	1,400	200	1,000	2,000	39,000	46,000	300	6,000	13,000	27,000	46,000	0
2041 - 2042	0	1,800	300	1,400	200	1,000	2,000	39,000	46,000	300	6,000	13,000	27,000	46,000	0
2042 - 2043	0	1,800	300	1,400	200	1,000	2,000	39,000	46,000	300	6,000	13,000	26,000	45,000	1,000
2043 - 2044	0	1,800	300	1,400	200	1,000	2,000	39,000	46,000	300	6,000	13,000	27,000	46,000	0
2044 - 2045	0	1,800	300	1,400	200	1,000	2,000	39,000	46,000	300	6,000	13,000	26,000	45,000	1,000
2045 - 2046	0	1,800	300	1,400	200	1,000	1,000	39,000	45,000	300	6,000	13,000	26,000	45,000	0
2046 - 2047	0	1,800	300	1,400	200	1,000	1,000	39,000	45,000	300	6,000	13,000	26,000	45,000	0
2047 - 2048	0	1,800	300	1,400	200	1,000	1,000	39,000	45,000	300	6,000	13,000	26,000	45,000	0
2048 - 2049	0	1,800	300	1,400	200	1,000	1,000	39,000	45,000	300	6,000	13,000	26,000	45,000	0
2049 - 2050	0	1,800	300	1,400	200	1,000	1,000	39,000	45,000	300	6,000	13,000	26,000	45,000	0
2050 - 2051	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	26,000	45,000	-1,000
2051 - 2052	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	26,000	45,000	-1,000
2052 - 2053	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	26,000	45,000	-1,000
2053 - 2054	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	26,000	45,000	-1,000
2054 - 2055	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	26,000	45,000	-1,000
2055 - 2056	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	26,000	45,000	-1,000
2056 - 2057	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2057 - 2058	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2058 - 2059	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2059 - 2060	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2060 - 2061	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2061 - 2062	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2062 - 2063	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2063 - 2064	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2064 - 2065	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2065 - 2066	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2066 - 2067	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2067 - 2068	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2068 - 2069	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
2069 - 2070	0	1,800	300	1,400	200	1,000	1,000	38,000	44,000	300	6,000	13,000	25,000	44,000	0
17/18-69/70 Avg	0	1,500	300	1,800	200	2,000	2,000	35,000	43,000	300	8,000	11,000	24,000	43,000	0

Alpaugh GSA
Representative Monitoring Site

Appendix **F**
Figure 1

Well 51
Lower Aquifer
Perforations: -563 to -1,193 (ft amsl)