Updated Groundwater Sustainability Plan

Version no: 2

Alpaugh Groundwater Sustainability Agency

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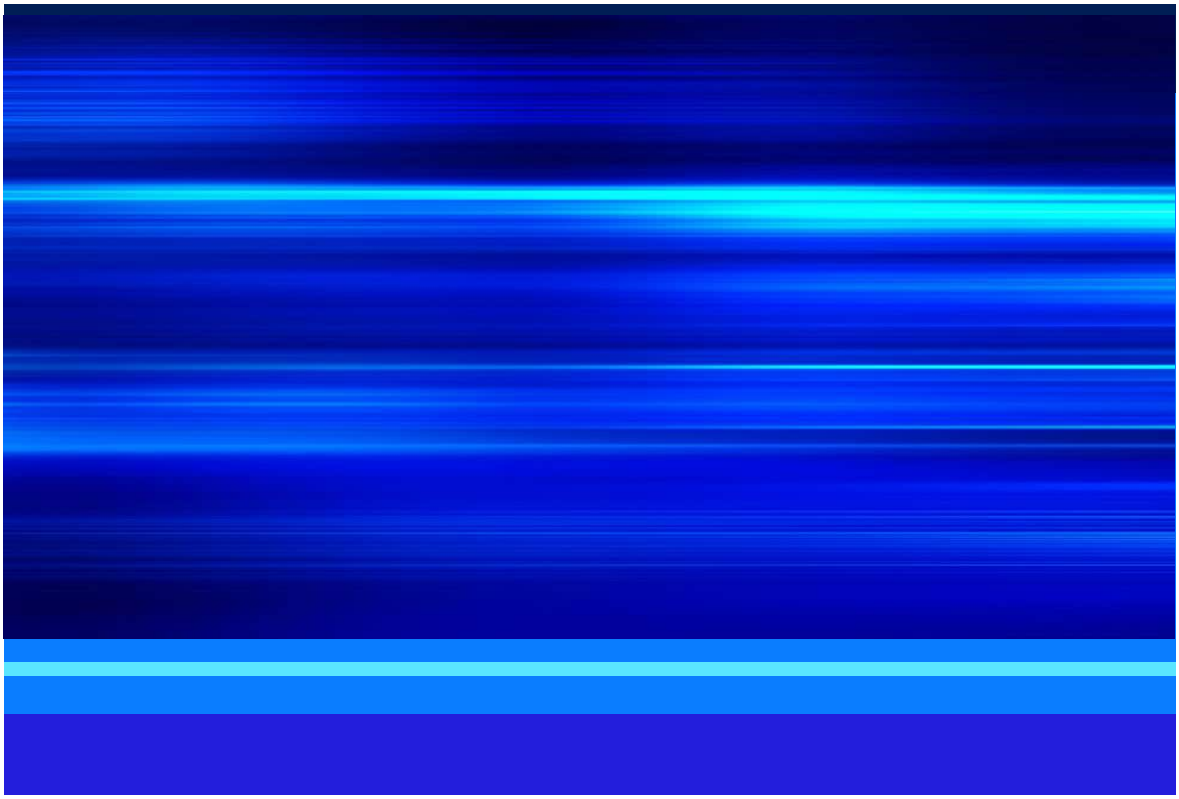

Updated Groundwater Sustainability Plan

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Jacobs Engineering Group Inc.

2525 Airpark Drive
Redding, CA 96001-2443
United States

T +1.530.243.5831
F +1.530.243.1654
www.jacobs.com

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Acronyms and abbreviations

%	percent
§	Section
AB	Assembly Bill
acre-feet/acre	acre-feet per acre
acre-feet/year	acre-feet per year
ACSD	Alpaugh Community Services District
AID	Alpaugh Irrigation District
AIWD	Atwell Island Water District
Alpaugh GSA	Alpaugh Groundwater Sustainability Agency
Board	Alpaugh GSA Board of Directors
Bureau	United States Bureau of Land Management
CASGEM	California State-wide Groundwater Elevation Monitoring Program
CEQA	California Environmental Quality Act
Coordination Agreement	Tule Subbasin Coordination Agreement
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
ET	Evapotranspiration
ETc	Crop evapotranspiration
ETo	Potential evaporation
feet/year	feet per year
FKC	Friant-Kern Canal
ft-bgs	feet below ground surface
ft-msl	feet relative to mean sea level
GPS	global positioning system
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
ID	Identification
ITRC	Irrigation Training Resource Center
MOU	Memorandum of Understanding

N/A	Not applicable
O&M	operation and maintenance
Reg	Groundwater Sustainability Plan Emergency Regulation
RMS	Representative Monitoring Site
SB	Senate Bill
SDI	subsurface drip irrigation
SGMA	Sustainable Groundwater Management Act
TSMP	Tule Subbasin Monitoring Plan
TSS	Tule Subbasin Setting
WY	Water Year

1. Introduction

1.1 Purpose of the Groundwater Sustainability Plan

On September 16, 2014, Governor Jerry Brown signed into law a three-bill legislative package composed of Assembly Bill (AB) 1739, Senate Bill (SB) 1168, and SB 1319, collectively known as the Sustainable Groundwater Management Act (SGMA). The SGMA requires governments and water agencies of high- and medium-priority basins to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. Under the SGMA, these basins should reach sustainability within 20 years of implementing their sustainability plans. The 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.

Alpaugh GSA was formed in May 2016 for the purpose of complying with the SGMA (**Appendix A**). This GSP complies with the SGMA by addressing the California Department of Water Resources (DWR) GSP Emergency Regulations in Sections (§) 354.2 through 354.10 (DWR 2016a). The GSP is the result of a collaborative process between local water agencies, technical experts, environmental managers, and community members with a mutual goal of sustainably managing the groundwater basin. This GSP serves to:

- Provide administrative information and historical context regarding Alpaugh GSA;
- Describe the geographic, geologic, and hydrogeologic features of Alpaugh GSA and their context in the Tule Subbasin[1];
- Describe the Sustainability Goal for Alpaugh GSA;
- Discuss the six undesirable results identified by SGMA and how they pertain to Alpaugh GSA;
- Identify specific minimum thresholds and measurable objectives to evaluate Alpaugh GSA's progress toward the Sustainability Goal;
- Establish a monitoring network that collects enough data to measure Alpaugh GSA's progress toward achieving its Sustainability Goal; and
- Describe projects and management actions proposed by Alpaugh GSA to achieve the Sustainability Goal.

The intent of the GSP is to guide long-term management of groundwater resources so that all stakeholders have a reliable and safe water supply now and in the future.

The present document updates the Alpaugh GSP originally submitted in January 2020, in response to a January 28, 2022 DWR letter titled "Incomplete Determination of the 2020 Groundwater Sustainability Plans Submitted for the San Joaquin Valley – Tule Subbasin."

1.1.1 Executive Summary

Alpaugh GSA is part of the Tule Subbasin and was formed in May 2016 for the purpose of complying with the SGMA. This updated GSP complies with the SGMA by addressing the DWR GSP Emergency Regulations in § 354.2 through 354.10. The GSP is the result of a collaborative process between local water agencies, technical experts, environmental managers, and community members with a mutual goal of sustainably managing the groundwater basin. Alpaugh GSA is one of seven participating GSAs in the Tule Subbasin, which organize their activities through the updated Tule Subbasin Coordination Agreement (Coordination Agreement). The Coordination Agreement is provided as **Appendix B** of this document, and provides

[1] The Tule Basin or Tule Subbasin is Groundwater Basin Number 5-22.13, with boundaries defined in Bulletin 118 (DWR 2016b)

descriptions of the overall Subbasin sustainability goal, definitions for undesirable results, and the program for basin- wide monitoring. Generally, the Tule Subbasin sustainability goal is to achieve no long-term change in groundwater storage by year 2040, by implementing a series of projects and management actions among the member agencies and stakeholders during this planning horizon.

The Tule Subbasin is designated by DWR as a critically overdrafted basin with an estimated subbasin average overdraft of 160,000 acre-feet per year (acre-feet/year). Alpaugh GSA has not contributed to the overdraft conditions over the last 30 years and has recharged the aquifer system with an average of 1,000 acre-feet/year over that period. Excessive groundwater pumping outside of Alpaugh GSA has lowered water levels, reduced groundwater storage, and induced land subsidence (Thomas Harder & Co. 2020).

This updated GSP addresses the deficiencies noted in the January 2022 DWR letter. This GSP discusses the legal and regulatory framework for the GSP, the physical characteristics and water budget of the aquifer system, and the occurrence and risk of undesirable groundwater conditions such as lowered water levels, loss of groundwater storage, degraded water quality, and land subsidence. The GSP sets targets that, when achieved, will result in the long-term sustainable use of groundwater in the Subbasin. A monitoring network to measure progress toward sustainability is presented, along with projects that will improve the health of the aquifer system as they are implemented.

Alpaugh GSA has determined on the basis of the technical information provided in this GSP and its Appendices, that Alpaugh GSA is not responsible for the overdraft conditions in the Tule Subbasin. As such, the Alpaugh GSA path to sustainability relies in part on limiting the excessive consumption of groundwater by those parties that have contributed to the overdraft conditions, especially those who began pumping groundwater while the aquifer system was already experiencing undesirable results. Alpaugh GSA has also identified projects and management actions that it will implement to reduce the consumptive use of groundwater within the GSA boundaries, including increased stormwater capture, changes to cropping patterns, and acquiring additional surface water supply.

Alpaugh GSA welcomes the opportunity to help guide the Tule Subbasin on its path to sustainability that will result in higher water levels, increased groundwater storage, improved water quality, and a reduction or cessation of land subsidence. Implementation of this GSP and the GSPs of the other GSAs in the Tule Subbasin will result in long-term sustainable and responsible use of groundwater resources.

Table 1-1 presents a Preparation Checklist for GSP Submittal, which serves as a guide to where content meeting GSP requirements can be found in the GSP.

Table 1-1. Preparation Checklist for GSP Submittal

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 3. Technical and Reporting Standards				
352.2		Monitoring Protocols	▪ Monitoring protocols adopted by the GSA for data collection and management ▪ 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 groundwater levels or quality or are caused by groundwater extraction in the basin	GSP 4 and TSMP
Article 5. Plan Contents, Subarticle 1. Administrative Information				
354.4		General Information	▪ Executive Summary ▪ List of references and technical studies	▪ GSP 1.1.1 ▪ GSP 7
354.6		Agency Information	▪ GSA mailing address ▪ Organization and management structure ▪ Contact information of Plan Manager ▪ Legal authority of GSA ▪ Estimate of implementation costs	▪ GSP 1.2.1 ▪ GSP 1.2.2 ▪ GSP 1.2.2 ▪ GSP 1.2.3 ▪ GSP 1.2.4, 6.1
354.8(a)	10727.2(a)(4)	Map(s)	▪ Area covered by GSP ▪ Adjudicated areas, other agencies within the basin, and areas covered by an Alternative ▪ Jurisdictional boundaries of federal or State land ▪ Existing land use designations ▪ Density of wells per square mile	▪ GSP Figure 1-3 ▪ N/A ▪ GSP Figure 1-2 ▪ GSP Figure 1-4 ▪ GSP Figure 1-5
354.8(b)		Description of the Plan Area	▪ Summary of jurisdictional areas and other features	▪ GSP 1.3
354.8(c) 354.8(d) 354.8(e)	10727.2(g)	Water Resource Monitoring and Management Programs	▪ Description of water resources monitoring and management programs ▪ Description of how the monitoring networks of those plans will be incorporated into the GSP ▪ Description of how those plans may limit operational flexibility in the basin ▪ Description of conjunctive use programs	▪ TSMP ▪ TSMP ▪ N/A ▪ N/A

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
354.8(f)	10727.2(g)	Land Use Elements or Topic Categories of Applicable General Plans	▪ Summary of general plans and other land use plans ▪ Description of how implementation of the GSP may change water demands or affect achievement of sustainability and how the GSP addresses those effects ▪ Description of how implementation of the GSP may affect the water supply assumptions of relevant land use plans ▪ Summary of the process for permitting new or replacement wells in the basin ▪ Information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management	▪ GSP 1.3.1.1 ▪ GSP 1.3.1.1 ▪ GSP 1.3.1.1 ▪ GSP 1.3.1.2 ▪ GSP 1.3.1.1
354.8(g)	10727.4	Additional GSP Contents	**Description of Actions related to:** ▪ Control of saline water intrusion ▪ Wellhead protection ▪ Migration of contaminated groundwater ▪ Well abandonment and well destruction program ▪ Replenishment of groundwater extractions ▪ Conjunctive use and underground storage ▪ Well construction policies ▪ Addressing groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects ▪ Efficient water management practices ▪ Relationships with State and federal regulatory agencies ▪ Review of land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity ▪ Impacts on groundwater dependent ecosystems	N/A
354.10		Notice and Communication	▪ Description of beneficial uses and users ▪ List of public meetings ▪ GSP comments and responses ▪ Decision-making process ▪ Public engagement ▪ Encouraging active involvement ▪ Informing the public on GSP implementation progress	▪ GSP 1.4.1 ▪ GSP 1.4.2 ▪ GSP 1.4.5 ▪ GSP 1.4.3 ▪ GSP 1.4.4 ▪ GSP 1.4.4 ▪ GSP 1.4.4

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 5. Plan Contents, Subarticle 2. Basin Setting				
354.14		Hydrogeologic Conceptual Model	▪ Description of the Hydrogeologic Conceptual Model ▪ Two scaled cross-sections ▪ Map(s) of physical characteristics: topographic information, surficial geology, soil characteristics, surface water bodies, source and point of delivery for imported water supplies	▪ TSS, GSP2 ▪ GSP Figures 2-1 and 2-2 ▪ TSS, GSP Figure 1-7
354.14(c)(4)	10727.2(a)(5)	Map of Recharge Areas	▪ Map delineating existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas	▪ TSS Figure 2-9
	10727.2(d)(4)	Recharge Areas	▪ Description of how recharge areas identified in the plan substantially contribute to the replenishment of the basin	▪ TSS 2.3.2.1
354.16	10727.2(a)(1) 10727.2(a)(2)	Current and Historical Groundwater Conditions	▪ Groundwater elevation data ▪ Estimate of groundwater storage ▪ Seawater intrusion conditions ▪ Groundwater quality issues ▪ Land subsidence conditions ▪ Identification of interconnected surface water systems ▪ Identification of groundwater-dependent ecosystems	▪ GSP 2.2, TSS 2.2.1 ▪ GSP 2.2, TSS 2.2.2 ▪ GSP 2.2, TSS 2.2.3 ▪ GSP 2.2, TSS 2.2.4 ▪ GSP 2.2, TSS 2.2.5 ▪ GSP 2.2, TSS 2.2.6 ▪ GSP 2.2, TSS 2.2.7
354.18	10727.2(a)(3)	Water Budget Information	▪ Description of inflows, outflows, and change in storage ▪ Quantification of overdraft ▪ Estimate of sustainable yield ▪ Quantification of current, historical, and projected water budgets	▪ GSP 2.3 ▪ TSS 2.3
	10727.2(d)(5)	Surface Water Supply	▪ Description of surface water supply used or available for use for groundwater recharge or in-lieu use	▪ TSS 2.3.1.1.1

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
354.20		Management Areas	▪ Reason for creation of each management area ▪ Minimum thresholds and measurable objectives for each management area ▪ Level of monitoring and analysis ▪ Explanation of how management of management areas will not cause undesirable results outside the management area ▪ Description of management areas	N/A
Article 5. Plan Contents, Subarticle 3. Sustainable Management Criteria				
354.24		Sustainability Goal	▪ Description of the sustainability goal	GSP 3.2
354.26		Undesirable Results	▪ Description of undesirable results ▪ Cause of groundwater conditions that would lead to undesirable results ▪ Criteria used to define undesirable results for each sustainability indicator ▪ Potential effects of undesirable results on beneficial uses and users of groundwater	GSP 3.4
354.28	10727.2(d)(1) 10727.2(d)(2)	Minimum Thresholds	▪ Description of each minimum threshold and how they were established for each sustainability indicator ▪ Relationship for each sustainability indicator ▪ Description of how selection of the minimum threshold may affect beneficial uses and users of groundwater ▪ Standards related to sustainability indicators ▪ How each minimum threshold will be quantitatively measured	GSP 3.5.2
354.30	10727.2(b)(1) 10727.2(b)(2) 10727.2(d)(1) 10727.2(d)(2)	Measurable Objectives	▪ Description of establishment of the measurable objectives for each sustainability indicator ▪ Description of how a reasonable margin of safety was established for each measurable objective ▪ Description of a reasonable path to achieve and maintain the sustainability goal, including a description of interim milestones	GSP 3.5.1

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 5. Plan Contents, Subarticle 4. Monitoring Networks				
354.34	10727.2(d)(1) 10727.2(d)(2) 10727.2(e) 10727.2(f)	Monitoring Networks	▪ Description of monitoring network ▪ Description of monitoring network objectives ▪ Description of how the monitoring network is designed to: demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features; estimate the change in annual groundwater in storage; monitor seawater intrusion; determine groundwater quality trends; identify the rate and extent of land subsidence; and calculate depletions of surface water caused by groundwater extractions ▪ Description of how the monitoring network provides adequate coverage of Sustainability Indicators ▪ Density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends ▪ Scientific rational (or reason) for site selection ▪ Consistency with data and reporting standards ▪ Corresponding sustainability indicator, minimum threshold, measurable objective, and interim milestone ▪ **(Monitoring Networks Continued)** ▪ Location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used ▪ Description of technical standards, data collection methods, and other procedures or protocols to ensure comparable data and methodologies	GSP 4 and TSMP 2
354.36		Representative Monitoring	▪ Description of representative sites ▪ Demonstration of adequacy of using groundwater elevations as proxy for other sustainability indicators ▪ Adequate evidence demonstrating site reflects general conditions in the area	GSP 4 ▪ and TSMP 3
354.38		Assessment and Improvement of Monitoring Network	▪ Review and evaluation of the monitoring network ▪ Identification and description of data gaps ▪ Description of steps to fill data gaps - Description of monitoring frequency and density of sites	TSMP 4

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 5. Plan Contents, Subarticle 5. Projects and Management Actions				
354.44		Projects and Management Actions	▪ Description of projects and management actions that will help achieve the basin's sustainability goal ▪ Measurable objective that is expected to benefit from each project and management action ▪ Circumstances for implementation ▪ Public noticing ▪ Permitting and regulatory process ▪ Time-table for initiation and completion, and the accrual of expected benefits ▪ Expected benefits and how they will be evaluated ▪ How the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included. ▪ Legal authority required ▪ Estimated costs and plans to meet those costs ▪ Management of groundwater extractions and recharge	GSP 5
354.44(b)(2)	10727.2(d)(3)		▪ Overdraft mitigation projects and management actions	GSP 5

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 8. Interagency Agreements				
357.4	10727.6	Coordination Agreements - Shall be submitted to the Department together with the GSPs for the basin and, if approved, shall become part of the GSP for each participating Agency.	**Coordination Agreements shall describe the following:** ▪ A point of contact ▪ Responsibilities of each Agency ▪ Procedures for the timely exchange of information between Agencies ▪ Procedures for resolving conflicts between Agencies ▪ How the Agencies have used the same data and methodologies to coordinate GSPs ▪ How the GSPs implemented together satisfy the requirements of SGMA ▪ Process for submitting all Plans, Plan amendments, supporting information, all monitoring data and other pertinent information, along with annual reports and periodic evaluations ▪ A coordinated data management system for the basin ▪ Coordination agreements shall identify adjudicated areas within the basin, and any local agencies that have adopted an Alternative that has been accepted by the Department	GSP Appendix B

Notes:

GSP 1.2.1 - Groundwater Sustainability Plan Section 1.2.1

N/A - Not applicable

TSMP 4 - Tule Subbasin Monitoring Plan Section 4

TSS 2.3 - Tule Subbasin Setting Section 2.3

1.1.2 References

A list of references used to develop this GSP is provided in **Section 7**.

1.2 Agency Information

In addition to the agency information contained in this section, **Appendix A** presents the documents establishing Alpaugh GSA.

1.2.1 Name and Mailing Address

Alpaugh Groundwater Sustainability Agency
P.O. Box 129
5458 Road 38
Alpaugh, California 93201

1.2.2 Organization and management structure

Alpaugh GSA is governed by a board of directors (Board):

- Ranveig Magden (Chairman),
- Milt Pace,
- DaVon Gary Gregory,
- Luis Vasquez, and
- Roger Strickland.

The Board has final authority for GSP implementation. The Board members are chosen in public meetings by the respective governing boards of the Member Agencies, with two members chosen by Alpaugh Irrigation District (AID), one by Atwell Island Water District (AIWD), and two by Alpaugh Community Services District (ACSD). Alternates for each Board member are chosen in the same manner by the same Member Agencies. Board members are elected to 4-year terms.

Bruce Howarth has been appointed Agency Manager by the Board. The Agency Manager manages the agency and GSP implementation.

Contact information for the Agency Manager:
Bruce Howarth
Alpaugh GSA
P.O. Box 129
5458 Road 38
Alpaugh, California 93201
Telephone: (559) 949-8323
Email: bruce@alpaughid.com

1.2.3 Legal Authority of the Agency

SB 1168 and 1319 and AB 1739 are collectively known as the SGMA and empower local agencies to form a GSA to manage groundwater subbasins on behalf of landowners within the GSA boundaries. Alpaugh GSA was formed through a May 11, 2016, Memorandum of Understanding (MOU) by and between three local public agencies: AID, AIWD, and ACSD. The MOU is included in **Appendix A**.

1.2.4 GSP Implementation Costs and Funding

Alpaugh GSA will incur costs on behalf of its members to implement the GSP and provide 5-year updates to the State of California. Estimated costs are detailed in **Section 5** and summarized in **Section 6**.

Funding to implement the GSP is derived from the Member Agencies. Each Member Agency in the GSA participates at its sole cost and expense, unless agreed to otherwise. The Member Agencies shall negotiate and determine each Member Agency's proportionate share of the costs.

The MOU that formed the GSA provides for the GSA to raise necessary funds through Proposition 218 procedures, and to collect fees from the Member Agencies, to further the purposes of the GSA and implement the GSP, including coordination activities.

1.3 Description of Alpaugh GSA Area

The location of the Tule Subbasin within California is shown on **Figure 1-1**. The Tule Subbasin includes seven GSAs that have coordinated efforts per the adopted SGMA regulations through a common Coordination Agreement but each with a separate GSP. The location of Alpaugh GSA within the Tule Subbasin is shown on **Figure 1-2**, in relation to the other GSAs within the Subbasin (Eastern Tule GSA, Lower Tule River GSA, Pixley Irrigation District GSA, Delano-Earlimart GSA, Tri-County Water Authority GSA, and Tulare County GSA). Jurisdictional boundaries of state, federal, tribal, municipal, county, and water management agencies in and near Alpaugh GSA are shown on **Figure 1-3**.

Alpaugh GSA has three member organizations. AID was organized under the Wright Act on March 22, 1915, at which point the district operations supplied water to over 2,500 acres of land in production using groundwater as the source (State of California Department of Engineering 1917). AIWD was formed in 1977 to connect to the proposed Cross Valley Canal, which was intended to connect the Friant-Kern Canal (FKC) and the California Aqueduct, but the connection was never built (United States Department of the Interior 2010). ACSD was formed in 2012 and operates the Alpaugh domestic water system.

Land use designations and water sources within Alpaugh GSA are depicted on **Figure 1-4**, and crop types grown in the agricultural areas of the GSA are shown on **Figure 1-5**. The density of well locations in the vicinity of Alpaugh GSA is shown on **Figure 1-6**. Alpaugh GSA water-distribution infrastructure is depicted on **Figure 1-7**, including storage reservoirs, water distribution canals, and water-supply wells (municipal and agricultural).

The area served by Alpaugh GSA is agriculturally oriented. Agricultural production and its supporting services are the dominant economic activities, contributing to Tulare County's position as one of the country's largest agricultural producers (Tulare County Resource Management Agency 2017). Despite the agricultural output, the community of Alpaugh is a severely disadvantaged community, experiencing a median household income less than half the state average, and unemployment rates at 1.6 percent (%) above the state average. This severe economic disadvantage leads to secondary effects such as deteriorated housing, poor-quality roads, poor air quality, inadequate domestic water service, and a lack of community-wide sewer and stormwater management systems. The Alpaugh community and the agencies that serve it generally lack adequate local funding for infrastructure improvements, including elements of the GSP.

Water for agricultural use is extracted from 13 AID agricultural wells into the gravity-driven canal system on an as-needed basis and distributed in the GSA (**Figure 1-7**). During precipitation events where Deer Creek exceeds its banks, stormwater associated with Deer Creek is captured and pumped into the storage reservoirs (i.e. Reservoirs 1, 2, and 3), and also distributed via canals in the GSA as required to supplement groundwater supply.

Domestic water supplies are entirely dependent on local groundwater, whether from domestic wells or from water wells operated by ACSD. Domestic water service providers for Alpaugh have been unable to support any new connections to their water system in recent years due to severe water quality problems (including arsenic in groundwater), inadequate system pressures, and water pipeline deterioration that causes leaks and breaks in outlying areas. Water system problems have halted any new development from occurring in the community. A water treatment design that addresses arsenic levels was completed in 2015, and construction was funded with a $3 million Proposition 1 grant in February 2018, and another

$886,000 of State funds in July 2019, with an estimated completion date of December 2020 (California Natural Resources Agency 2019).

Municipal water is typically extracted from a single water-supply well (Well #1), with a designated backup well (Well #10). Groundwater is pumped into a storage tank for gravity-fed distribution to customers. ACSD samples their water-supply well on a quarterly basis, in the third month of each calendar quarter. The well is sampled for water-quality parameters and compared to drinking-water regulatory standards (Tulare County Resource Management Agency 2017).

Within the Tule Subbasin, several groundwater monitoring and management programs are active. The programs that include data collection within Alpaugh GSA are detailed in **Section 4** of this GSP. No known conflicts exist between the GSP elements and existing water resource monitoring or management programs.

No conjunctive use programs are presently operating in Alpaugh GSA.

1.3.1 General Plans in the Alpaugh GSA Area

Alpaugh is designated as a Community in the Tulare County General Plan, 2030 Update (Tulare County Resource Management Agency 2012), and the Alpaugh Community Plan 2017 details conditions in the community and sets goals and priorities for the community and its infrastructure (Tulare County Resource Management Agency 2017). Outside of the Alpaugh community, the remainder of the GSA is covered under the Tulare County General Plan (Tulare County Resource Management Agency 2012).

The Water Resources element of the Tulare County General Plan contains many implementation measures that impact groundwater resource management and potentially impact this GSP. Tulare County has chosen to implement the following measures related to groundwater management:

- Regulate the permanent extraction and exportation of groundwater from Tulare County.
- Protect groundwater from contamination related to solid waste disposal.
- Assure that all watershed planning is done on a complete regional and watershed basis, and that such planning considers a balance between urban and agricultural demands.
- Participate in coordinated local, regional, and state-wide groundwater monitoring and planning programs.
- Encourage active participation by local stakeholders and develop groundwater-monitoring partnerships with local groundwater users and developers.
- Avoid destruction of established recharge sites and establish development or design standards for the protection of groundwater recharge areas.
- Work with federal, state, local and regional agencies to improve local groundwater pollution detection and monitoring.
- Encourage responsible agencies and organizations to install and monitor additional groundwater monitoring wells in areas where data gaps exist.
- Research the development of an education program to inform homeowners in the valley and mountain areas regarding water quality concerns.
- Incorporate provisions for water conservation techniques into the county's building, zoning, and subdivision ordinances.
- Identify and evaluate conditions within established watersheds which are causing deterioration of the water quality, water supply, or declining water yields.
- Manage contaminants in cooperation with the agricultural community and industrial interests.

- Require deeper seals in areas of known contaminants and oversee the proper abandonment of unused wells.
- Participate in Integrated Regional Water Management Plans.
- Adopt an ordinance to require new subdivisions to demonstrate water supply capabilities.
- Develop a priority of consumptive uses for various water sources to ensure availability of adequate supplies to meet public health and safety needs and for resource protection.
- Develop an education program to inform residents of water conservation techniques and the importance of water quality and adequate water supplies.
- Work with other local/regional agencies, water purveyors, and interest groups to seek funding sources to implement a variety of surface and groundwater restoration activities.

1.3.1.1 Summary of General Plans and Other Land Use Plans

Land within Alpaugh GSA boundaries is generally zoned for agricultural use (Tulare County Resource Management Agency 2012, Figure 4-1). The main crop types in the GSA are dairy and dairy support crops, miscellaneous field crops, and cotton.

Land within the Urban Development Boundary of the Alpaugh Community is designated as mixed-use (Tulare County Resource Management Agency 2017). Per the Tulare County General Plan, land within the Alpaugh Community, which is designated as residential reserve, commercial reserve, or industrial reserve, shall be retained in agricultural use until such time as conversion to urban use is appropriate. When a rezoning occurs without a general plan amendment, the reserve designation shall be removed from the parcel. Zoning districts in the Alpaugh Community are depicted in the Alpaugh Community Plan 2017 (Tulare County Resource Management Agency 2017).

Development in the Alpaugh Community and the addition of residential housing is currently restricted by the use of septic systems for wastewater disposal (Tulare County Resource Management Agency 2017). No major residential development is possible within the GSA boundaries until a sewage conveyance and treatment system is built to serve the area. Tulare County projects a 1.3% annual growth rate for the Community of Alpaugh through 2030. No major industrial development is currently anticipated in the GSA. The water demands within the GSA boundaries and Community are expected to remain similar to current demands.

The impact of the Alpaugh GSP on water-supply assumptions of relevant land use plans will range from beneficial (e.g., a reduction in groundwater demand from Alpaugh GSA) to detrimental (adjacent areas may be required to reduce consumptive use of groundwater). **Section 5.2.3** contains additional details regarding adjacent areas. The magnitude and location of this impact is currently unknown, but will not exceed the quantity of groundwater historically put to beneficial use in Alpaugh GSA.

The impact of implementing other GSPs in the Tule Subbasin and surrounding areas is likely to be highly beneficial to Alpaugh GSA. As noted in **Section 2.3.1**, Alpaugh GSA has not been a cause of overdraft in the Tule Subbasin for 30 years or more. As nearby groundwater users reduce their consumption and operate more sustainably, groundwater conditions in Alpaugh GSA are expected to improve in the form of rising water levels, increased groundwater storage, and reduced potential for further land subsidence.

1.3.1.2 Well Permitting Process

Well permitting processes in the Subbasin are set by Tulare County, in accordance with SB 252 (California Water Code, §13807 et seq.; Tulare County Environmental Health Services Division 2018a, 2018b).

In a critically overdrafted basin such as the Tule Subbasin, the County must request the following information from the applicant or applicant's agent for all new wells, to the extent that it can be reasonably known as part of the well application. The County must also make the information publicly available and easily accessible including, but not limited to, posting the information on the County's

internet website or offering an email mailing list for interested parties. The information includes the following:

- A map of the location, as well as information including, but not limited to, global positioning system coordinates and elevation of the proposed well;
- The well depth;
- The estimated capacity, pumping rate, anticipated pumping schedule, and estimated annual extraction volume;
- Any existing wells on the property, including well use, depth, diameter, screen interval, pumping rate, estimated or measured annual extraction volume, and, if available, information on specific capacity or other pumping tests completed;
- For a well below Corcoran clay, a map showing the location of canals, ditches, pipelines, utility corridors, and roads within 2 miles;
- The estimated cumulative extraction volume before January 1, 2020;
- The distance of any potential sources of pollution onsite and on adjacent properties including, but not limited to, existing or proposed septic systems, wells, animal or fowl enclosures, transmission lines, or sewer lines;
- The distance from ponds, lakes, and streams within 300 feet;
- The geologic siting information including, but not limited to, water table depth, seasonal fluctuations, recharge area and rate, and location to floodplain;
- The size in acres of the area to be served by the well; and
- The planned category of water use, such as irrigation, stock, domestic, municipal, industrial, or other.

1.4 Notice and Communications

Alpaugh GSA conducted several actions to engage beneficial users of groundwater, interested parties, and the general public in the development of the GSP. This section summarizes notifications and communications by Alpaugh GSA regarding the SGMA and the development of the GSP, as required by California Code of Regulations §354.10:

"Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:

a. A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.

b. A list of public meetings at which the Plan was discussed or considered by the Agency.

c. Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.

d. A communication section of the Plan that includes the following:

1. An explanation of the Agency's decision-making process.

2. Identification of opportunities for public engagement and a discussion of how public input and response will be used.

3. A description of how the Agency encourages the active involvement of diverse social, cultural and economic elements of the population within the basin.

4. *The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions."*

1.4.1 Beneficial Users of Groundwater and Interested Parties in Alpaugh GSA

Pursuant to California Water Code §10723.2, "[t]he groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans. These interests include, but are not limited to, all of the following:

a. *Holders of overlying groundwater rights, including:*

    1. *Agricultural users, including farmers, ranchers, and dairy professionals.*
    2. *Domestic well owners.*

a. *Municipal well operator.*

b. *Public water systems.*

c. *Local land use planning agents.*

d. *Environmental users of groundwater.*

e. *Surface water users, if there is a hydrologic connection between surface and groundwater bodies.*

f. *The federal government, including, but not limited to, the military and managers of federal lands.*

g. *California Native American tribes.*

h. *Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems.*

i. *Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency.*

§10723.4 The groundwater sustainability agency shall establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents. Any person may request, in writing, to be placed on the list of interested persons."

1.4.1.1 Agricultural Users

Alpaugh GSA is composed almost entirely of agricultural users within the GSA's boundaries (**Appendix A**). Agricultural interests are represented in the SGMA process through individual membership on the Board, participation in Advisory Committee meetings, and through public review of this GSP. Agricultural interests are also represented in the GSP development process by the Tulare County Farm Bureau, and individual farmworkers and growers. The SGMA and GSP development were also discussed in public meetings held by AID and ACSD.

1.4.1.2 Domestic Well Owners

Domestic wells within Alpaugh GSA are operated in agricultural areas outside of the Alpaugh Community, which is served by ACSD. The SGMA excludes "de minimis extractors" from its requirements; at this time, Alpaugh GSA is also excluding all domestic wells from GSP requirements. Alpaugh GSA does not anticipate changing this approach, but reserves the right to, if it becomes necessary for sustainable management of the GSA. As beneficial users of groundwater, private well owners and consumers have the opportunity to contribute to the GSP during the Board and Advisory Committee meetings, as well as during the public review period.

1.4.1.3 Municipal Well Operators

There are no incorporated cities or municipal water systems within the GSA boundaries.

1.4.1.4 Public Water Systems

There are three public water systems within the GSA boundaries operated by AID, AIWD, and ACSD. The Alpaugh GSA Board is composed of members chosen in public meetings by their governing boards, with two members chosen by AID, one by AIWD, and two by ACSD (**Appendix A**). Customers of the public water districts have the opportunity to contribute to the GSP during the Board and Advisory Committee meetings, as well as during the public review period.

1.4.1.5 Local Land Use Planning Agencies

Local land use planning agencies within the GSA boundaries include the Tulare County Board of Supervisors, Tulare County Planning Commission, and the Tulare County Local Agency Formation Commission (Tulare County Resource Management Agency 2012). These planning commissions were invited to public meetings of the GSA and invited to comment on the GSP during the public review period.

1.4.1.6 Environmental Users of Groundwater

Environmental users of groundwater within Alpaugh GSA include the United States Bureau of Land Management (Bureau) (United States Department of the Interior 2010). The Bureau was invited to public meetings of the GSA and invited to comment on the GSP during the public review period.

1.4.1.7 Surface Water Users

There are no surface water bodies within the GSA boundaries that have a hydrologic connection to the underlying aquifer system.

1.4.1.8 The Federal Government

Federal agencies with responsibility for land management within the GSA boundaries include the Bureau. The Bureau was invited to public meetings of the GSA and invited to comment on the GSP during the public review period.

1.4.1.9 California Native American Tribes

There are no California Native American tribes recognized within the GSA boundaries.

1.4.1.10 Disadvantaged Communities

Alpaugh is a severely disadvantaged community based upon household income. As defined by the State of California Public Resources Code §750"5(g), a "[d]isadvantaged "community" means a community with a median household income less than 80% of the state-wide "average. "Severely disadvantaged community" means a community with a median household income less than 60% of the state-wide average."

In 2015, Alpaugh's median household income was $27,222, whereas the State of California's median household income was $61,818. Alpaugh's median household income was 44% of the State of California's median household income; therefore, it is considered a severely disadvantaged community.

Stakeholders in Alpaugh can consult on the GSP during the Board and Advisory Committee meetings and during the public review period. In addition to individual stakeholder contribution opportunities, ACSD supplies drinking water to Alpaugh residents and is represented on the Board.

1.4.1.11 Groundwater Monitoring and Reporting Entities

No wells within the GSA boundaries are monitored under the California State-wide Groundwater Elevation Monitoring Program (CASGEM) (DWR 2019a).

Five wells within Alpaugh GSA have water quality data that were reported to the California Groundwater Ambient Monitoring and Assessment Program (California State Water Resources Control Board 2019a).

1.4.2 Public Meetings and Outreach

Alpaugh GSA meets regularly on the second Monday of each month at 2:30 PM. Special meetings of Alpaugh GSA will be announced to interested parties by a notification on the GSA website (alpaughgsa.com) and by emails to those who have signed up for notifications. A draft of this GSP was made available on the GSA website for the 90-day public review.

As of January 2020, Alpaugh GSA had met 28 times, on the following dates:

October 9, 2017;
November 13, 2017;
December 11, 2017;
January 8, 2018;
February 12, 2018;
March 12, 2018;
April 9, 2018;
May 14, 2018;
June 11, 2018;
July 9, 2018;
August 13, 2018;
September 10, 2018;
October 8, 2018;
November 12, 2018;
December 10, 2018;
January 14, 2019;
February 11, 2019;
March 11, 2019;
April 8, 2019;
May 13, 2019;
June 10, 2019;
July 8, 2019;
August 12, 2019;
September 9, 2019;
October 9, 2019, at which a draft of this GSP was made available for public review;
November 11, 2019;
December 9, 2019; and
January 13, 2020, at which this GSP was adopted by Alpaugh GSA.

This updated GSP was adopted by Alpaugh GSA on January 25, 2022.

The Alpaugh GSP and the overall Tule Subbasin GSP have also been discussed at public meetings held by other agencies, including over 30 meetings of the Tule Subbasin MOU Group Technical Advisory Committee since December 2015 (approximately monthly) (Tule Subbasin SGMA Committee 2019).

1.4.3 Alpaugh GSA Decision-Making Process

The Board is authorized to take action at any meeting at which a quorum is present, defined as a majority of the Board members then in office. The Board shall adopt actions for the purpose of regulating,

conserving, managing, and controlling the use and extraction of groundwater within the GSA boundaries. All actions by the Board are adopted by a majority vote at noticed public hearings, and notice of adoption of all actions will be published. Notices of hearings and Board actions will be provided pursuant to §6066 of the California Government Code, by publication in the newspaper of general circulation.

1.4.4 Opportunities for Public Engagement

Public participation is welcomed by Alpaugh GSA. Comments can be delivered to the Board in person at public meetings of Alpaugh GSA, or in writing by using the Agency Manager. Alpaugh GSA encourages active public participation from the diverse social, cultural, and economic elements of the local population. Outreach efforts to promote community participation and awareness of the GSP will include:

- Developing an informational flyer about the GSP in both English and Spanish, to promote awareness and participation in the Spanish-speaking portion of the Alpaugh community,
- Distributing flyers to homes, businesses, and schools within the GSA boundaries,
- Exploring a partnership with Alpaugh Unified School District to advertise GSA meetings by sending flyers home with students,
- Posting flyers in public areas such as local businesses and the Alpaugh post office, and
- Scheduling some GSA meetings in the evening, so that it is easier for working residents to attend.

1.4.5 Comments Received on the GSP and Agency Responses

Alpaugh GSA received comments on a draft of this document, which was made available for public review October 9, 2019. Some comments pertained specifically to Alpaugh's GSP, and some pertained to the overall Tule Subbasin GSP. These comments are addressed below. Although the public comment period on this document has concluded, Alpaugh GSA continues to welcome public participation in and input to the GSP.

Comments received from Aaron Bock, Tulare County Resource Management Agency:

1. **Comment:** Besides the Water Resource Element the County has several other Elements (Planning Framework, Agriculture and Health and Safety) and Implementation Policies that may be helpful to show how the County Policies will assist the GSP in promoting groundwater sustainability. The County is working towards updating these policies to further assist the GSPs in complying with SGMA.

   Response: Alpaugh GSA looks forward to continuing cooperation with the County in the future.

2. **Comment:** Figure 4.1 of the County's Land Use Diagram shows the actual General Plan land uses within' the GSA's boundaries and could be referenced in the next version to show land use compliance with actual land usage. Also for reference, the County projected a 1.3% growth rate for the Community of Alpaugh through the General Plan Horizon of 2030.

   Response: Section 1.3.1.1 has been updated to reference Figure 4-1 of the Tulare County General Plan, and to note the projected growth rate for the Community of Alpaugh.

3. **Comment:** Within the Urban Development Boundary of the Alpaugh Community, the land use is fixed-use". Please reference References to the adopted Alpaugh Community Plan Land Use Diagram (Figure 14 Pg. 71) and adopted zoning districts (Figure 17 Pg. 74).

   Response: The text of Section 1.3.1.1 has been updated with the land use designation and a reference to the suggested figures.

4. **Comment:** [On page 26, the Tulare County Board of Supervisors should be included on the list of Local Land Use Planning Agencies.

Response: The text of Section 1.4.1.5 has been updated to include the Tulare County Board of Supervisors on the list of Local Land Use Planning Agencies.

Shafter-Wasco Irrigation District commented on six of the Tule Subbasin GSPs collectively. Their comments mainly address subsidence along the FKC and are part of a 171-page document that is not reproduced here. Some comments do not pertain specifically to Alpaugh GSA, which they have noted is not adjacent to the FKC. Included below are the comments that pertain to Alpaugh GSA specifically, and those that pertain to Alpaugh GSA in its role as a member of the Tule Subbasin. Each of their comments was accompanied by additional explanatory text in the original comment letter.

Comments received from Shafter-Wasco Irrigation District:

5. **Comment:** The Friant Districts are concerned that the minimum thresholds in the Tule Subbasin GSPs as currently drafted are not protective of the beneficial water users downstream of the Tule Subbasin and will negatively impact the Friant Districts by limiting their ability to receive significant quantities of their contracted surface water imports due to past and ongoing subsidence within the Tule Subbasin.

   Response: Alpaugh GSA recognizes the concerns of the Friant Districts. The Tule Subbasin GSAs rely on the Friant-Kern Canal for part of the subbasin's water supply, and a loss of conveyance capacity will negatively impact the Tule Subbasin GSAs and their neighbors. As noted in Section 2.3.1 of this GSP, Alpaugh GSA has operated with an average groundwater surplus of approximately 1,000 acre-feet/year for the past 3 decades. Alpaugh GSA is not a significant contributor to lowered water levels and therefore subsidence, in the Tule Subbasin. Due to its geographic location (not adjacent to the Friant-Kern Canal), Alpaugh GSA is unlikely to either improve or degrade conditions contributing to subsidence. Nonetheless, Alpaugh GSA will be implementing this GSP and the projects and management actions described in Section 5, which will further reduce the (already small) potential impacts of its operations on future subsidence in the Tule Subbasin.

6. **Comment:** The Friant Districts recommend the Tule Subbasin GSPs include immediate management actions that provide for no additional subsidence (0 feet) beyond that "legacy" subsidence which would occur if pumping were to cease immediately.

   Response: As noted in Section 2.3.1 of this GSP, Alpaugh GSA has operated with an average groundwater surplus of approximately 1,000 acre-feet/year for the past 3 decades. Alpaugh GSA is not a significant contributor to lowered water levels and therefore subsidence, in the Tule Subbasin, including near the Friant-Kern canal. Based on the above and because of its geographic location (not adjacent to the Friant-Kern Canal), Alpaugh GSA will not likely impact (i.e., either improve or degrade) conditions contributing to subsidence in the future. As such, Alpaugh's current operations and the GSP for future sustainable groundwater management already provide for no further subsidence caused or contributed to by Alpaugh GSA along the Friant-Kern Canal.

7. **Comment:** The Sustainability Goal in the TSCA [Tule Subbasin Coordination Agreement] and the Tule Subbasin GSPs is not fully consistent with the General Principles laid forth in the GSP Regulations.

   Response: Alpaugh GSA believes that the Sustainability Goals for the Subbasin and for Alpaugh GSA are consistent with the General Principles laid forth in the GSP Regulations. While these Sustainability Goals are focused on local impacts and actions, they do not exclude the required consideration of impacts in neighboring basins.

8. **Comment:** The definition of Undesirable Results in the TSCA and the Tule Subbasin GSPs is not compliant with the GSP Regulations.

   Response: The language in the Coordination Agreement and in the Alpaugh GSP has been updated to explicitly acknowledge that impacts to the functionality of the Friant-Kern Canal are included in the definition of Undesirable Results. The definition was not geographically restricted to impacts within the Tule Subbasin.

9. **Comment:** The Basin Setting information lacks sufficient discussion of the serious issue of subsidence.

Response: Alpaugh GSA believes that the publication of the revised *Tule Subbasin Setting* (*TSS*) (Thomas Harder & Co. 2022a; included as **Appendix B2** of this GSP) and the groundwater flow model documentation *Groundwater Flow Model of the Tule Subbasin* (Thomas Harder & Co. 2020) sufficiently addresses the issue of subsidence. We note that the groundwater flow model was calibrated to match thousands of historical water levels and thousands of historical subsidence measurements in the Tule Subbasin. The groundwater flow model is the best available tool for estimating and interpreting projected SGMA-related impacts and was used to perform a robust impact and uncertainty analysis for the Friant-Kern Canal.

10. **Comment:** The proposed Sustainable Management Criteria for subsidence are insufficient in their consideration of impacts on adjacent basins.

    Response: The language in the Coordination Agreement and in the Alpaugh GSP has been updated to explicitly acknowledge that land subsidence impacts causing a loss of functionality of the Friant-Kern Canal are significant and unreasonable. The definition was not geographically restricted to impacts within the Tule Subbasin.

In addition, after adoption of the January 2020 GSP, Alpaugh GSA reviewed the January 2022 letter from DWR and revised this GSP in response to the detailed review comments provided. Comment summaries and responses to the DWR letter are included at the end of this section as **Exhibit A**.

1.5 Exhibit A

EXHIBIT A

Summary of Responses to DWR Comments to the Tule Subbasin Groundwater Sustainability Plans

DWR Identified Deficiency	DWR Comment	Coordination Agreement Sections	Summary of Revisions
Chronic Lowering of Groundwater Levels	The GSPs do not describe, with information specific to the Subbasin, the groundwater level conditions that are considered significant and unreasonable and would result in undesirable results.	4.3 4.3.1.2 Attachment 4 Attachment 7	The groundwater conditions that are considered significant and unreasonable for agricultural, municipal, and industrial uses are continued chronic lowering of groundwater levels after 2040. Lowered groundwater levels during the transition period from 2020 – 2040 may impact shallow wells as quantified in the Well Impact Analysis Technical Memo (Appendix A, Attachment 4). Well impacts will be addressed through the Tule Subbasin Mitigation Framework (Appendix A, Attachment 7).
	The GSPs do not explain or justify how the quantitative definition of undesirable results is consistent with avoiding effects the GSAs have identified as undesirable results.	4.3.1.3 Attachment 7	The potential effects of lowering groundwater levels during the transition period were found to be acceptable for a majority of the beneficial uses and users. For those well users that may be impaceted, mitigation is addressed through the Tule Subbasin Mitigation Framework (Appendix A, Attachment 7).
	The GSPs do not demonstrate that the established sustainable management criteria are based on a commensurate level of understanding of the basin setting or whether the interests of beneficial uses and users have been considered.	4.3 4.3.1.2 4.3.1.3 4.4.1.1 Attachment 2 Attachment 4 Attachment 7	The relationship of lowered groundwater levels, minimum thresholds, and impacts to beneficial uses are addressed in more detail in Section 2.4.2 of Subbasin Setting. Interests of agricultural, municipal, industrial, and domestic supply uses are all addressed in these sections of the Coordination Agreement (Appendix A), Subbasin Setting (Appendix A, Attachment 2), Well Impact Analysis Technical Memo (Appendix A, Attachment 4), Tule Subbasin Mitigation Framework (Appendix A, Attachment 7).
Land Subsidence	In areas adjacent to the Friant-Kern Canal, the GSPs do not identify, through analysis, the total amount of subsidence that can be tolerated by the Friant-Kern Canal during implementation of the GSPs in order to maintain the ability to reasonably operate to meet contracted for water supply deliveries.	4.3.4.2 Attachment 6 ETGSA LSMP	Along the portion of the FKC that occurs in the Tule Subbasin, the maximum amount of land subsidence allowed during the transition period from 2020 to 2040 is three feet. SMC established for RMS benchmarks throughout the Subbasin were developed in coordinated manner to be consistent with the minimum thresholds set within the ETGSA to be protective of the FKC operations based on a Settlement Agreement with the FWA.
	The GSPs do not explain how implementation of projects and management actions is consistent both with achieving the long-term avoidance or minimization of subsidence and with not exceeding the tolerable amount of cumulative subsidence adjacent to the Canal.	4.3.4.3	Land subsidence in the vicinity of the FKC is being monitored and managed under Eastern Tule Groundwater Sustainability Agency's Land Subsidence Monitoring and Management Plans, which includes a Monitoring Committee made of technical representatives of the multiple stakeholders.
	The GSPs do not explain how the criteria defining when undesirable results occur in the Subbasin was established, the rationale behind the approach, and why it is consistent with avoiding the significant and unreasonable effects identified by the GSAs.	4.3.4.2 4.4.4.1 Attachment 6 Attachment 7	Except for the ETGSA Land Subsidence Management Area, Minimum Thresholds for land subsidence were established throughout the Tule Subbasin based on the maximum amount of land subsidence forecast during the transition period from 2020 to 2040 using the calibrated groundwater flow model and best available data.
	The GSPs do not identify land uses and property interests, apart from the Friant-Kern Canal, susceptible to impacts from land subsidence, explain how they were considered, and describe the rationale for establishing minimum thresholds for land subsidence in consideration of uses and interests, or provide reasonable and convincing evidence that the other areas of the basin are not susceptible to impacts from land subsidence.	4.3.4.3 4.4.4.4 Attachment 6 Attachment 7	Potentially impacted land uses in the Tule Subbasin have been divided into high priority land uses and low priority land uses as described in these sections of the Coordination Agreement (Appendix A). This is also supported by Land Subsidence Technical Memo (Appendix A, Attachment 6) and Mitigation Framework (Appendix A, Attachment 7).

	The GSPs' current minimum thresholds and measurable objectives for land subsidence are not consistent with the intent of SGMA that subsidence be avoided or minimized once sustainability is achieved in the Subbasin.	4.3.4.2	"Any land subsidence occurring after 2040 that is not attributable to recoverable compaction is considered an undesirable result. It is acknowledged that residual land subsidence resulting from historical groundwater conditions may occur after 2040. Additional studies and data are needed to assess the rate and extent of residual land subsidence that could occur after 2040 and the potential for this subsidence to cause undesirable results"

Summary of Responses to DWR Comments to the Tule Subbasin Groundwater Sustainability Plans

DWR Identified Deficiency	DWR Comment	Applicable Coordination Agreement Section	Summary of Revisions
Degraded Water Quality	The GSPs do not specify what groundwater conditions are considered suitable for agricultural irrigation and domestic use.	4.4.3.1 Attachment 5	Reference MCLs and Ag WQO's as set by existing State Regulations.
	The GSPs do not explain the choice of constituents (pH, conductivity, and nitrate) as a means of evaluating impacts to beneficial uses and users, especially agricultural irrigation.	4.3.3.2 4.3.3.3 Attachment 7	COCs were expanded to include Arsenic, Nitrate, Chromium-6, DBCP, TCP, PCE, Sodium, Chloride, Perchlorate, TDS.
	The GSPs do not explain how the use of a 10-year running average to establish the sustainable management criteria will avoid undesirable results due to degraded groundwater quality and related potential effects of the undesirable results to existing regulatory standards.	4.4.3.5 4.5.3 Attcahment 7	Sustainable Management Criteria was set as follows Measurable Objective: 75% of MCL or Ag WQO Minimum Threshold: MCL or Ag WQO
	The GSPs do not explain how the criteria defining when undesirable results occur in the Subbasin was established, the rationale behind the approach, and why it is consistent with avoiding significant and unreasonable effects associated with groundwater pumping and other aspects of the GSAs' implementation of their GSPs.	4.3.3.2 4.3.3.3 Attachment 7	Reference Drinking Water MCLs and Ag WQO's. The Tule Subbasin Mitigation Framework (Appendix A, Attachment 7) discuss mitigation for impacts from degradation of groundwater quality from GSP implementation.
	The GSPs do not explain how the sustainable management criteria for degraded water quality relate to existing groundwater regulatory requirements in the Subbasin and how the GSAs will coordinate with existing agencies and programs to assess whether or not implementation of the GSPs is contributing to the degradation of water quality throughout the Subbasin.	4.3.3.2 4.3.3.3 Attachment 7	Same as previous comment. Additional background information on existing programs was added to section 2.2.4 of the Tule Subbasin Setting (Appendix A, Attachment 2).

2. Hydrogeologic Conceptual Model (§354.12)

2.1 Overview

The GSAs in the Tule Subbasin have commissioned the *TSS* report which is included as **Appendix B2** of this GSP (Thomas Harder & Co., 2022a). The Coordination Agreement (**Appendix B**) describes the administrative framework through which the subbasin-wide SGMA activity is agreed upon and performed by GSA staff and their technical consultants, including the preparation of the *TSS*. The *TSS* satisfies GSP regulations §354.14(a), 354.16, and 354.18(a):

- *§354.14(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."*
- *§354.16: "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[…]."*
- *§354.18(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."*

The following sections highlight information from the *TSS* that pertains specifically to Alpaugh GSA. The hydrogeologic conditions and groundwater conditions that give context are in the *TSS,* and conditions in Alpaugh GSA should be understood in the context of the overall Tule Subbasin.

Figures from the *TSS* that are referred to in this section have been included in the **Figures** section of this GSP.

2.2 Alpaugh GSA Hydrogeologic Setting

Alpaugh GSA is located on the western side of the Tule Subbasin, which is in the southern portion of the San Joaquin Valley Groundwater Basin in the Central Valley of California (**Figures 1-1 and 1-2**) (Thomas Harder & Co. 2022a). The Alpaugh Community is centrally located within the GSA boundaries (**Figure 1-3**). The Alpaugh GSA area is 14,491 acres within the 475,895-acre Tule Subbasin. Alpaugh GSA is adjacent to the Tulare Lake Subbasin to the west, Pixley Irrigation District GSA to the northeast, and Tri-County Water Authority GSA to the north, east, and south.

The GSA is underlain by an upper aquifer, the Corcoran Clay confining unit below that, and a lower aquifer, shown in cross sections on **Figures 2-1 and 2-2**. The upper aquifer is 400 to 450 feet thick under Alpaugh, unconfined to semi-confined, and composed of streambed, alluvial, flood plain, and lake bed deposits. Relatively low-permeability clay deposits generally increase in thickness near Tulare Lake on the western side of the GSA. The Corcoran Clay is a regional confining mostly-clay layer that is 180 to 280 feet thick beneath Alpaugh. The lower aquifer is confined by the Corcoran Clay, and is similar to the upper aquifer in composition: streambed, alluvial, flood plain, and lake bed deposits.

The freshwater portion of the aquifer system is approximately 2,500 feet thick under Alpaugh (Planert and Williams 1995). Shallow groundwater flows north-northeast toward a cone of depression (*TSS* Figures 2-17 and 2-18). Deep groundwater flows west and northwest toward a cone of depression (*TSS* Figure 2-19). Vertical flow is from the shallow aquifer to the deep aquifer.

Agricultural and municipal production wells in Alpaugh GSA are perforated from as shallow as 500 feet below ground surface (ft-bgs) to as deep as 1520 ft-bgs, with perforated intervals ranging from 185 to 825 feet long.

Shallow groundwater within Alpaugh GSA is designated for beneficial uses, but due to high salinity, has been de-designated for agricultural and municipal uses to the west and northwest of the GSA (California Regional Water Quality Control Board, Central Valley Region 2018). Lower-aquifer groundwater quality in Alpaugh GSA is suitable for agriculture, but water-quality monitoring locations are limited. Drinking water supplied by ACSD from the lower aquifer is impacted by naturally occurring arsenic in the geologic materials that make up the aquifer. Construction of a water treatment system that addresses arsenic levels in drinking water supplied by ACSD was completed in February 2022 (California Natural Resources Agency 2022). There are two recently active cleanup sites in Alpaugh GSA identified on the California Department of Toxic Substances Control's (DTSC's) EnviroStor website, both of which have received notices of no further action required (DTSC 2019):

- The Alpaugh K-12 Reconstruction Project was led by Department of Toxic Substances Control and certified by DTSC for no further removal action on May 8, 2019. The contaminants associated with this site were metals, organochlorine pesticides, petroleum, polychlorinated biphenyls, and polynuclear aromatic hydrocarbons (EnviroStor Identification [ID] 60001606).
- The Western Farm Services site was also led by DTSC, and no further action is required at the site as of August 1, 2019. The contaminants associated with this site were metals and pesticides (EnviroStor ID 54070288).

Land surface subsidence in the Alpaugh area has occurred both historically and more recently. From 2007 to 2011, land subsidence in Alpaugh GSA was estimated to range from 0.5 feet in the south to as much as 3 feet at the northern tip of the GSA (*TSS* Figure 2-24). From 2015 to 2018, land subsidence was estimated to be 0.25 feet in the south of the GSA to 2.25 feet in the north (*TSS* Figure 2-25). The cumulative recent (2007 to 2018) subsidence in the northern part of the GSA is estimated to be at least 5 feet, or a rate of 0.4 feet per year (feet/year) or more; no estimate was available for 2012 to 2014. At the southern end of the GSA, subsidence is estimated to be at least 0.75 feet, or a rate of 0.06 feet/year or more.

The following data gaps were identified for Alpaugh GSA:

- Water level measurements in production wells and observation wells within Alpaugh GSA, and
- Measurements of subsidence within Alpaugh GSA.

The data gaps will be addressed as Alpaugh GSA implements the monitoring program designed to close such gaps, as described in **Section 4**.

Table 2-1. Groundwater Production Wells in Alpaugh GSA

Owner	CASGEM State Well Number	Borehole Depth (ft-bgs)	Casing Depth (ft-bgs)	Top of Perforations (ft-bgs)	Bottom of Perforations (ft-bgs)	Year Drilled	X-Coordinate[1] (feet)	Y-Coordinate[2] (feet)
AID	Well 43	1205	1205	500	1200	1966	6423930.535	1817616.895
	Well 44	1150	1150	600	1150	1968	6423843.409	1823353.283
	Well 45	1200	1200	750	1200	1972	6419905.344	1837270.155
	Well 48	1500	N/A[3]	N/A	N/A	N/A	6429346.946	1842505.657
	Well 50	1515	1400	770	1400	1981	6429366.112	1847919.4
	Well 51	1515	1400	770	1400	1980	6429394.739	1849064.47
	Well 52	1520	1520	720	1520	1980	6431975.122	1848981.505
	Well 55		1459	707	1459	1981	6432066.568	1849112.181
	Well 56	1520	1487	944	1487	1981	6436678.92	1851759.097
	Well 57	1530	1491	712	1482	1981	6438528.223	1843962.876
	Well 58	1530	1479	644	1469	1982	6441009.713	1844094.474
	Well 59	N/A	N/A	N/A	N/A	N/A	6439795.142	1845082.614
	Well 9	1150	1150	920	1150	1983	6421163.271	1838544.379
ACSD	Well 1	1320	N/A	700	N/A	N/A	6418755.947	1842018.136
	Well 10	1200	1200	720	1200	N/A	6419990.124	1838406.174

Notes:

[1] X-Coordinates in State Plane Zone 4

[2] Y-Coordinates in State Plane Zone 4

[3] N/A = Not Available

Well 1 pump intake set at 750 ft-bgs.

Well 10 pump intake set at 5870 ft-bgs.

2.3 Water Budget

2.3.1 Historical (Water Years 1987 to 2017)

Historical surface water and groundwater budgets were presented in the *TSS* report for the 31-year period from water year (WY) 1987 through WY2017, and local water budgets for Alpaugh GSA are included as Tables 2-2a, 2-2b, and 2-3. Table 2-2a presents surface water inflows, Table 2-2b presents surface water outflows, and Table 3 presents groundwater inflows and outflows for Alpaugh GSA. A WY is the 12-month period from October 1 for any given year through September 30 of the following year, and it is designated by the year in which it ends (e.g., WY2019 ends on September 30, 2019). Inflow terms for the surface water budget include:

- Precipitation,
- Stream inflow,
- Imported water, and
- Discharge to the land surface from wells.

Outflow terms for the surface water budget 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.

Groundwater inflow terms are often outflow terms from the surface water budget and include:

- 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.

Groundwater 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 (Table 2-3). On average over the 31-year period, Alpaugh GSA had a surplus of approximately 1,000 acre-feet/year (i.e., inflows were greater than outflows), illustrated on **Figure 2-3**. Recent drought conditions have resulted in an estimated 10-year average annual deficit of 2,100 acre-feet of groundwater storage per year.

Groundwater pumping within Alpaugh GSA (municipal and agricultural) has varied during the 31-year period, reaching a maximum of 36,200 acre-feet/year. During the 10-year period of WY2008 through WY2017, Alpaugh GSA groundwater pumping reached a maximum of 30,300 acre-feet/year, and a maximum of 19,300 acre-feet/year in the most recent 5-year period (WY2013 through WY2017).

Access to groundwater supplies in California is controlled by a combination of laws, regulations, and judicial decisions that have developed over more than a century. California courts recognize three main categories of groundwater rights (California State Water Resources Control Board 2019b):

- Overlying Rights. A landowner whose land lies over a groundwater basin has a right to extract and use that groundwater on the overlying land. The right is restricted to an amount which is reasonable in light of the competing demands of other overlying users.
- Appropriative Rights. A party who does not own land overlying the basin, who owns overlying land but uses the water on non-overlying land, or who sells the water to the public generally is an "appropriator" and not an overlying user. Appropriative groundwater use takes the available *surplus* from a groundwater basin and applies it to beneficial use inside or outside of the basin.
- Prescriptive Rights. Prescriptive rights do not begin to accrue until a condition of overdraft begins. Prescriptive rights are grounded in the legal concept of adverse possession: rewarding those who actively put resources to valuable use and penalizing those that allow resources to lie fallow. To acquire a prescriptive right to groundwater, courts have generally required a basin to be in overdraft, some notice of the overdraft condition, and continuous use of the groundwater for 5 years.

Alpaugh GSA asserts that it possesses and is entitled to overlying, appropriative, and prescriptive rights to groundwater in the overdrafted Tule Subbasin, and its member agencies have been putting groundwater to beneficial use within the basin since 1915. A forthcoming document will detail Alpaugh GSA's legal arguments supporting this assertion (Alpaugh GSA 2020). This GSP assumes Alpaugh GSA's rights to beneficial use of groundwater within the Tule Subbasin will be confirmed.

2.3.2 Projected (WY2021 to WY2070)

A projected water budget for Alpaugh GSA was developed as part of the Tule Subbasin water budget to incorporate the planned projects and management actions of each of the GSAs for achieving sustainability (Tables 2-4a, 2-4b, and 2-5) (Thomas Harder & Co., 2020). Table 2-4a presents projected surface water inflows, Table 2-4b presents projected surface water outflows, and Table 2-5 presents projected groundwater inflows and outflows for Alpaugh GSA. The projects and management actions were incorporated into the groundwater flow model of the Tule Subbasin for the projected time period from WY2021 to WY2070 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 projected Sustainable Yield for the Tule Subbasin is 129,700 acre-feet/year. Alpaugh GSA makes up 3.0% of the total acreage of the Tule Subbasin, making Alpaugh GSA's portion of the basin's Sustainable Yield 3,890 acre-feet/year, which is the amount of groundwater that can be pumped for consumptive use as a long-term average with a reasonable expectation that no undesirable effects will impact the aquifer system.

Water budget projections for Alpaugh GSA show a long-term balance of inflows and outflows, with no groundwater surplus or deficit simulated over the 50-year projection period (WY2021 to WY2070). This overall equal balance between inflows and outflows is similar to the historical 31-year average. During the time that Alpaugh's operations resulted in an estimated 31,000 acre-feet of net groundwater recharge over the 31-year historical period (Table 2-3), groundwater levels declined beneath the GSA. In other words, as Alpaugh GSA maintained a reasonable and sustainable balance of inflows and outflows, the health of the aquifer system beneath the GSA declined due to nearby and regional overpumping of groundwater. Future projections greatly improve the sustainability of local and regional groundwater use surrounding Alpaugh GSA, giving Alpaugh GSA the opportunity to continue sustainable use of groundwater into the future.

Projects and management actions to improve Alpaugh GSA's operational flexibility and reduce reliance on pumped groundwater are detailed in **Section 5**. Alpaugh GSA intends to maintain agricultural land in

production into the future, through a combination of acquiring additional surface water supply and reducing groundwater pumping by others in the region through assertion of Alpaugh GSA's water rights. For projected water budgeting purposes, acquiring additional imported surface water supply and reducing agricultural consumptive use of water by taking land out of production have similar, but not identical, impacts on the projected groundwater budget. Both directly reduce the demand for groundwater pumping. Importing additional surface water supply results in an assumed 20% return flow to groundwater, while taking land out of production does not result in return flows to the aquifer system.

A projected schedule for implementation of projects and management actions is provided in **Section 6.2**. To maintain progress toward the SGMA Sustainability Goals, during each 5-year period beginning in 2025, as management actions Alpaugh GSA will seek to either identify approximately 1,000 acre-feet of additional surface-water supply or identify equivalent reductions in acreage to reduce groundwater demand. Additionally, if Alpaugh GSA believes that it has superior water rights to any third party outside the GSA, Alpaugh GSA may seek to establish and/or exercise those superior water rights against an equivalent amount of pumping instead of or in addition to obtaining additional surface water supply or identifying reductions with Alpaugh GSA.

Table 2-2a. Alpaugh GSA Historical Surface Water Budget Inflows WY1987 to WY2017

	Surface Water Inflow (acre ft)					
		Imported water		Discharge from Wells		
Water Year	Precipitation	Alpaugh ID	Atwell Island WD	Agricultural	Municipal	Total IN
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

	Surface Water Inflow (acre ft)					
		Imported water		Discharge from Wells		
Water Year	Precipitation	Alpaugh ID	Atwell Island WD	Agricultural	Municipal	Total IN
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

Table 2-2b Alpaugh GSA Historical Surface Water Budget Outflows 1987 to 2017

	Surface Water Outflow (acre ft)								
		Deep Percolation of Applied			Evapotranspiration				
Water Year	Aerial Recharge of Precipitation	Imported Water	Agricultural Pumping	Municipal Pumping	Perception Crops/Native	Imported Water Agricultural Cons. Use	Ag. Cons Use From Pumping	Municipal (Landscape ET)	Total Out
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

Water Year	Surface Water Outflow (acre ft)								
		Deep Percolation of Applied			Evapotranspiration				
	Aerial Recharge of Precipitation	Imported Water	Agricultural Pumping	Municipal Pumping	Perception Crops/Native	Imported Water Agricultural Cons. Use	Ag. Cons Use From Pumping	Municipal (Landscape ET)	Total Out
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

Table 2-3. Alpaugh GSA Historical Groundwater Budget 1987 to 2017

	Groundwater Inflows (acre ft)								Groundwater Outflows (acre ft)					
		Imported Water Deliveries	Agricultural Pumping	Municipal Pumping	Release of Water from Compression of Aquitards	Sub-surface Inflow			Groundwater Pumping		Sub-surface Outflow			
Water Year	Areal Recharge from Precipitation	Return Flow	Return Flow	Return Flow		From Outside Subbasin	From Other GSA	Total In	Municipal	Agricultural	To Outside Subbasin	To Other GSAs	Total Out	Change in Storage (acre ft)
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	-,2000
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
86/87-16/17 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

Table 2-4a. Projected Alpaugh GSA Surface Water Budget Inflows

		Surface Water Inflow (acre ft)					
			Imported water		Discharge from Wells		
Water Year	Precipitation	Stream Inflow Deer Creek	Alpaugh ID	Atwell Island WD	Agricultural	Municipal	Total IN
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
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

		Surface Water Inflow (acre ft)					
			Imported water		Discharge from Wells		
Water Year	Precipitation	Stream Inflow Deer Creek	Alpaugh ID	Atwell Island WD	Agricultural	Municipal	Total IN
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
2017/2018-2069/2070 Avg	7,000	1,200	6,600	0	8,000	300	23,000

Table 2-4b Projected Alpaugh GSA Surface Water Budget Outflow

	Surface Water Outflow (acre ft)										
	Deep Percolation of Applied					Evapotranspiration	Imported Water	Deer Creek Imported Water			
Water Year	Aerial Recharge of Precipitation	Imported Water	Deer Creek	Agri-cultural Pumping	Municipal Pumping	Precipitation Crops/Native	Agricultural Cons. Use		Ag. Cons Use From Pumping	Municipal (Landscape ET)	Total Out
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

Water Year	Surface Water Outflow (acre ft)										
	Deep Percolation of Applied					Evapotranspiration	Imported Water	Deer Creek Imported Water			
	Aerial Recharge of Precipitation	Imported Water	Deer Creek	Agri-cultural Pumping	Municipal Pumping	Precipitation Crops/Native	Agricultural Cons. Use		Ag. Cons Use From Pumping	Municipal (Landscape ET)	Total Out
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

Water Year	Surface Water Outflow (acre ft)										
	Deep Percolation of Applied					Evapotranspiration	Imported Water Agricultural Cons. Use	Deer Creek Imported Water	Ag. Cons Use From Pumping	Municipal (Landscape ET)	Total Out
	Aerial Recharge of Precipitation	Imported Water	Deer Creek	Agri-cultural Pumping	Municipal Pumping	Precipitation Crops/Native					
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
2017/2018-2069/2070 Avg	0	1,500	300	1,800	200	7,000	5,100	1,000	6,000	100	23,000

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

Table 2-5. Alpaugh GSA Projected Groundwater Budget

	Groundwater Inflows (acre ft)									Groundwater Outflows (acre ft)					
		Imported Water Deliveries	Deer Creek	Agricultural Pumping	Municipal Pumping		Sub-surface Inflow			Groundwater Pumping		Sub-surface Outflow			
Water Year	Areal Recharge from Precipitation	Return Flow	Return Flow	Return Flow	Return Flow	Release of Water from Compression of Aquitards	From Outside Subbasin	From Other GSA	Total In	Municipal	Agricultural	To Outside Subbasin	To Other GSAs	Total Out	Change in Storage (acre ft)
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

	Groundwater Inflows (acre ft)									Groundwater Outflows (acre ft)					
		Imported Water Deliveries	Deer Creek	Agricultural Pumping	Municipal Pumping		Sub-surface Inflow			Groundwater Pumping		Sub-surface Outflow			
Water Year	Areal Recharge from Precipitation	Return Flow	Return Flow	Return Flow	Return Flow	Release of Water from Compression of Aquitards	From Outside Subbasin	From Other GSA	Total In	Municipal	Agricultural	To Outside Subbasin	To Other GSAs	Total Out	Change in Storage (acre ft)
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
Cumulative Change in Storage															0

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

3. Sustainable Management Criteria

3.1 Introduction § 354.22

23 Cal. Code Regs. § 354.22 Introduction to Sustainable Management Criteria. *This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.*

This Section defines the process for determining the sustainable management criteria, specific to Alpaugh GSA, in order to achieve the sustainability goal of the Tule Subbasin outlined in the Coordination Agreement (**Appendix B**). Specifically, this Section includes the characterization and definition of minimum thresholds and measurable objectives with interim milestones for each applicable sustainability indicator.

3.2 Sustainability Goal § 354.24

23 Cal. Code Regs. § 354.24 Sustainability Goal. *Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.*

The Sustainability Goal of the Tule Subbasin is defined in the Coordination Agreement as the absence of significant and unreasonable undesirable results associated with groundwater pumping, accomplished by 2040 and achieved through an integrated program of sustainable groundwater management between the Tule Subbasin GSAs and 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.

3.3 Process for Establishing Sustainable Management Criteria

The Sustainable Management Criteria (SMC) discussed and established in this Section were developed in consultation with Alpaugh GSA's member agencies, local stakeholders, Tule Subbasin GSA counterparts, technical leads, regional partners, interbasin stakeholders, and other interested parties. The process for setting SMC related to undesirable results and measurement methodology is generally consistent among the various GSAs within the Tule Subbasin, while the quantifiable process for setting measurable objectives, interim milestones, and minimum thresholds for Representative Monitoring Sites (RMSs) in each GSA individually was determined by that agency and their consultants to cater to the specific conditions that occur within each GSA.

The general process leading up to the development and establishment of these Sustainable Management Criteria included:

- Regular agenda items, material reviews, and presentations at Alpaugh GSA regular Groundwater Planning Commission Meetings wherein information relevant pertinent to the development of Sustainable Management Criteria was discussed with recommendations provided;
- Holding public outreach landowner meetings within the Alpaugh GSA and throughout the Tule Subbasin outlining the process for Plan development, discussing Sustainable Management Criteria, and providing data and context related to local groundwater-related issues; and
- Reviewing existing hydrologic data, current and historical groundwater information assembled in the *Tule Subbasin Setting* (**Appendix B2**), and future projections prepared by the Tule Subbasin Hydrogeologist utilizing the Tule Subbasin Groundwater Flow Model (GFM) (**Appendix B3**) to provide a summary of historic groundwater conditions and projected future groundwater conditions based upon implementation of the proposed projects and management actions described in **Section 5** of this Plan.

3.4 Undesirable Results § 354.26(a)

23 Cal. Code Regs. § 354.26 Undesirable Results. (a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

Undesirable Results are caused by groundwater conditions occurring throughout a significant and unreasonable portion of 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 within the Coordination Agreement, wherein, if any such significant and unreasonable conditions were to become present, they would constitute an undesirable result within the Agency. The process to identify the conditions that constitute significant and unreasonable conditions in the Tule Subbasin was informed through:

- Research and documentation of the hydrogeological conceptual model of the subbasin (Coordination Agreement, Attachment 1);
- Development of a calibrated numerical groundwater flow model of the subbasin for use in estimating sustainable yield and analyzing the effects of projects and management actions on future groundwater levels and land subsidence (Coordination Agreement, Attachment 3);
- Analysis of potential future groundwater levels, land subsidence, and groundwater quality throughout the subbasin for use in assessing significant and unreasonable groundwater conditions and identifying sustainable management criteria (Coordination Agreement, Attachments 4 and 5).

Based on analysis of the hydrogeological conceptual model, four sustainability indicators were identified with potential to cause significant and unreasonable effects within the Tule Subbasin. These indicators 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.

Two groundwater conditions, the depletion of interconnected surface waters and seawater intrusion, do not apply as sustainability indicators within the Tule Subbasin (defined in the Tule Subbasin Setting; Coordination Agreement, **Attachment 2)** and, therefore, cannot create adverse conditions that are significant and unreasonable and will be evaluated every five years during the five-year review process to confirm no change of the Tule Subbasin conditions.

Based on groundwater level and land subsidence projections from the Tule Subbasin groundwater flow model and analysis of potential impacts of the additional groundwater level decline and land subsidence projected for the transition period from 2020 to 2040 (Attachments 4 and 5), each GSA developed Sustainable Management Criteria for each of the sustainability indicators to avoid undesirable results in consideration of the beneficial uses of groundwater and the beneficial users of these supplies and facilities:

- Municipal and Domestic Supply
- Agricultural Supply
- Industrial Supply
- Critical Infrastructure, including the Friant-Kern Canal (FKC)

The Sustainable Management Criteria identified to avoid undesirable results were vetted through a public process that included multiple stakeholder workshops, meetings, and document review. While the sustainable management criteria are protective of undesirable results for most beneficial uses and users, during the transition period between 2020 and 2040, if impacts occur, a mitigation program has been developed to address these impacts. The Tule Mitigation Plan can be found as Attachment 7 of the Tule Subbasin Coordination Agreement (**Appendix B**).

The definition and description of the undesirable result for each of the four applicable sustainability indicators are described commonly between the GSAs in the Tule Subbasin, included in the Coordination Agreement (**Appendix B**). Note that because the Tule Subbasin is a single hydrologic system where a GSA's operations can affect other GSAs in the Subbasin, the Alpaugh GSA Sustainable Management Criteria were designed to be protective of the overall Tule Subbasin system, and may not be specifically protective of an entity within Alpaugh GSA. For example, if Alpaugh GSA had no physical features within it susceptible to subsidence, relevant Sustainable Management Criteria would still be set within Alpaugh GSA to protect the overall subbasin from subsidence impacts.

3.5 Minimum Thresholds, Interim Milestones, and Measurable Objectives for Sustainability Indicators § 354.28(a); § 354.30(a)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

23 Cal. Code Regs. § 354.30 Measurable Objectives (a)*. Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the*

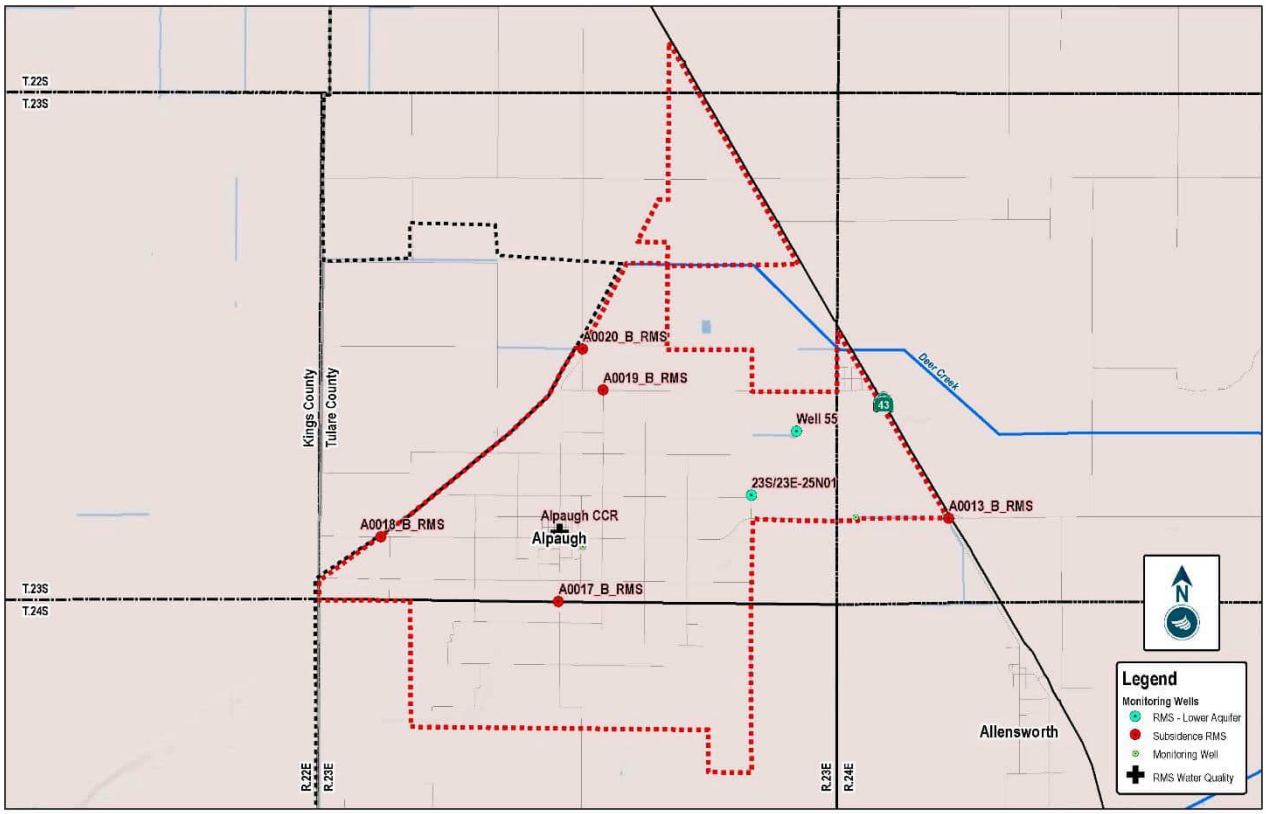
basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.

The Alpaugh GSA has developed the numerical minimum thresholds, interim milestones, and measurable objectives for each of the four sustainability indicators applicable to the Tule Subbasin, including:

- Chronic Lowering of Groundwater Levels
- Reduction of Groundwater Storage
- Degraded Water Quality
- Land Subsidence

Each sustainability indicator is evaluated at the various RMS within Alpaugh GSA, defined in the Tule Subbasin Monitoring Plan, to establish the numerical minimum threshold, interim milestones and measurable to achieve sustainability within 20 years. The locations of the various RMSs for each Sustainability Indicator are identified in **Figure 3-1.** Well 55 was selected as a RMS for Alpaugh GSA for its central geographic location in the GSA, deep aquifer perforated interval, and for its water-level record that begins in 2011.

Figure 3-1. Alpaugh GSA RMS Network Locations Map



In addition, for each sustainability indicator in Alpaugh GSA, the metrics for quantifying the measurable objective and minimum threshold are established, as identified in **Table 3-1. Metrics for Quantifying Sustainability Indicators.**

Table 3-1. Metrics for Quantifying Sustainability Indicators

Sustainability Indicator	Metric for Quantifying
Chronic Lowering of Groundwater Levels	Depth to Groundwater
Reduction in Groundwater Storage	Depth to Groundwater

Sustainability Indicator	Metric for Quantifying
Seawater Intrusion	*Not Applicable to Tule Subbasin*
Degraded Water Quality	Measured Groundwater Quality
Land Subsidence	Measured Land Subsidence
Depletion of Interconnected Surface Waters	*Not Applicable to Tule Subbasin*

3.5.1 Measurable Objectives and Interim Milestones § 354.30(a); § 354.30(c); § 354.30(d); § 354.30(e); § 354.30(f); § 354.30(g)

23 Cal. Code Regs. § 354.30 Measurable Objectives. (b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*

(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*

(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*

(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

(f) *Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.*

(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

Measurable objectives and interim milestones for each sustainability indicator have been defined at each RMS with a quantitative value using a technically-based process. The measurable objectives and interim milestones describe targets and goals for Alpaugh GSA, for achievement of the overall Tule Subbasin sustainability goal over the planning and implementation horizon.

Additionally, operational flexibility was developed between the measurable objective and interim milestones and the minimum threshold to allow for seasonal hydrologic variations and periods of drought to occur to avoid the minimum threshold.

During each year of the plan implementation period, Alpaugh GSA will evaluate the data collected from the monitoring program during each Spring monitoring event and compare to the target values established. Alpaugh GSA will use adaptive management to adjust goals based on the data collected.

Each measurable objective and interim milestone established developed includes the following assumptions:

- The Projects and Management Actions outlined in **Section 5** of this plan are implemented during the initial 20-year GSP implementation period.

- The Projects and Management Actions proposed by the other GSAs within the Tule Subbasin are also implemented during the initial 20-year GSP implementation period.
- Average Hydrology, including Climate Change factors, will occur throughout the Tule Subbasin during the 20 years of GSP implementation.
- Current Baseline Conditions (starting point) for each sustainability indicator will be adjusted to Spring 2020.

The process for establishing the Measurable Objectives and Interim Milestones varies and is described separately for each Sustainability Indicator in the following sections.

3.5.1.1 Chronic Lowering of Groundwater Levels

The interim milestones and measurable objective for each RMS associated with the Chronic Lowering of Groundwater Levels Sustainability Indicator have been quantified using the following available data:

- Historical groundwater elevation data from wells monitored by Alpaugh GSA member agencies, monitored by other local monitoring entities, or otherwise available through CASGEM;
- Projects and Management Actions as proposed by Alpaugh GSA and other Tule Subbasin GSAs incorporated into the Groundwater Flow Model.
- Historical and future projections scenarios of groundwater elevation specific to each RMS well based on output from the Tule Subbasin Groundwater Flow Model; and
- Other relevant information discussed in the Tule Subbasin Setting.

3.5.1.1.1 Process for Determining Measurable Objectives and Interim Milestones

The following four (4) steps detail the process for setting interim milestones and the measurable objective at each RMS well.

Step 1: Locate the RMS defined in the Tule Subbasin Monitoring Plan, identify which portion of the aquifer it represents, and prepare a hydrograph using available historical groundwater elevation data.

Step 2: Plot RMS well historical and forecast groundwater elevations from the "safe yield" Groundwater Flow Model scenario with the measured groundwater elevation data from Step 1.

Step 3: Adjust the GFM projected groundwater elevations at the RMS well to the corresponding representative measured groundwater elevation. Each RMS site will further be adjusted to the groundwater elevation measured during February 2020 to establish the starting baseline conditions.

Step 4: Use the adjusted GFM projected groundwater elevations for the period 2020 to 2040 to quantify the interim milestones and measurable objective value in 2040.

3.5.1.1.2 Quantifiable Measurable Objectives and Interim Milestones

Using the process described, a hydrograph was established at each RMS well location (**Appendix B4;** also **Exhibit 3-1** at the end of this section), and from the hydrograph, the quantifiable interim milestones and measurable objectives were established, summarized in **Table 3-2.** Chronic Lowering of Groundwater Levels Interim Milestones and Measurable Objective by RMS Well

Table 3-2. Chronic Lowering of Groundwater Levels Interim Milestones and Measurable Objective by RMS Well

RMS ID	Agency Management Area	Aquifer	Interim Milestone GWE (ft amsl) 2025	2030	2035	Measurable Objective GWE (ft amsl) 2040
23S/23E-	Alpaugh ID Service	Lower	-90	-65	-35	-5
Well 55	Alpaugh ID Service	Lower	-109	-103	-98	-92

3.5.1.2 Reduction of Groundwater Storage

The interim milestones and measurable objective for the Reduction of Groundwater Storage Sustainability Indicator have been quantified using the following available data:

- The same RMS wells as identified for the Chronic Lowering of Groundwater Levels, along with the interim milestones and measure objective values as a proxy data point to calculate groundwater storage; and
- Other relevant information discussed in the Tule Subbasin Setting.

3.5.1.2.1 Process for Determining Measurable Objectives and Interim Milestones

The process to determine the total numerical volume of groundwater storage for Alpaugh GSA is calculated using the Groundwater Flow Model which incorporates the numerical interim milestones and measurable objective groundwater elevation values established at each RMS well. From this groundwater elevation data, along with applying the soil characteristics described in the Tule Subbasin Setting, the groundwater storage is calculated.

3.5.1.2.2 Quantified Measurable Objectives and Interim Milestones

The interim milestones and measurable objective for groundwater storage for the GSA are summarized in Table 3-3. Reduction of Groundwater Storage Interim Milestones and Measurable Objectives.

Table 3-3. Reduction of Groundwater Storage Interim Milestones and Measurable Objectives

Interim Milestone[2] GW Storage Volume (million ac-ft) 2025	2030	2035	Measurable Objective2 GW Storage Volume (million ac-ft) 2040
8.90	8.83	8.76	8.70

3.5.1.3 Groundwater Quality

The interim milestones and measurable objective for the Groundwater Quality Sustainability Indicator have been quantified using the following available data:

[2] Numeric Values to be updated based on initial 2020 monitoring results. Values shown are most current values available

- Utilizing historical groundwater quality data from the existing RMS wells which are monitored under separate groundwater quality regulatory programs, such as those wells monitored under the California Regional Water Quality Control Board Irrigated Lands Regulatory Program, CV-Salts Nitrate Control Program, and those associated with Public Water Systems; and
- Other relevant information discussed in the Tule Subbasin Setting.

3.5.1.3.1 Process for Determining Measurable Objectives and Interim Milestones

The following three (3) steps detail the process for setting interim milestones and the measurable objective at individual RMS related to Groundwater Quality:

Step 1:

Locate the RMS defined in the Tule Subbasin Monitoring Plan, identify which portion of the aquifer it represents, and the associated Constituents of Concern (COC) to be monitored at the RMS based on beneficial uses and users of groundwater represented by the RMS well (Agricultural, Drinking Water) as described below:

Drinking Water: If an RMS well is located within an urban area, within one mile of a public water system, which includes schools, or the dominant beneficial use (greater than 50% of the wells within the determined area) is drinking water, then the minimum threshold would be set at the MCL for drinking water.

Agricultural: If the majority of the beneficial use (greater than 50% the wells within a determined area) is agricultural and there are no public water systems (including schools) the minimum threshold would be several agricultural water quality constituents.

In cases where both of the above criteria are found to be true, the minimum thresholds would be established for both drinking water MCLs and agricultural WQO's and minimum thresholds would be set at the most stringent of the two when considering common constituents.

If drinking water MCLs or agricultural WQOs were historically exceeded at an RMS well or found not be a result of implementation of a GSP, the GSA will coordinate with the responsible regulatory agency to prevent GSA SGMA activities from further degrading groundwater quality.

Agricultural or drinking water constituents of concerns will be evaluated based on the established Maximum Contaminant Level (MCL) or Water Quality Objectives (WQO) by the responsible regulatory agency. In the case of drinking water, the following title 22 constituents will be monitored and for agricultural the following Basin Plan Water Quality Objective (WQO) COCs as identified in **Table 3-4.** Constituents of Concern by Beneficial Uses and Users

Table 3-4. Constituents of Concern by Beneficial Uses and Users

Drinking Water	Agricultural
Arsenic	Nitrogen as N
Nitrate as N	*Chloride*
Hexavalent Chromium	Sodium
Dibromochloropropane (DBCP)	Total Dissolved Solids
1,2,3-Trichloropropane (TCP)	Perchlorate
Tetrachloroethene (PCE)	
Chloride	
Total Dissolved Solids	
Perchlorate	

Step 2:

Establish measurable objectives and interim milestones at each groundwater quality RMS well based on 75% of the regulatory limits set as part of the responsible regulatory programs that are applicable to the identified beneficial uses and users of groundwater represented by the RMS well as shown in **Table 3-5.** Interim Milestones & Measurable Objectives for Groundwater Quality.

Table 3-5. Interim Milestones & Measurable Objectives for Groundwater Quality

			Interim Milestone & Measurable Objective	
Constituent	Units	California or Federal MCL/SMCL	75% Drinking Water Limits (MCL/SMCL)	75% Agricultural Water Quality Objective (WQOs)
Arsenic	ppb	10	7.5	N/A
Nitrate as N	ppm	10	7.5	N/A
Hexavalent Chromium	ppb	10	7.5	N/A
Dibromochloropropane (DBCP)	ppb	0.2	0.15	N/A
1,2,3-Trichloropropane (TCP)	ppt	5	3.75	N/A
Tetrachloroethene (PCE)	ppb	5	3.75	N/A
Chloride	ppm	250	187.5	79.5
Sodium	ppm		N/A	51.75
Total Dissolved Solids	ppm	500	375	337.5
Perchlorate	ppb	6	4.5	N/A

Step 3:

Evaluate historical groundwater quality data for instances where SMCs established at RMS wells have been historically exceeded not as a result of implementation of a GSP. In those instances, SMCs will not be set at the MCLs or WQOs, but rather the pre-SGMA implementation concentration. These RMS wells will be closely monitored to evaluate if further degradation is occurring at the RMS site as a result of GSP implementation into the future (i.e. time series groundwater concentration trends over time will be evaluated to determine if GSP implementation is resulting in increasing concentrations).

Under the terms of the cooperative agreements with the PUD/CSDs, those agencies have an ongoing opportunity propose minimum thresholds for additional constituents and determine whether additional changes to the monitoring network should be made to address water quality issues. The GSA will consider such proposals when made.

In addition, the GSA will seek to collect data from the public water systems as part of monitoring efforts. The collected data will reflect what these public water systems report to existing regulatory agencies to determine if existing regulatory requirements are being met and to determine if specific management actions would be warranted by the GSA under its authority to manage groundwater. The GSA will be monitoring and coordinating these items to determine if groundwater pumping activities are contributing to undesirable effects related to degraded water quality.

For Municipal management areas water quality data gathered from Consumer Confidence Reports will be utilized rather than quality reading taken from individual wells.

(Note that Point Source/Non-Point Source Discharges unrelated to groundwater recharge are not monitored under this Plan or regulated by Alpaugh GSA).

3.5.1.3.2 Quantified Measurable Objectives and Interim Milestones

The interim milestones and measurable objective for groundwater quality for each RMS well are summarized in **Table 3-6.** Groundwater Quality Interim Milestones and Measurable Objectives

Table 3-6. Groundwater Quality Interim Milestones and Measurable Objectives

			COC Measurable Objective									
RMS ID	Well Design.	Aquifer	Arsenic (ppb)	Nitrate as N (ppm)	Hexavalent Chromium (ppb)	DBCP (ppb)	TCP (ppt)	PCE (ppm)	Chloride (ppm)	Sodium (ppm)	TDS (ppm)	Perchlorate (ppb)
Alpaugh CSD CCR	Drinking	UNK	7.5	7.5	7.5	0.15	3.75	3.75	187.5	N/A	375	4.5

3.5.1.4 Land Subsidence

The interim milestones and measurable objective for each RMS associated with the Land Subsidence Sustainability Indicator have been quantified using the following available data:

- Historical land subsidence data from United States Geological Survey (USGS) extensometer, National Aeronautics and Space Administration (NASA) Interferometric Synthetic Aperture Radar (InSAR) Jet Propulsion laboratory, and GPS Stations
- Projects and Management Actions as proposed by Alpaugh GSA and other Tule Subbasin GSAs incorporated into the Groundwater Flow Model
- Historical and future projections scenarios of land subsidence specific to each RMS well based on output from the Tule Subbasin Groundwater Flow Model
- Evaluation of critical infrastructure including the FKC and, DEID pipelines (**Appendix B6** in this GSP).; and
- Other relevant information discussed in the Tule Subbasin Setting

3.5.1.4.1 Process for Determining Measurable Objectives and Interim Milestones

The following four (4) steps detail the process for setting interim milestones and the measurable objective at individual RMS.

Step 1: Locate the RMS defined in the Tule Subbasin Monitoring Plan, identify which portion of the aquifer it represents, and prepare a chart using available historical land subsidence data interpolated to RMS location.

Step 2: Incorporate into the RMS chart the projected depth of land subsidence from the Groundwater Flow Model.

Step 3: Adjust depth of land subsidence to each RMS site based on the ground surface elevation measured during Fall 2019 to establish the starting baseline ground surface conditions.

Step 4: Utilize the adjusted GFM estimated depth of land subsidence for the period 2020 to 2040 to quantify numerically the interim milestones and the measurable objective value in 2040.

3.5.1.4.2 Quantifiable Measurable Objectives and Interim Milestones

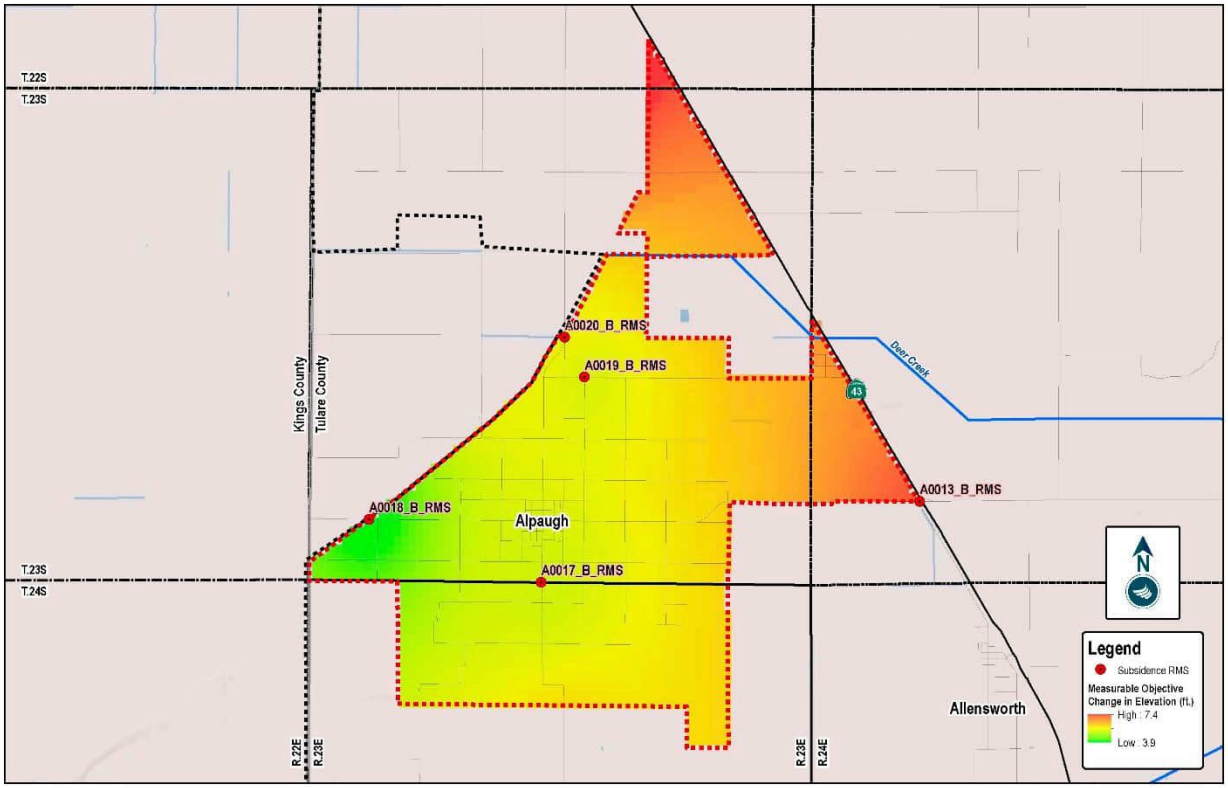
Using the process described, a chart was established at each RMS location (**Appendix B6**; also **Exhibit 3-3** at the end of this section), and from the chart, the quantifiable interim milestones and measurable objectives were established, summarized in **Table 3-7.** Land Subsidence Interim Milestones and Measurable Objective by RMS Location.

Table 3-7. Land Subsidence Interim Milestones and Measurable Objective by RMS Location

	Ground Surface Elevation (ft amsl)				
RMS Benchmark ID	2020	2025 IM	2030 IM	2035 IM	Measurable Objective
A0013_B_RMS	196.814	194.13	191.72	190.41	189.64
A0017_B_RMS	204.396	202.73	201.24	200.04	199.11
A0018_B_RMS	196.141	195.41	194.32	193.14	192.2
A0019_B_RMS	192.326	190.44	188.83	187.62	186.92
A0020_B_RMS	195.065	193.12	191.43	190.18	189.46

Additionally, using the Groundwater Flow Model, a map of the GSA identifying the potential land subsidence that would occur using the measurable objective values is shown in **Figure 3-2.**

Figure 3-2. Land Subsidence Map at Measurable Objectives



In response to concern about subsidence-related damage specifically to the Friant-Kern Canal ("FKC"), it has been suggested that monitoring sites and higher sensitivity Minimum Thresholds should be established for areas in close proximity to the FKC. In concept, the development of a defined FKC subsidence management area within the Tule Subbasin, with specific minimum thresholds and management actions for that management area, may be appropriate for some portions of the GSA. However, this is an action that the GSA Board, as well as the governing boards of other GSAs within the Tule Subbasin, will consider in the future as regionalized subsidence impacts are better understood through future monitoring and analysis

3.5.2 Minimum Thresholds § 354.28(b)(1); § 354.28(b)(6)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Minimum thresholds are quantified for the applicable sustainability indicators at individual representative monitoring sites within Alpaugh GSA, such that, if the numeric value used to define a minimum threshold

at a particular RMS is exceeded, on its own or in combination with other RMS within Alpaugh GSA, may lead to an undesirable result (Undesirable Results are defined using Minimum Thresholds in Tule Subbasin Coordination Agreement). When a minimum threshold is exceeded, Alpaugh GSA will evaluate the management actions and projects described in **Section 5: Projects and Management Actions**, that are intended to prevent the exceedance of an undesirable result from occurring.

During each year of the plan implementation period, Alpaugh GSA will evaluate the data collected from the monitoring program during each monitoring event and compare to the minimum thresholds established. Alpaugh GSA will use adaptive management to adjust thresholds based on the data collected.

Each minimum threshold established developed includes the following assumptions:

- The Projects and Management Actions outlined in **Section 5** of this plan are implemented during the initial 20-year GSP implementation period.
- The Projects and Management Actions proposed by the other GSAs within the Tule Subbasin are also implemented during the initial 20-year GSP implementation period.
- A significant drought (similar to most recent 10-year drought period 2007-2016), would occur during plan implementation period.
- Current Baseline Conditions (starting point) for each sustainability indicator will be adjusted to Spring 2020.

The measurement for each Minimum Threshold varies depending on the RMS and is described within the Tule Subbasin Monitoring Plan.

The process for establishing the Minimum Threshold varies and is described separately for each Sustainability Indicator in the following sections.

3.5.2.1 Chronic Lowering of Groundwater Levels § 354.28(c)(1)(A)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(1) *Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:*

> ***(A)*** *The rate of groundwater elevation decline based on historical trend, water year type, and projected water use in the basin.*

The minimum threshold for each RMS associated with the Chronic Lowering of Groundwater Levels Sustainability Indicator have been quantified using the same data set described in **Section 3.5.1.1** of this GSP above.

3.5.2.1.1 Process for Determining Minimum Threshold

The following four (4) steps detail the process for setting the minimum threshold at each RMS well.

Step 1: Utilize the Hydrograph created for each RMS well based on process for establishing the interim milestones and measurable objective which assumes average hydrology.

Step 2: Calculate the change in groundwater elevation during the most recent 10-year drought period (2007-2016) from historical groundwater data at the RMS well.

Step 3: Deduct the calculated change in groundwater elevation during drought conditions from the lowest projected interim milestone during the initial 10-year plan implementation period (2020 - 2030).

Step 4: Establish the minimum threshold for groundwater elevation for the entire plan implementation period as a single value below the interim milestones and measurable objective. The difference between the interim milestones and measurable objective is the operational flexibility established at each RMS well.

Based on the best available data collected to date and groundwater model analysis (Tule Subbasin Setting Section 4.3.1.2), Alpaugh GSA established groundwater level minimum thresholds designed to reasonably protect access to groundwater for the majority of beneficial users in the Tule Subbasin, including those within Alpaugh GSA. For those uses such as shallow domestic well owners where impacts to groundwater access may occur, the Tule Subbasin GSAs have adopted Framework for a Mitigation Program (Coordination Agreement Attachment 7, Tule Subbasin Setting).

3.5.2.1.2 Quantifiable Minimum Threshold

Using the process described, a minimum threshold was added to each RMS well hydrograph (**Appendix B4; Exhibit 3-1**), and from the hydrograph, the quantifiable minimum threshold was determined as summarized in Table 3-8. Chronic Lowering of Groundwater Levels Minimum Threshold by RMS Well.

Table 3-8. Chronic Lowering of Groundwater Levels Minimum Threshold by RMS Well

RMS ID	Management Area	Aquifer	Minimum Threshold GWE (ft amsl)
23S/23E-25N01	Alpaugh ID Service Area	Lower	-110
Well 55	Alpaugh ID Service Area	Lower	-209

3.5.2.2 Reduction of Groundwater Storage § 354.28(c)(2)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(2) *Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that my lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.*

The minimum threshold for each RMS associated with the Reduction of Groundwater Storage Sustainability Indicator have been quantified using the same data set described in **Section 3.5.1.2** of this GSP above.

3.5.2.2.1 Process for Determining Minimum Thresholds

The process to determine the minimum threshold volume of groundwater storage for Alpaugh GSA is calculated using the Groundwater Flow Model which incorporates the minimum threshold groundwater elevation values established at each RMS well.

3.5.2.2.2 Quantified Minimum Thresholds

The minimum threshold for groundwater storage within the GSA is summarized in **Table 3-9.** Reduction of Groundwater Storage Minimum Thresholds

Table 3-9. Reduction of Groundwater Storage Minimum Thresholds

Minimum Threshold3
GW Storage Volume (million ac-ft)
8.60

3.5.2.3 Degraded Groundwater Quality § 354.28(c)(4)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(4) *Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.*

The minimum threshold for each RMS associated with the Groundwater Quality Sustainability Indicator have been quantified using the same data set described in **Section 3.5.1.3** of this GSP. Maps of water quality are presented in **Appendix B5** and as **Exhibit 3-2** of this section.

3.5.2.3.1 Process for Determining Minimum Threshold

The following three (3) steps detail the process for setting minimum threshold values at individual RMS wells related to Groundwater Quality:

Step 1:

Locate the RMS defined in the Tule Subbasin Monitoring Plan (**Appendix B1**), identify which portion of the aquifer it represents, and the associated Constituents of Concern (COC) to be monitored at the RMS based on beneficial uses and users of groundwater represented by the RMS well (Agricultural, Drinking Water) as described below:

Drinking Water: The RMS well is within an urban MA or 1-mile of a public water system**.**

Agricultural: Greater than 50% of the pumping within the representative area is determined to be agricultural and there are no public water systems within a 1-mile radius.

Agricultural or drinking water constituents of concerns will be evaluated based on the established Maximum Contaminant Level (MCL) or Water Quality Objectives (WQO) by the responsible regulatory agency. In the case of drinking water, the following Title 22 constituents will be monitored and for agricultural the following Basin Plan Water Quality Objective (WQO) COC as previously identified in Error! Reference source not found.

Establish minimum thresholds at each groundwater quality RMS well based on the regulatory limits set as part of the responsible regulatory programs that are applicable to the identified beneficial uses and users

[3] Numeric Values to be updated based on initial 2020 monitoring results. Values shown are most current values available

of groundwater represented by the RMS well as shown in **Table 3-4.** Constituents of Concern by Beneficial Uses and Users

Table 3-10. Minimum Thresholds for Groundwater Quality

Constituent	Units	Minimum Thresholds	
		Drinking Water Limits (MCL/SMCL)	Agricultural Water Quality Objective (WQOs)
Arsenic	ppb	10	N/A
Nitrate as N	ppm	10	N/A
Hexavalent Chromium	ppb	10	N/A
Dibromochloropropane (DBCP)	ppb	0.20	N/A
1,2,3-Trichloropropane (TCP)	ppt	5	N/A
Tetrachloroethene (PCE)	ppb	5	N/A
Chloride	ppm	500	106
Sodium	ppm	N/A	69
Total Dissolved Solids	ppm	1,000	450
Perchlorate	ppb	6	N/A

Step 3:

Evaluate historical groundwater quality data for instances where SMCs established at RMS wells have been historically exceeded not as a result of implementation of a GSP. In those instances, SMCs will not be set at the MCLs or WQOs, but rather the pre-SGMA implementation concentration. These RMS wells closely monitored to evaluate if further degradation is occurring at the RMS site as a result of GSP implementation into the future

(Note that Point Source/Non-Point Source Discharges unrelated to groundwater recharge are not monitored under this GSP or regulated by the Agency and may trigger a minimum threshold).

3.5.2.3.2 Quantified Minimum Thresholds

The minimum thresholds for groundwater quality are summarized in **Table 3-11.** Groundwater Quality Minimum Thresholds

Table 3-11. Groundwater Quality Minimum Thresholds

			COC Measurable Objective									
RMS ID	Well Design.	Aquifer	Arsenic (ppb)	Nitrate as N (ppm)	Hexavalent Chromium (ppb)	DBCP (ppb)	TCP (ppt)	PCE (ppm)	Chloride (ppm)	TDS (ppm)	Sodium (ppm)	Perchlorate (ppb)
Alpaugh CSD CCR	Drinking	UNK	10	10	10	0.2	5	5	500	N/A	1000	6

3.5.2.4 Land Subsidence § 354.28(c)(5)(A); § 354.28(c)(5)(B)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(5) *Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:*

> ***(A)*** *Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.*
>
> ***(B)*** *Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.*

The minimum threshold for each RMS associated with the Groundwater Quality Sustainability Indicator have been quantified using the same data set described in **Section 3.5.1.4** of this GSP. The beneficial users for this sustainability indicator are identified in the Coordination Agreement, Attachment 6.

3.5.2.4.1 Process for Determining Minimum Threshold

The following four (4) steps detail the process for setting minimum threshold at each RMS.

Step 1: Utilize the Chart created for each RMS location based on process for establishing the interim milestones and measurable objective which assumes average hydrology.

Step 2: Extract the projected land subsidence (from 2020- to 2040) from the GFM "transitional pumping" scenario.

Step 3: Subtract the maximum forecasted land subsidence from the baseline 2020 ground surface elevation (**Appendix B6**) at each RMS location to quantify the minimum threshold.

Step 4: Compare the minimum threshold value to estimates of tolerable subsidence for surface land uses and critical infrastructure such as the FKC and DEID pipelines (Coordination Agreement, Attachment 6). If necessary, adjust interim milestones and measurable objective values to avoid undesirable results or provide appropriate mitigation.

Note that land subsidence evaluation includes legacy related subsidence.

3.5.2.4.2 Quantifiable Minimum Thresholds

Using the process described, a graph was established at each RMS location (**Appendix B6; Exhibit 3-3**), and from the graph, the quantifiable minimum thresholds were established, summarized in **Table 3-12.** Land Subsidence Minimum Thresholds by RMS Location**.**

Table 3-12. Land Subsidence Minimum Thresholds by RMS Location

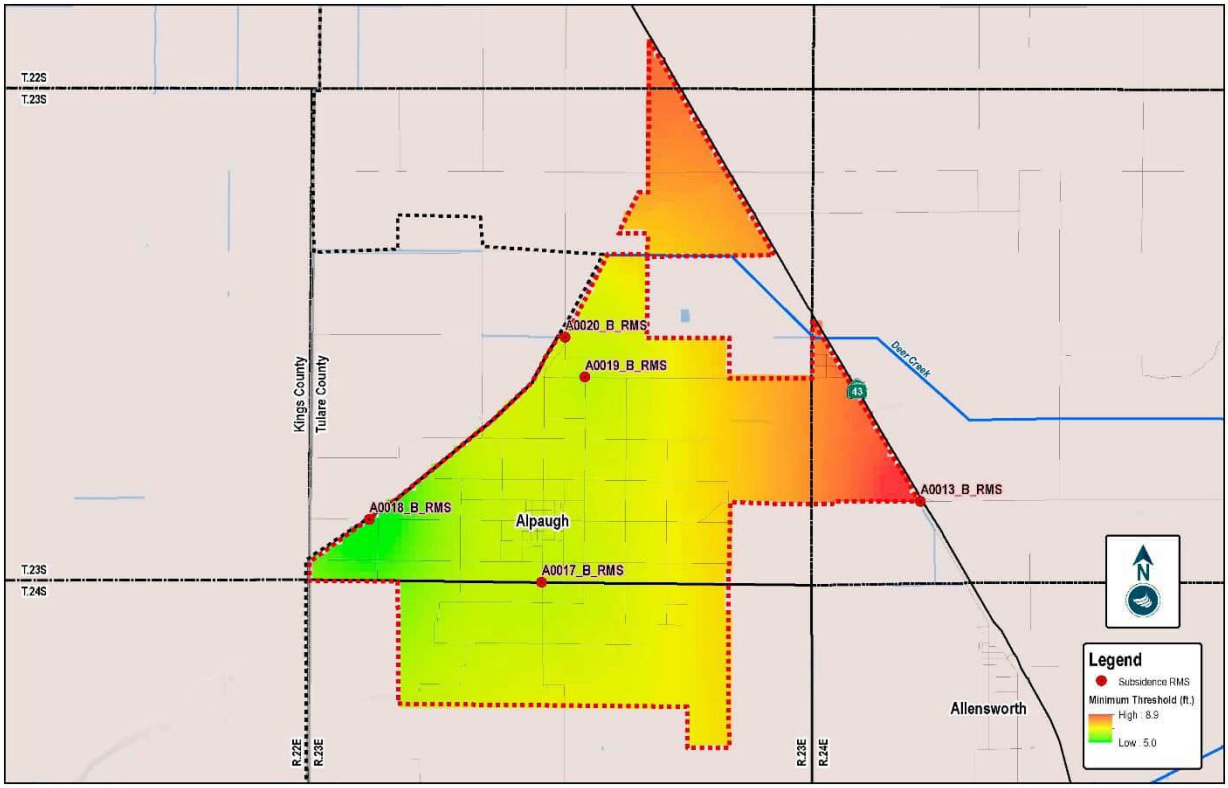
	Ground Surface Elevation (ft amsl)	
RMS Benchmark ID	2020 Measured	Minimum Threshold
A0013_B_RMS	196.814	187.88
A0017_B_RMS	204.396	198.00

RMS Benchmark ID	Ground Surface Elevation (ft amsl)	
	2020 Measured	Minimum Threshold
A0018_B_RMS	196.141	191.15
A0019_B_RMS	192.326	185.92
A0020_B_RMS	195.065	188.46

The minimum thresholds at these RMS represent conditions that, if exceeded, could generate significant and unreasonable undesirable results associated with impacts to gravity driven water conveyance.

Additionally, using the Groundwater Flow Model, a map of Alpaugh GSA identifying the potential land subsidence that would occur using the minimum threshold values is shown in **Figure 3-3**.

Figure 3-3. Land Subsidence Map at Minimum Thresholds



3.5.2.5 Minimum Threshold Potential Effects

The following sections describe the potential effects the minimum thresholds might have to other sustainability indicators, other GSAs, other subbasins, the beneficial users within Alpaugh GSA, and government agency standards.

3.5.2.5.1 Minimum Threshold Relationship Between Sustainability Indicators § 354.28(b)(2)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (b) *The description of minimum thresholds shall include the following:*

(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

Although each of the sustainability indicators were evaluated independently with different measurement methodologies, the overall Groundwater Flow Model prepared includes the projects and project management actions which establish a common basis. Groundwater elevations generally also affect each of the sustainability indicators, and the groundwater elevations established at the various RMS wells helped establish the numerical values for the other sustainability indicators.

During the plan implementation period, Alpaugh GSA plans to adaptively manage based on the data collected from the monitoring program. If one set of data for one sustainability indicator can be correlated to contributing to a minimum threshold of another sustainability indicator, projects or management actions will be revised to prevent further issues.

3.5.2.5.2 Effects on Adjacent Basins § 354.28(b)(3)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (b) *The description of minimum thresholds shall include the following:*

(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

Alpaugh GSA is a party to the Tule Subbasin Coordination Agreement, to coordinate minimum thresholds and measurable objectives within the Subbasin. The minimum thresholds for the applicable sustainability indicators in the Tule Subbasin were established based on the proposed projects and management actions for achieving the subbasin sustainability goal by 2040. As a result, groundwater flow is expected to return to the natural groundwater gradient, northeast to southwest, leading to reduced subbasin groundwater inflow from adjacent basins. As groundwater elevations are stabilized to natural conditions during the GSP Implementation period, adjacent basins should not be affected by Alpaugh GSA. As data is collected during the GSP implementation period, the Tule Subbasin GSAs, including Alpaugh GSA will adapt and amend projects and management actions to achieve the sustainability goal.

3.5.2.5.3 Effects on Beneficial Uses § 354.28(b)(4)

23 Cal. Code Regs. § 354.28 Minimum Thresholds. (b) *The description of minimum thresholds shall include the following:*

(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

Based on groundwater level and land subsidence projections from the Tule Subbasin groundwater flow model and analysis of potential impacts of the additional groundwater level decline and land subsidence projected for the transition period from 2020 to 2040 (Attachments 4 and 6, Tule Subbasin Setting), Alpaugh GSA developed Sustainable Management Criteria for each of the sustainability indicators to avoid undesirable results in consideration of the beneficial uses of groundwater and the beneficial users of these supplies and facilities:

- Municipal and Domestic Supply
- Agricultural Supply

- Industrial Supply
- Critical Infrastructure, including the Friant-Kern Canal (FKC)

The Sustainable Management Criteria identified to avoid undesirable results were vetted through a public process that included multiple stakeholder workshops, meetings, and document review. While the sustainable management criteria are protective of undesirable results for most beneficial uses and users, during the transition period between 2020 and 2040, the Tule Subbasin GSAs will adopt a Mitigation Program or Programs consistent with the Framework attached hereto as Attachment 7 of the Tule Subbasin Setting.

3.5.2.5.4 Existing Standards § 354.28(b)(5)

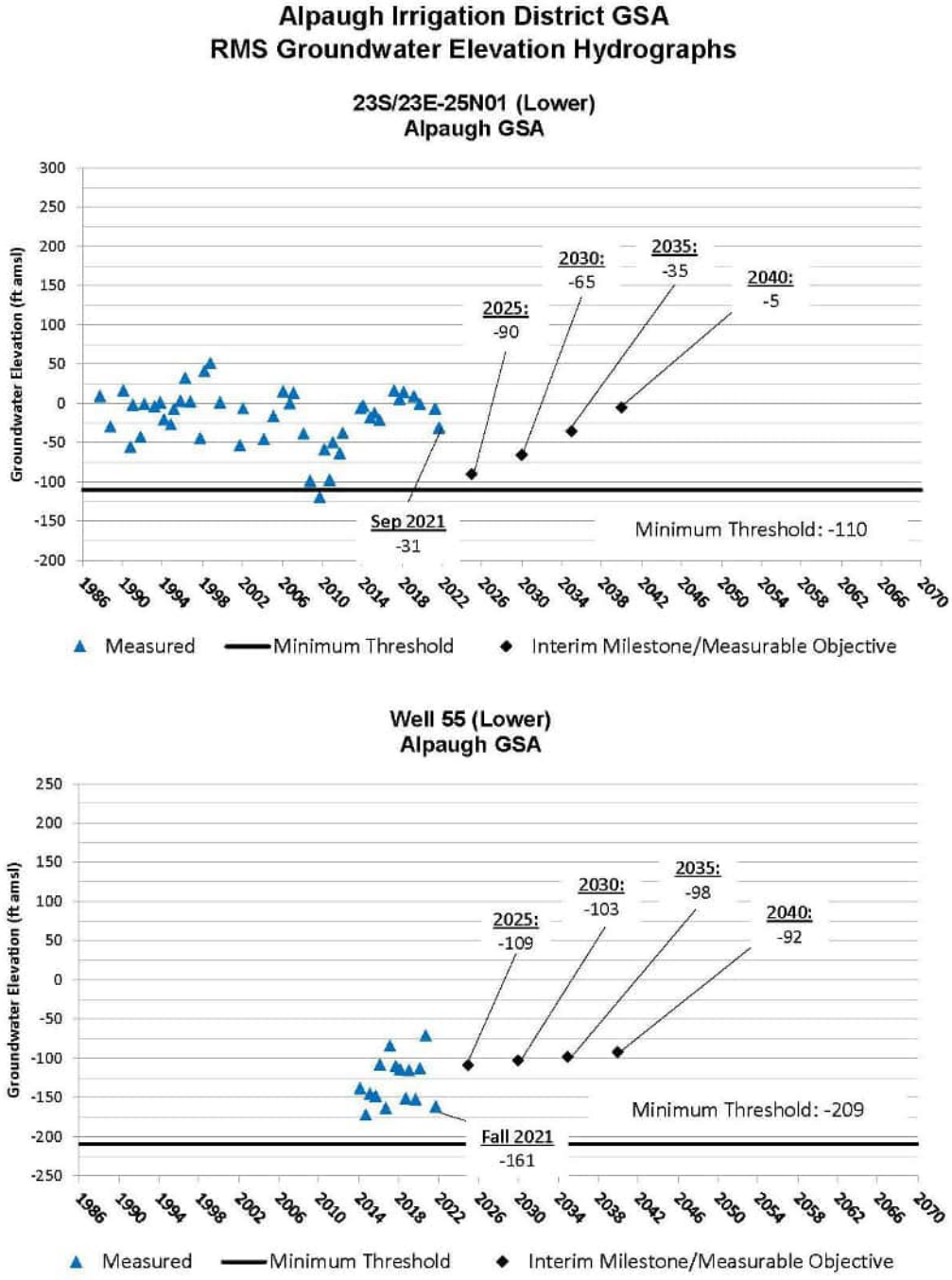
23 Cal. Code Regs. § 354.28 Minimum Thresholds. (b) *The description of minimum thresholds shall include the following:*

(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

Federal, state or local standards were used to establish the minimum thresholds for degradation of groundwater quality.

3.6 Exhibits

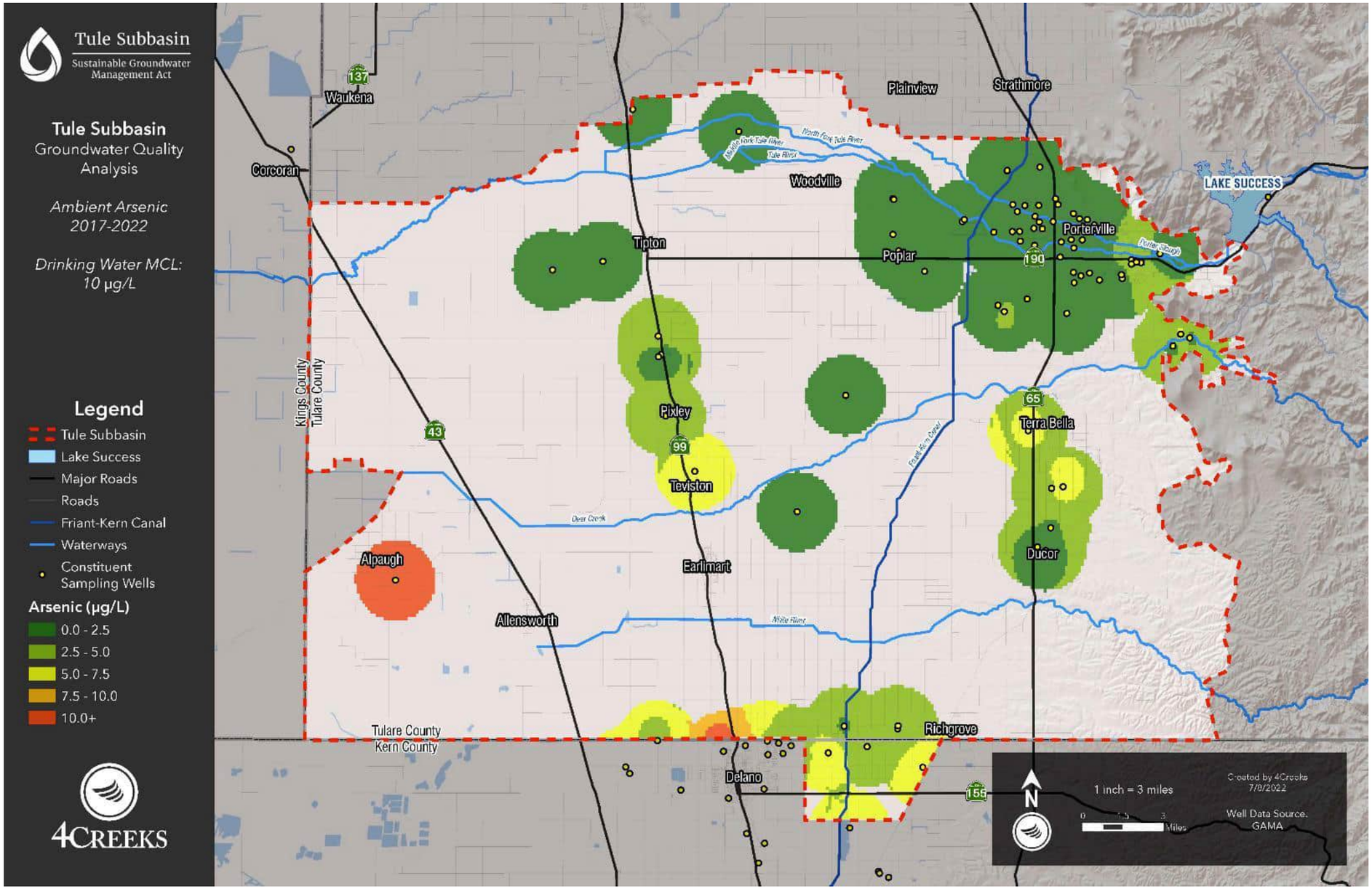
Exhibit 3-1. RMS Groundwater Level Hydrographs

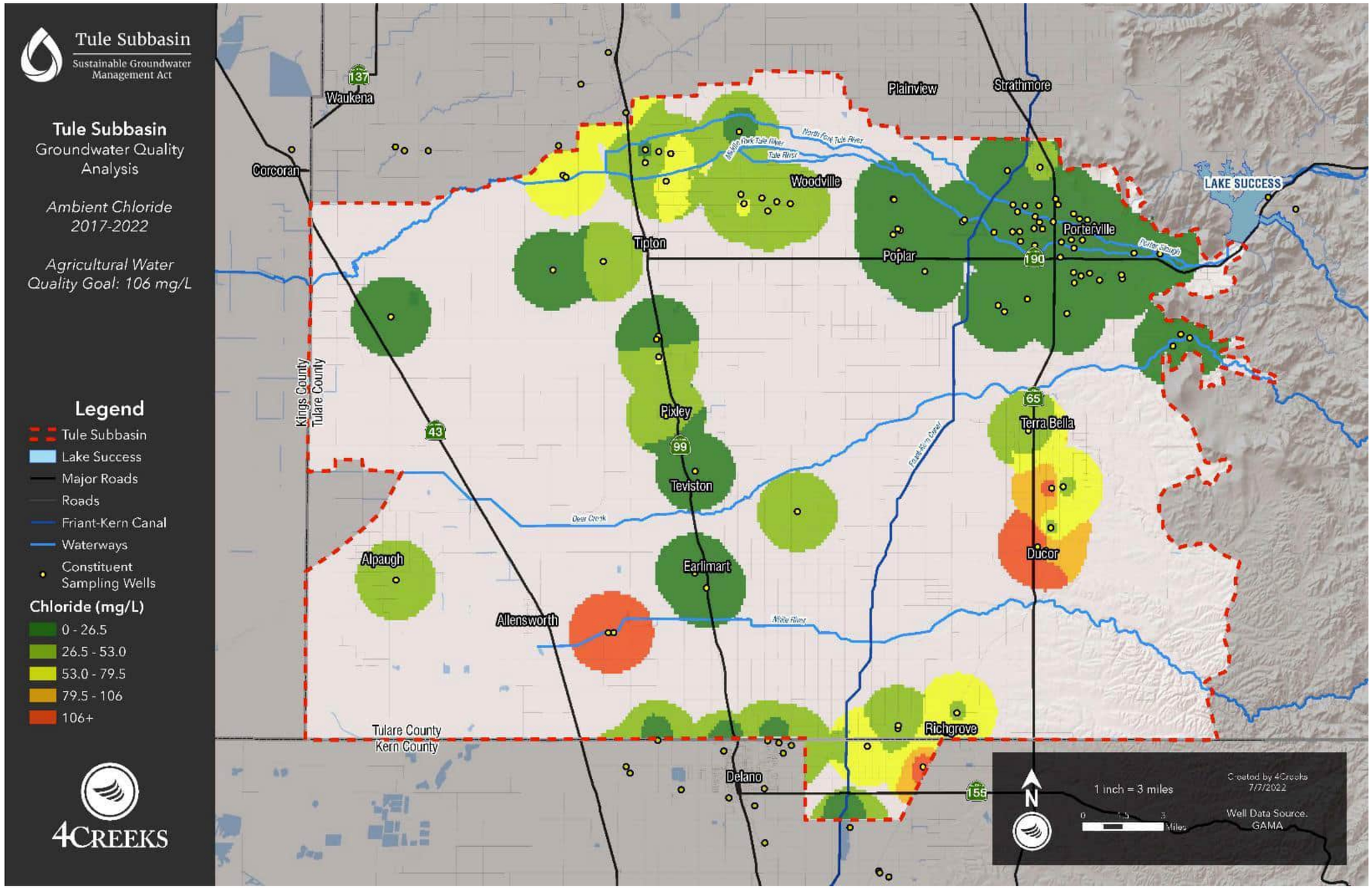


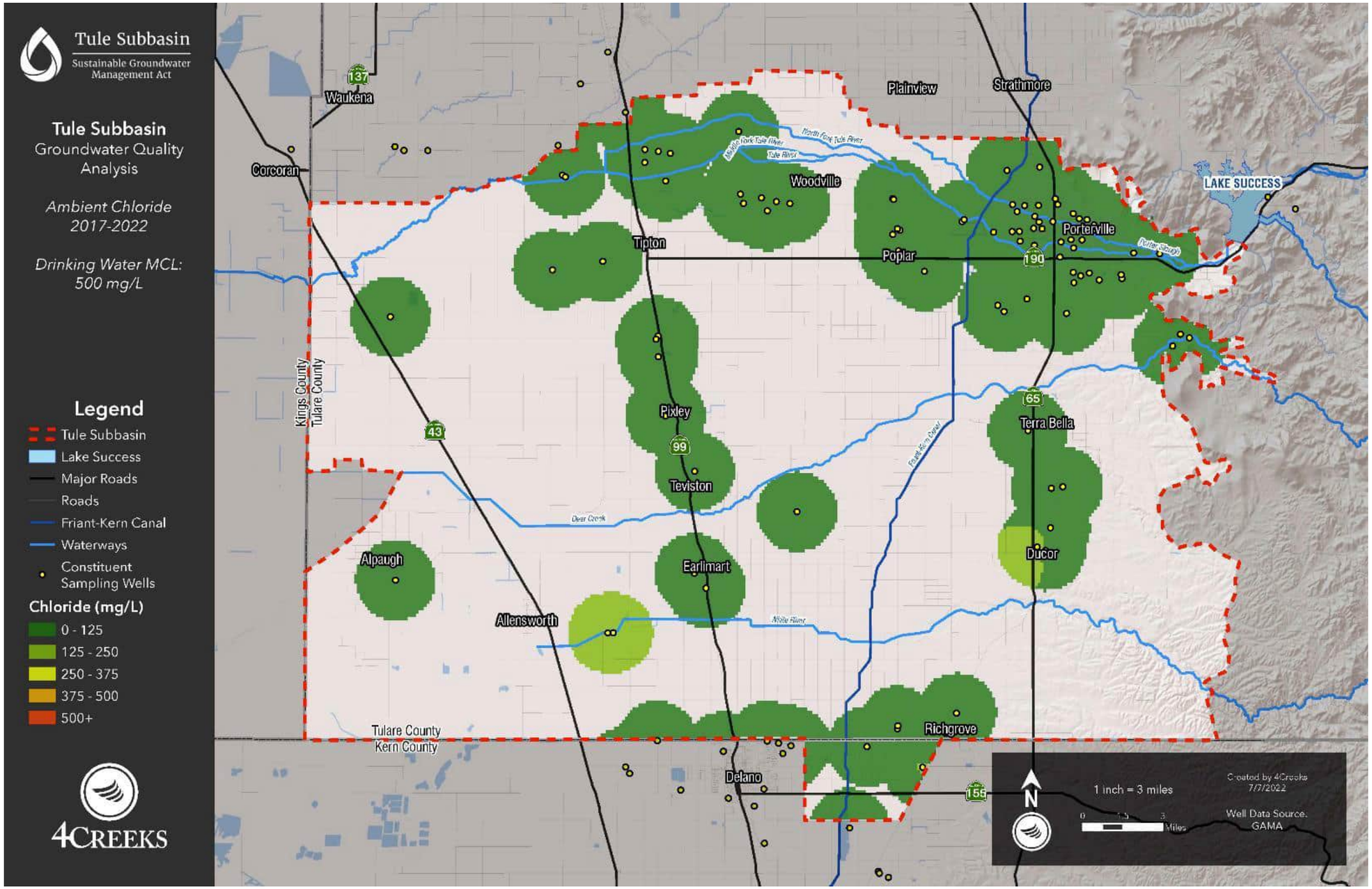
Thomas Harder & Co. Groundwater Consulting

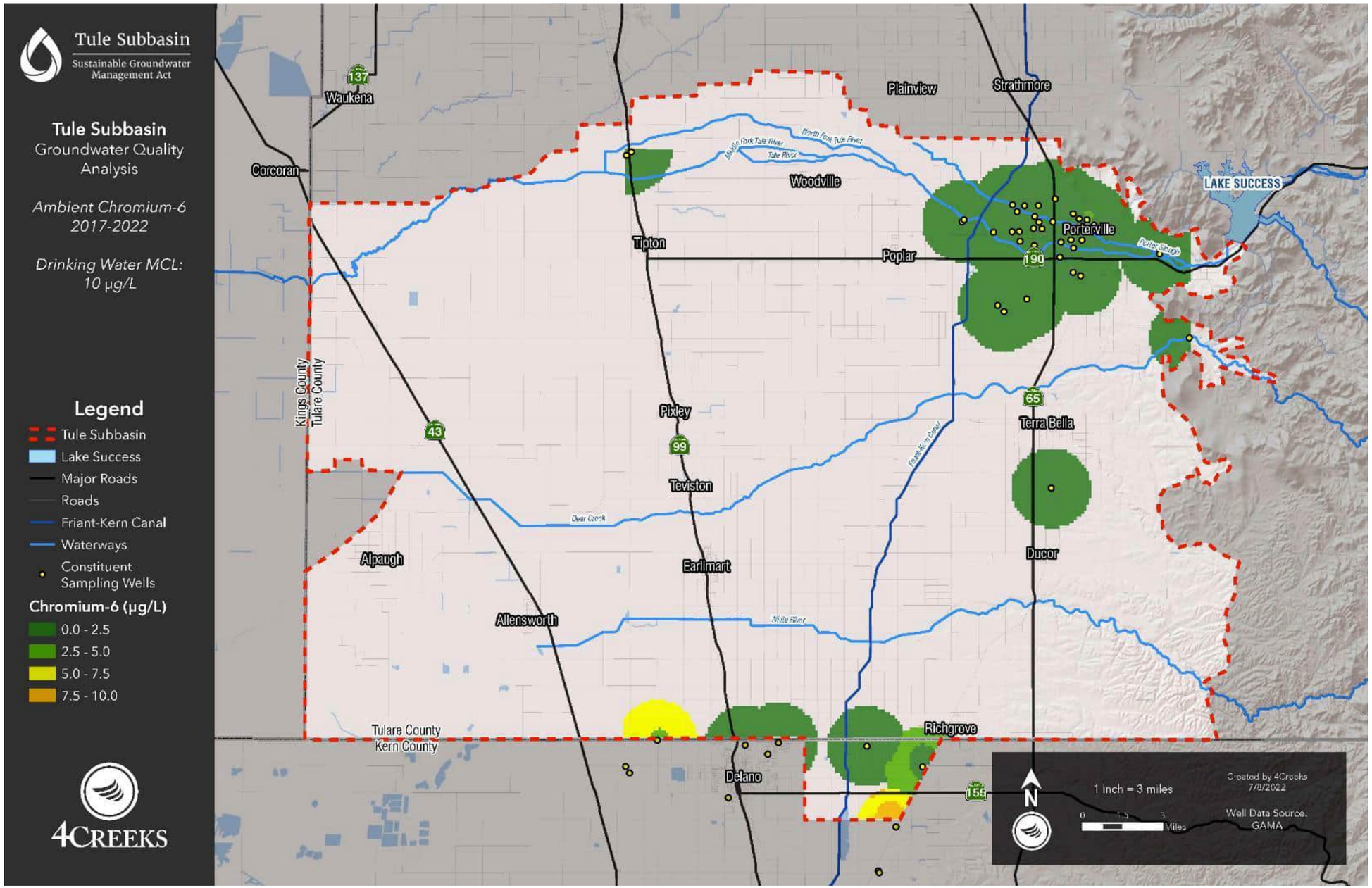
July 2022

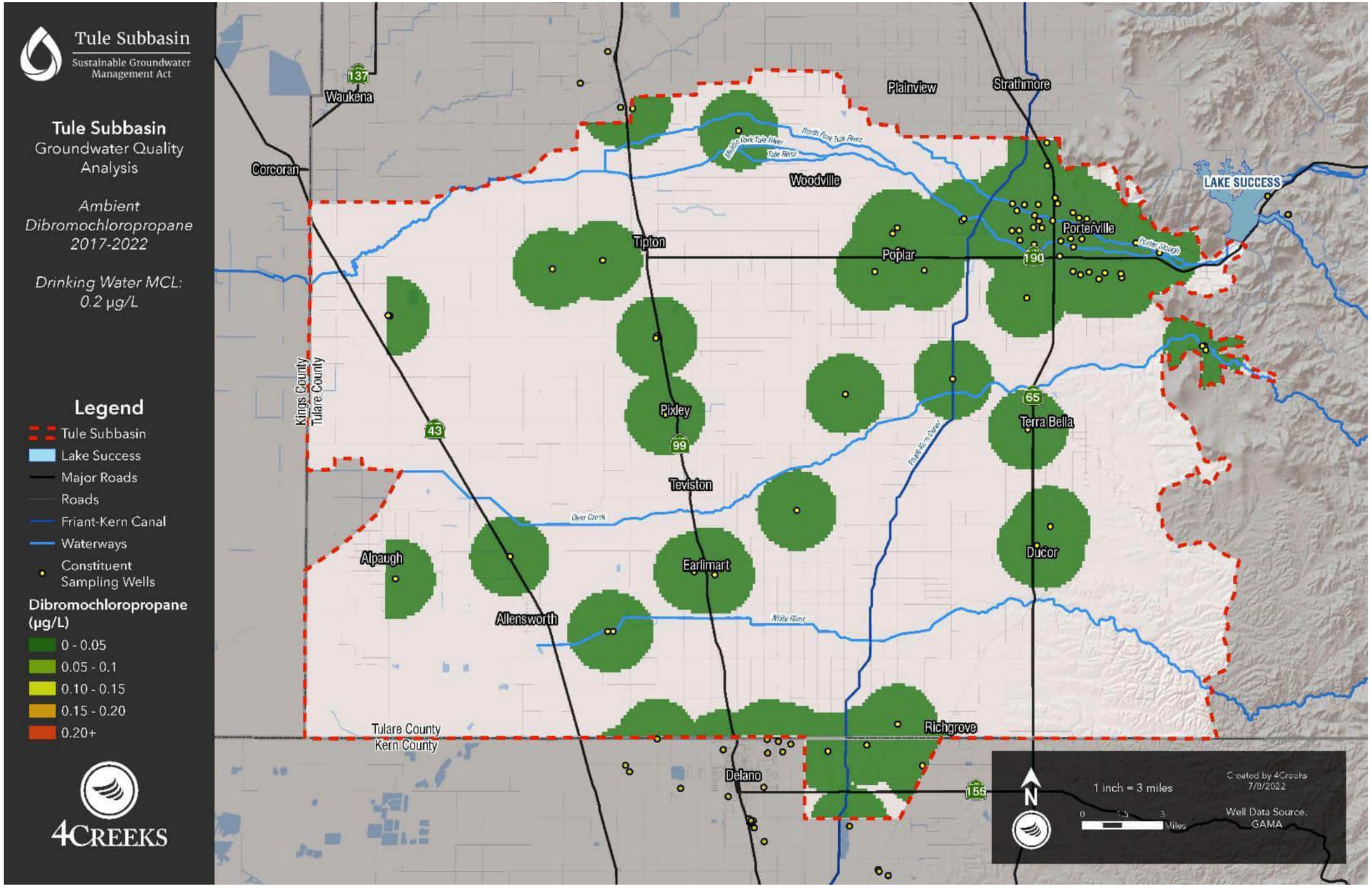
Exhibit 3-2. COC Groundwater Quality Isocontour Maps

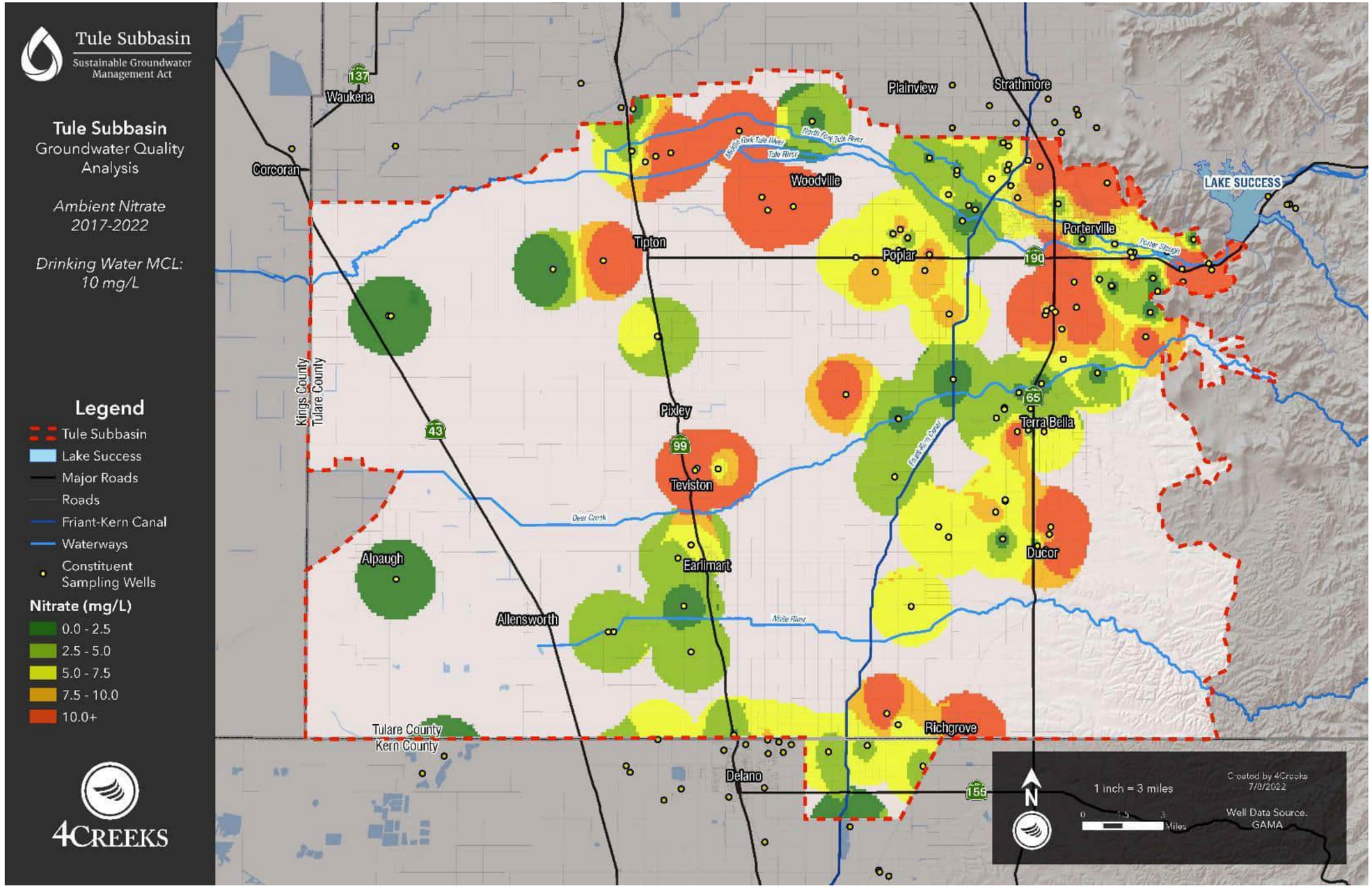


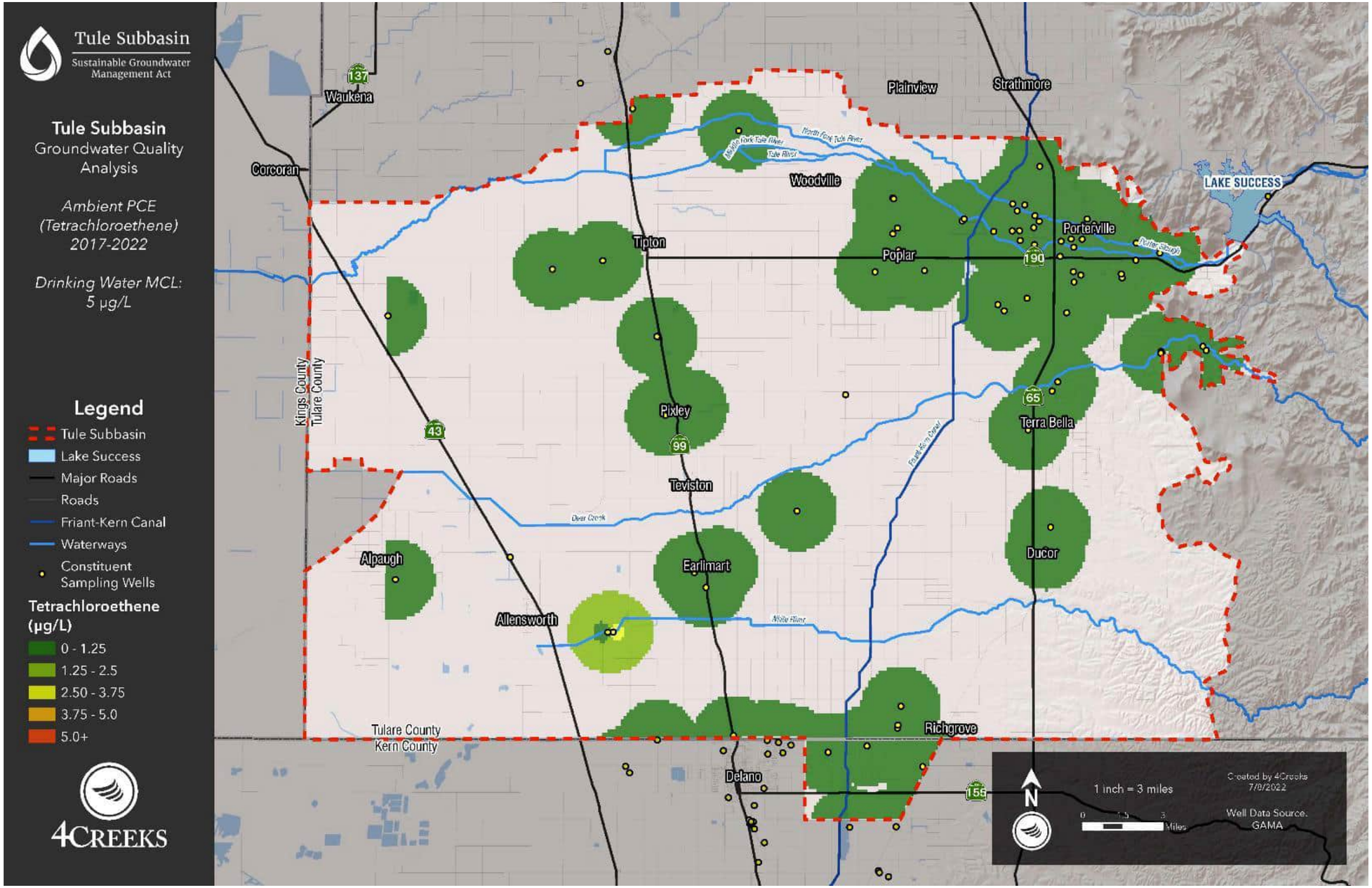

Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient Chloride 2017-2022
Agricultural Water Quality Goal: 106 mg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Chloride (mg/L)
0 - 26.5
26.5 - 53.0
53.0 - 79.5
79.5 - 106
106+
4CREEKS
Waukena
Corcoran
Plainview
Strathmore
Woodville
LAKE SUCCESS
Porterville
Tipton
Poplar
Kings County
Tulare County
Pixley
Teviston
Terra Bella
Ducor
Alpaugh
Earlimart
Allensworth
Tulare County
Kern County
Richgrove
Delano
1 inch = 3 miles
Created by 4Creeks 7/7/2022
Well Data Source: GAMA
N

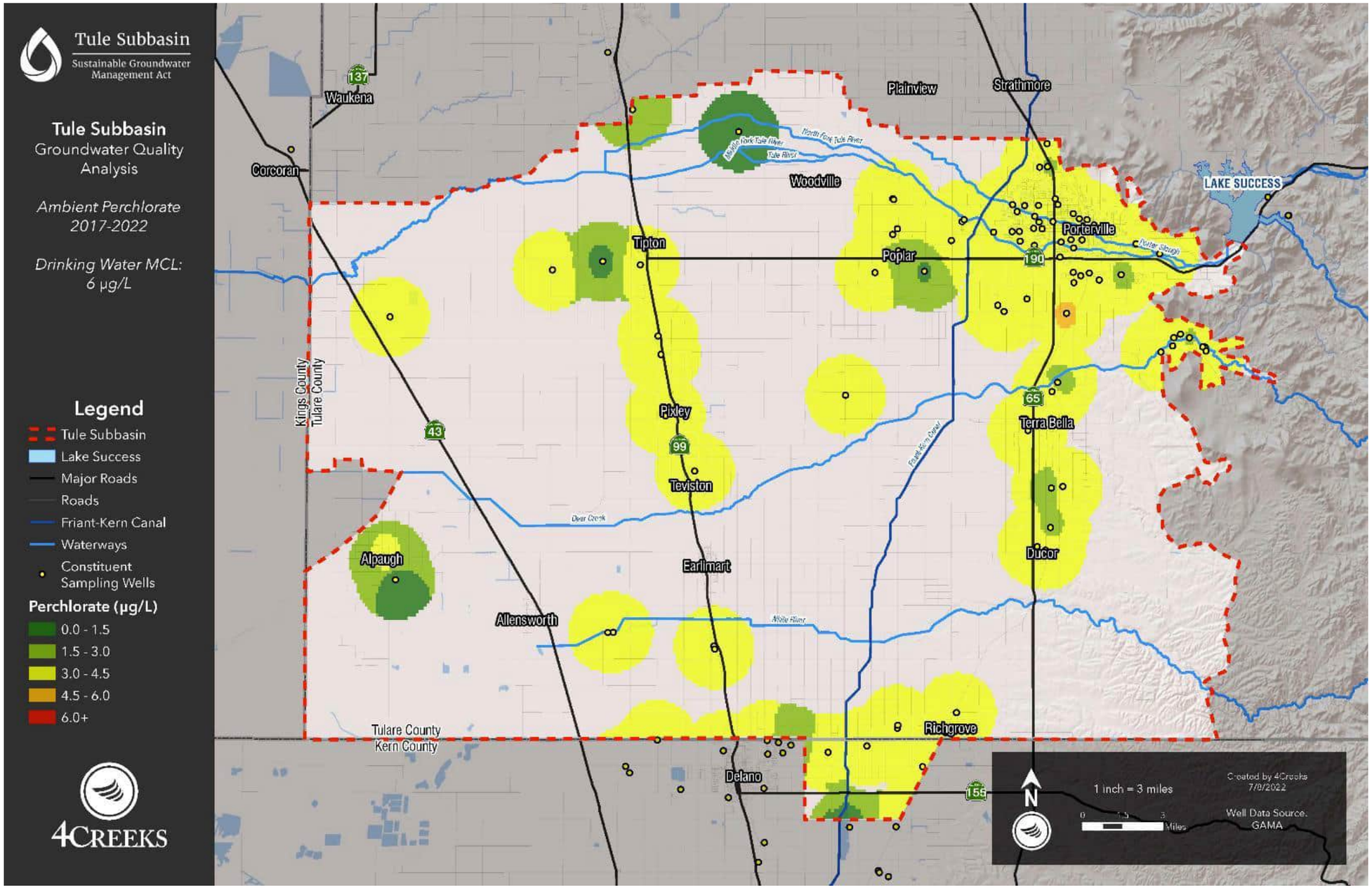

Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient Chloride 2017-2022
Drinking Water MCL: 500 mg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Chloride (mg/L)
0 - 125
125 - 250
250 - 375
375 - 500
500+
4CREEKS
Waukena
Corcoran
Plainview
Strathmore
Woodville
LAKE SUCCESS
Tipton
Poplar
Porterville
Pixley
Terra Bella
Teviston
Ducor
Alpaugh
Earlimart
Allensworth
Richgrove
Delano
Kings County
Tulare County
Tulare County
Kern County
North Fork Tule River
Middle Fork Tule River
Tule River
Deer Creek
White River
Friant-Kern Canal
Porter Slough
1 inch = 3 miles
Created by 4Creeks
7/7/2022
Well Data Source:
GAMA
Miles

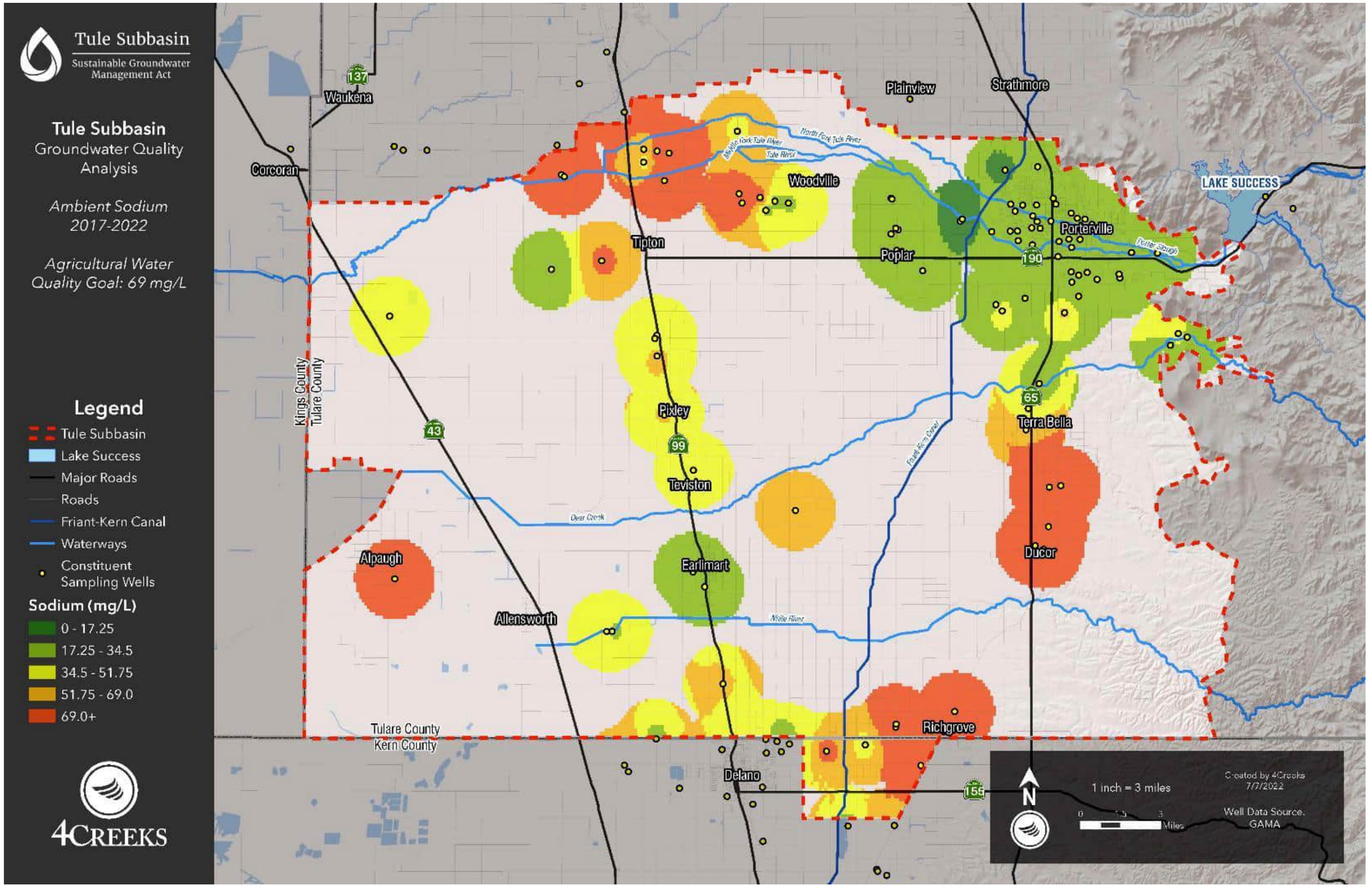

Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient Chromium-6
2017-2022
Drinking Water MCL:
10 µg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Chromium-6 (µg/L)
0.0 - 2.5
2.5 - 5.0
5.0 - 7.5
7.5 - 10.0
4CREEKS
Waukena
Plainview
Strathmore
Corcoran
Woodville
LAKE SUCCESS
Tipton
Poplar
Porterville
Kings County
Tulare County
Pixley
Terra Bella
Teviston
Alpaugh
Earlimart
Ducor
Allensworth
Tulare County
Kern County
Richgrove
Delano
1 inch = 3 miles
Created by 4Creeks
7/9/2022
Well Data Source:
GAMA
N

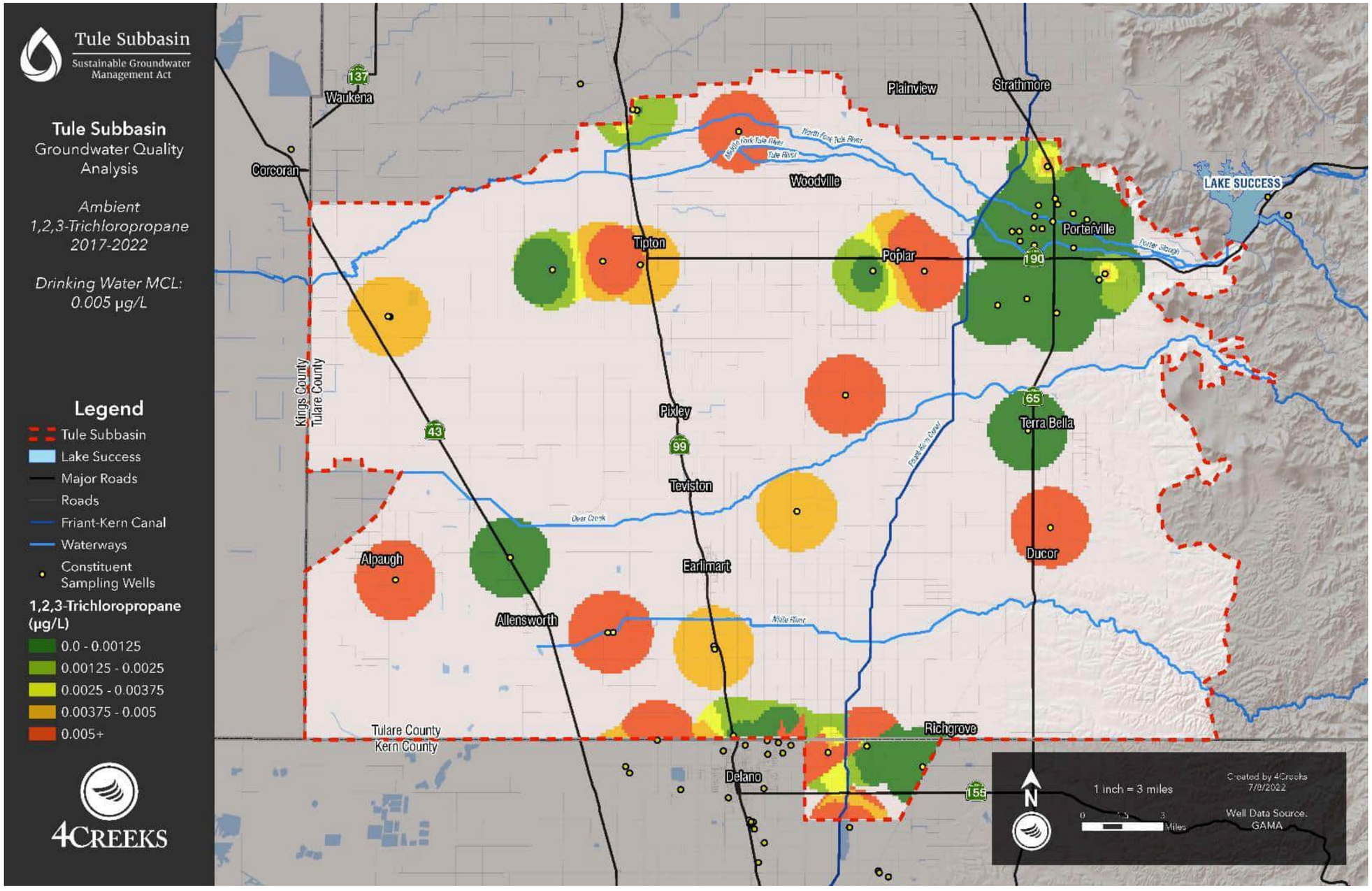

Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient Dibromochloropropane 2017-2022
Drinking Water MCL: 0.2 µg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Dibromochloropropane (µg/L)
0 - 0.05
0.05 - 0.1
0.10 - 0.15
0.15 - 0.20
0.20+
4CREEKS
Waukena
Plainview
Strathmore
Corcoran
Woodville
LAKE SUCCESS
Porterville
Tipton
Poplar
Pixley
Terra Bella
Teviston
Ducor
Alpaugh
Earlimart
Allensworth
Richgrove
Delano
Kings County
Tulare County
Tulare County
Kern County
1 inch = 3 miles
Created by 4Creeks 7/8/2022
Well Data Source: GAMA
N

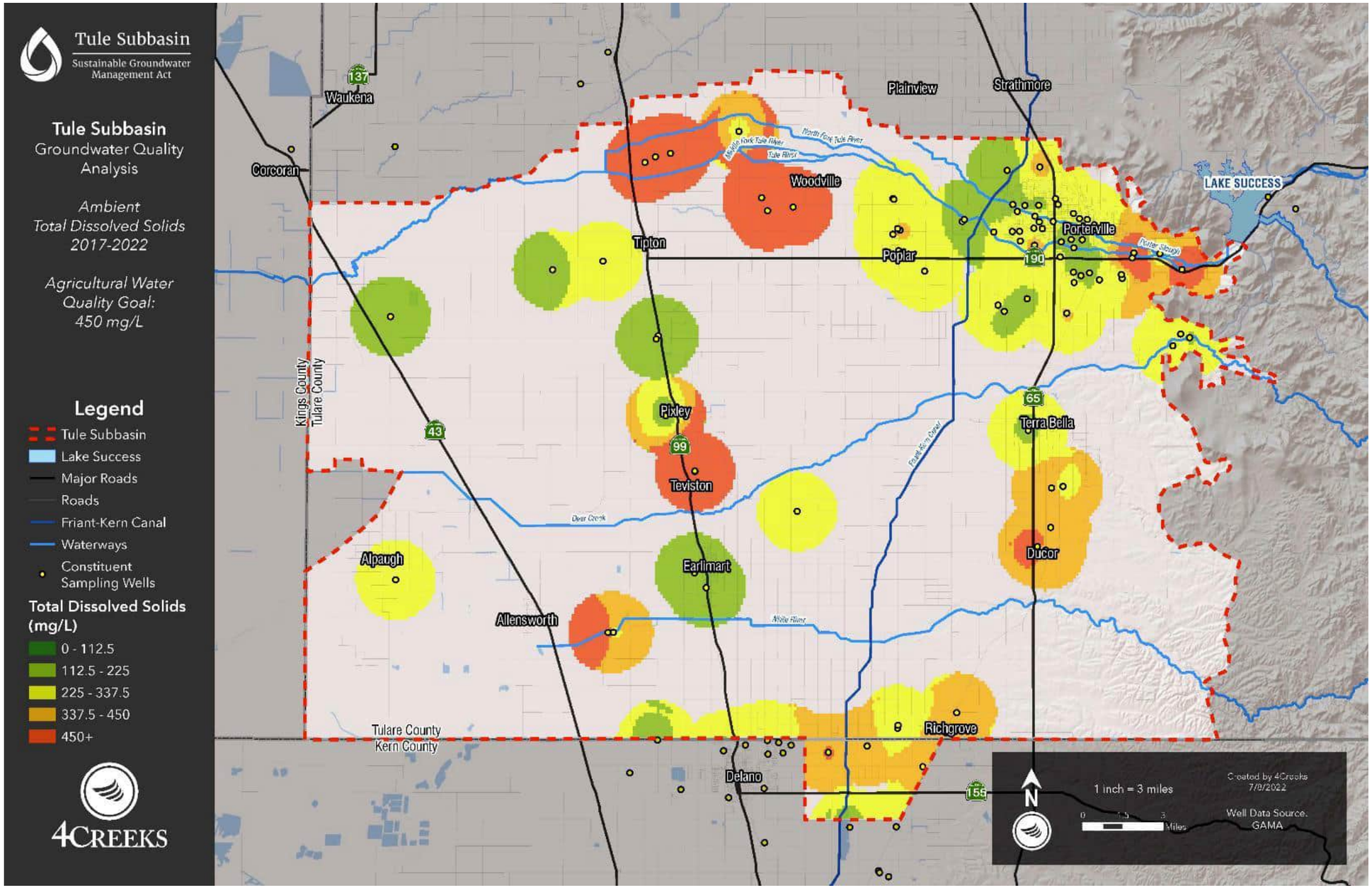

Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient Nitrate
2017-2022
Drinking Water MCL:
10 mg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Nitrate (mg/L)
0.0 - 2.5
2.5 - 5.0
5.0 - 7.5
7.5 - 10.0
10.0+
4CREEKS
Waukena
Corcoran
Plainview
Strathmore
Woodville
LAKE SUCCESS
Porterville
Tipton
Poplar
Kings County
Tulare County
Pixley
Terra Bella
Teviston
Alpaugh
Earlimart
Ducor
Allensworth
Richgrove
Tulare County
Kern County
Delano
1 inch = 3 miles
Created by 4Creeks
7/9/2022
Well Data Source:
GAMA
Miles


Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient PCE (Tetrachloroethene) 2017-2022
Drinking Water MCL: 5 µg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Tetrachloroethene (µg/L)
0 - 1.25
1.25 - 2.5
2.50 - 3.75
3.75 - 5.0
5.0+
4CREEKS
Waukena
Plainview
Strathmore
Corcoran
Woodville
LAKE SUCCESS
Tipton
Poplar
Porterville
Pixley
Terra Bella
Teviston
Ducor
Alpaugh
Earlimart
Allensworth
Richgrove
Delano
Kings County
Tulare County
Tulare County
Kern County
North Fork Tule River
Middle Fork Tule River
Tule River
Deer Creek
Friant-Kern Canal
Porter Slough
1 inch = 3 miles
Created by 4Creeks 7/0/2022
Well Data Source: GAMA
Miles


Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient Perchlorate 2017-2022
Drinking Water MCL: 6 µg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Perchlorate (µg/L)
0.0 - 1.5
1.5 - 3.0
3.0 - 4.5
4.5 - 6.0
6.0+
4CREEKS
Waukena
Corcoran
Plainview
Strathmore
Woodville
LAKE SUCCESS
Porterville
Tipton
Poplar
Pixley
Teviston
Terra Bella
Ducor
Alpaugh
Earlimart
Allensworth
Richgrove
Delano
Tulare County
Kings County
Kern County
North Fork Tule River
Middle Fork Tule River
Tule River
Deer Creek
Porter Slough
Friant-Kern Canal
White River
1 inch = 3 miles
Created by 4Creeks 7/8/2022
Well Data Source: GAMA
Miles


Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient Sodium
2017-2022
Agricultural Water Quality Goal: 69 mg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Sodium (mg/L)
0 - 17.25
17.25 - 34.5
34.5 - 51.75
51.75 - 69.0
69.0+
4CREEKS
Waukena
Corcoran
Plainview
Strathmore
Woodville
LAKE SUCCESS
Porterville
Tipton
Poplar
Pixley
Teviston
Terra Bella
Ducor
Alpaugh
Earlimart
Allensworth
Richgrove
Delano
Kings County
Tulare County
Tulare County
Kern County
North Fork Tule River
Middle Fork Tule River
Tule River
Deer Creek
White River
Porter Slough
Friant-Kern Canal
1 inch = 3 miles
Created by 4Creeks
7/7/2022
Well Data Source:
GAMA
Miles


Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient
1,2,3-Trichloropropane
2017-2022
Drinking Water MCL:
0.005 µg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
1,2,3-Trichloropropane (µg/L)
0.0 - 0.00125
0.00125 - 0.0025
0.0025 - 0.00375
0.00375 - 0.005
0.005+
4CREEKS
Waukena
Corcoran
Plainview
Strathmore
Woodville
LAKE SUCCESS
Porterville
Tipton
Poplar
Pixley
Teviston
Terra Bella
Ducor
Alpaugh
Earlimart
Allensworth
Richgrove
Delano
Kings County
Tulare County
Tulare County
Kern County
North Fork Tule River
Middle Fork Tule River
Tule River
Deer Creek
Porter Slough
Friant-Kern Canal
White River
137
43
99
65
190
155
N
1 inch = 3 miles
0
1.5
3
Miles
Created by 4Creeks
7/8/2022
Well Data Source:
GAMA


Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient
Total Dissolved Solids
2017-2022
Agricultural Water Quality Goal:
450 mg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Total Dissolved Solids (mg/L)
0 - 112.5
112.5 - 225
225 - 337.5
337.5 - 450
450+
4CREEKS
Waukena
Corcoran
Plainview
Strathmore
Woodville
Tipton
Poplar
Porterville
LAKE SUCCESS
Pixley
Teviston
Terra Bella
Ducor
Alpaugh
Earlimart
Allensworth
Richgrove
Delano
Kings County
Tulare County
Tulare County
Kern County
North Fork Tule River
Middle Fork Tule River
Tule River
Deer Creek
Middle River
Friant-Kern Canal
Porter Slough
137
43
99
65
190
155
N
1 inch = 3 miles
Created by 4Creeks
7/8/2022
Well Data Source:
GAMA
Miles

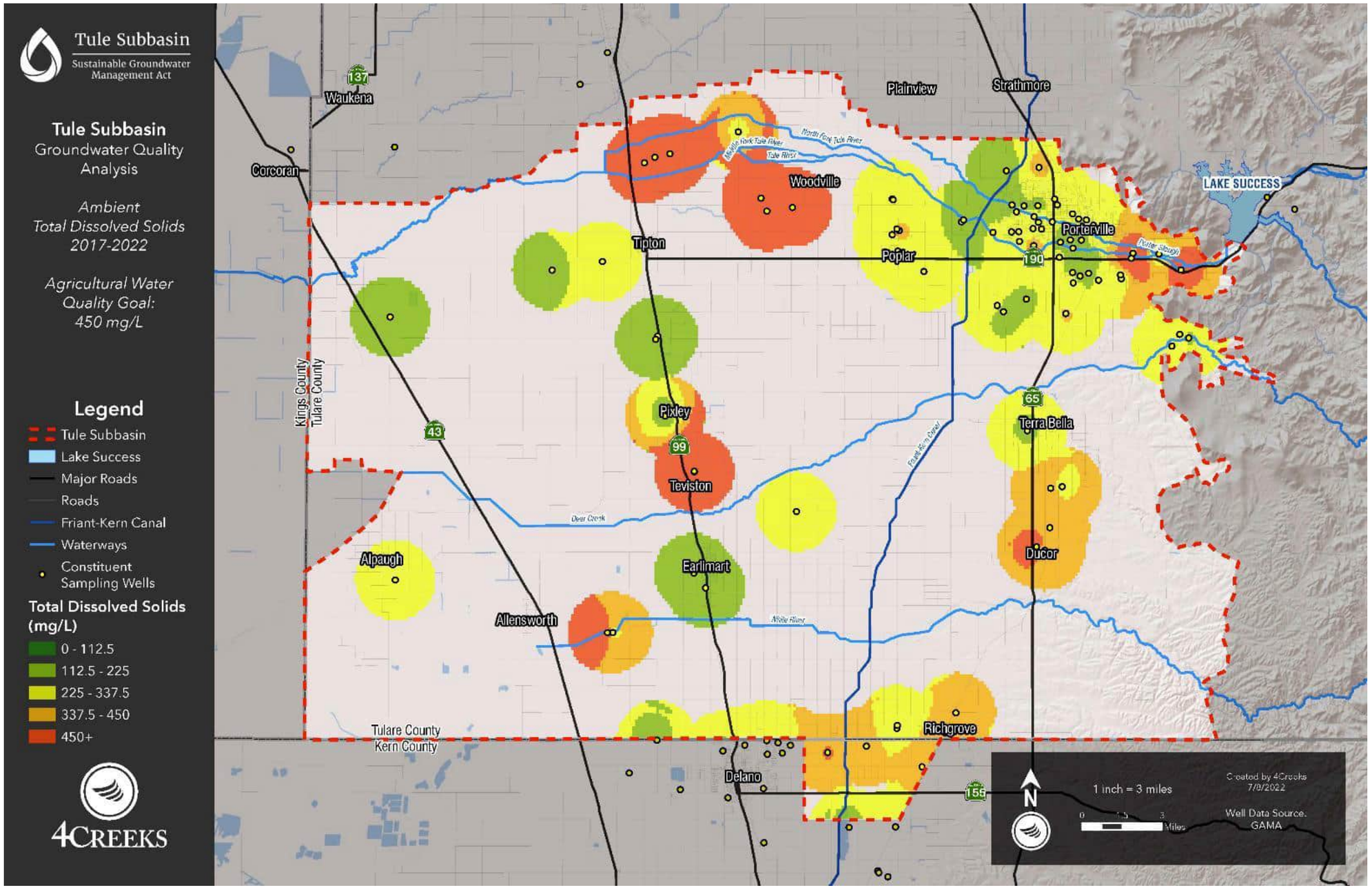
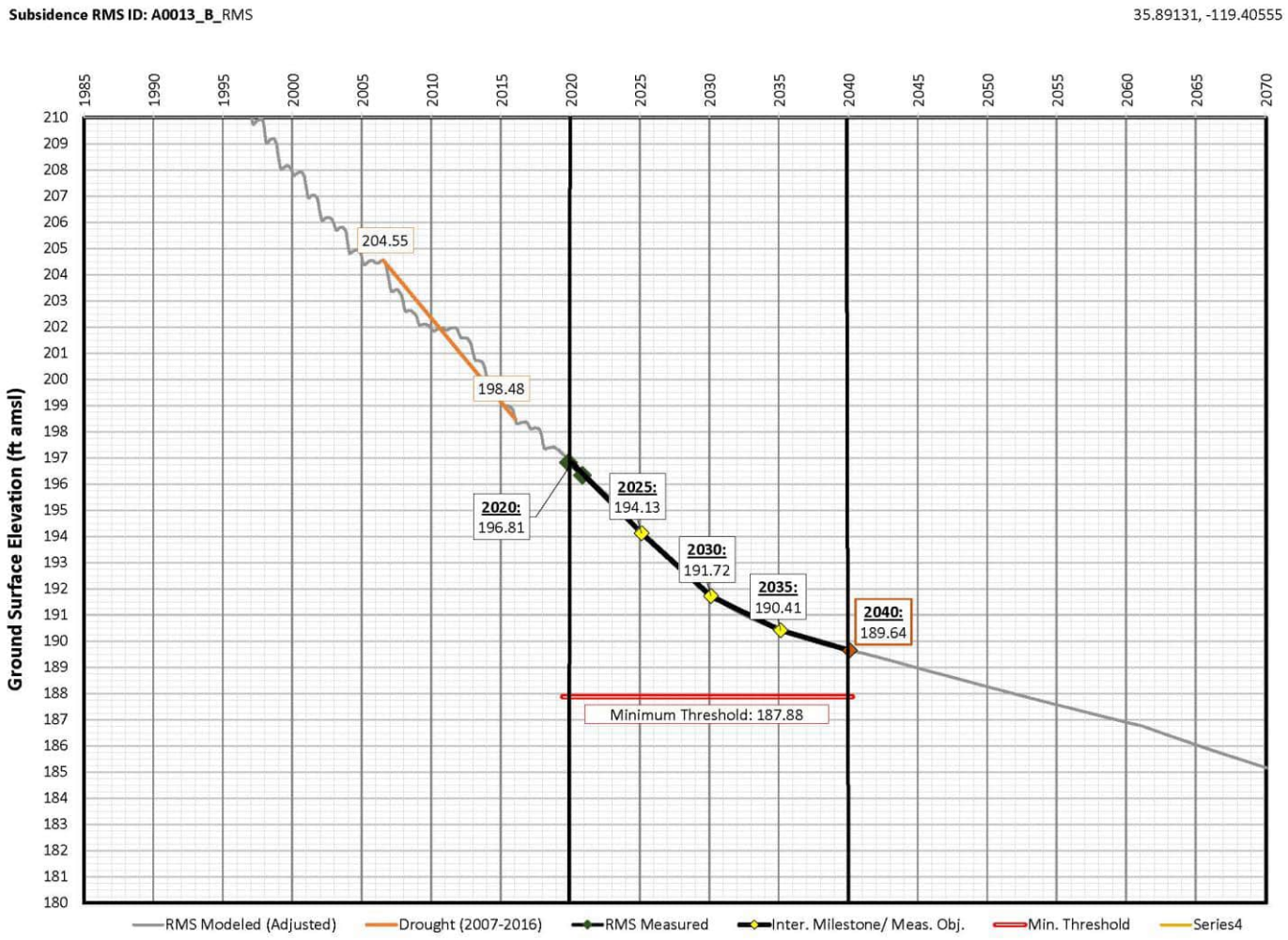
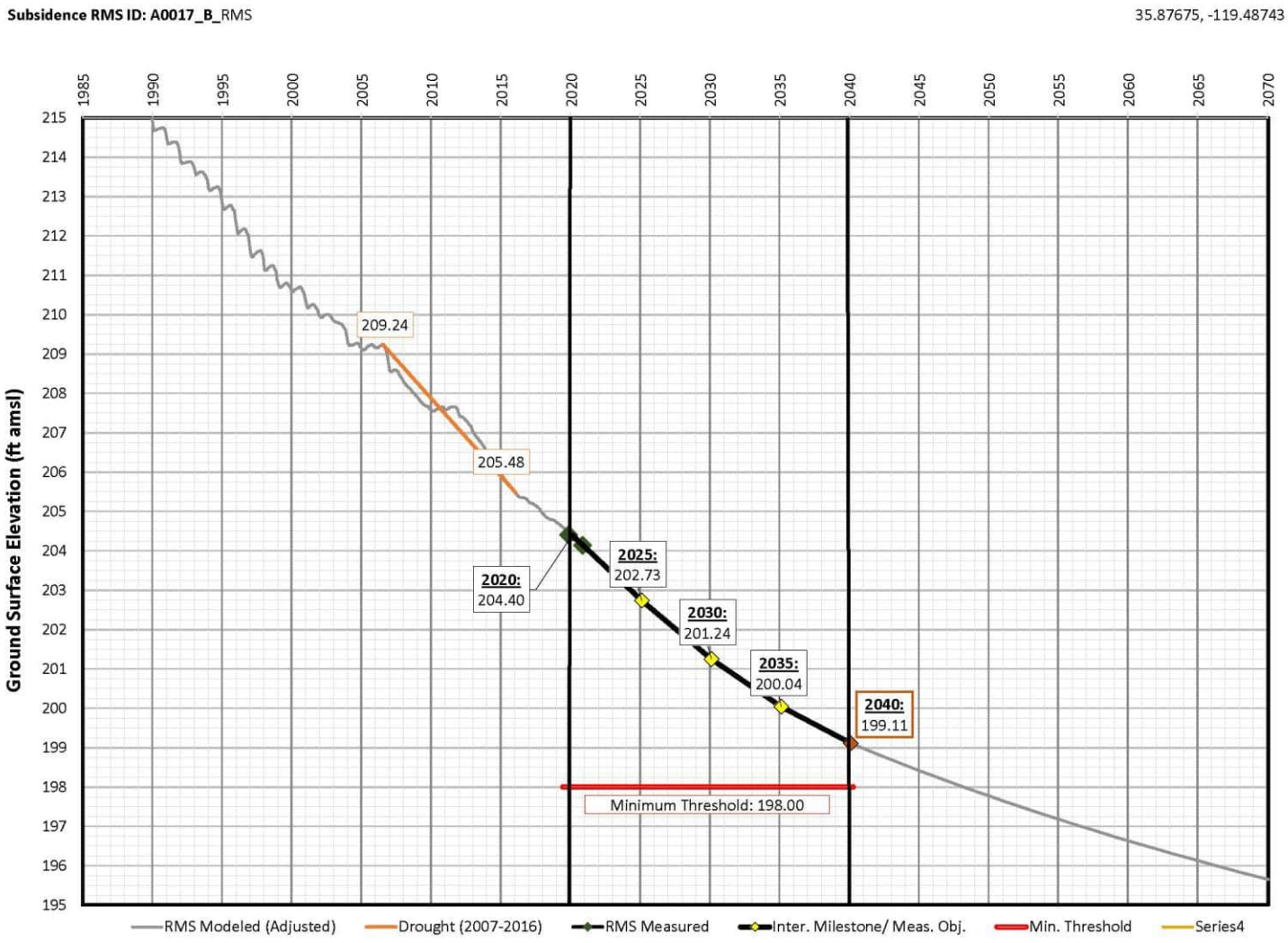
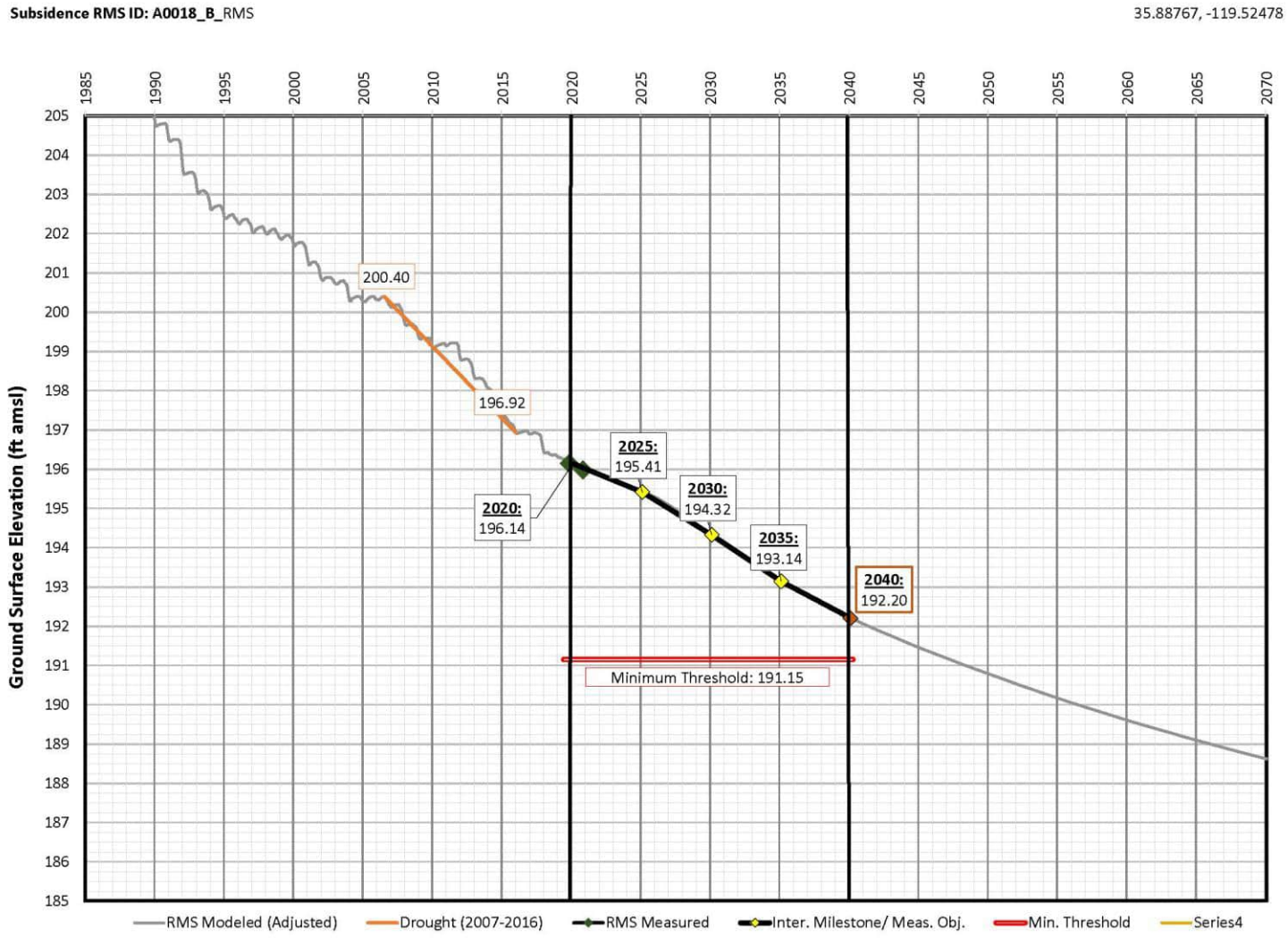
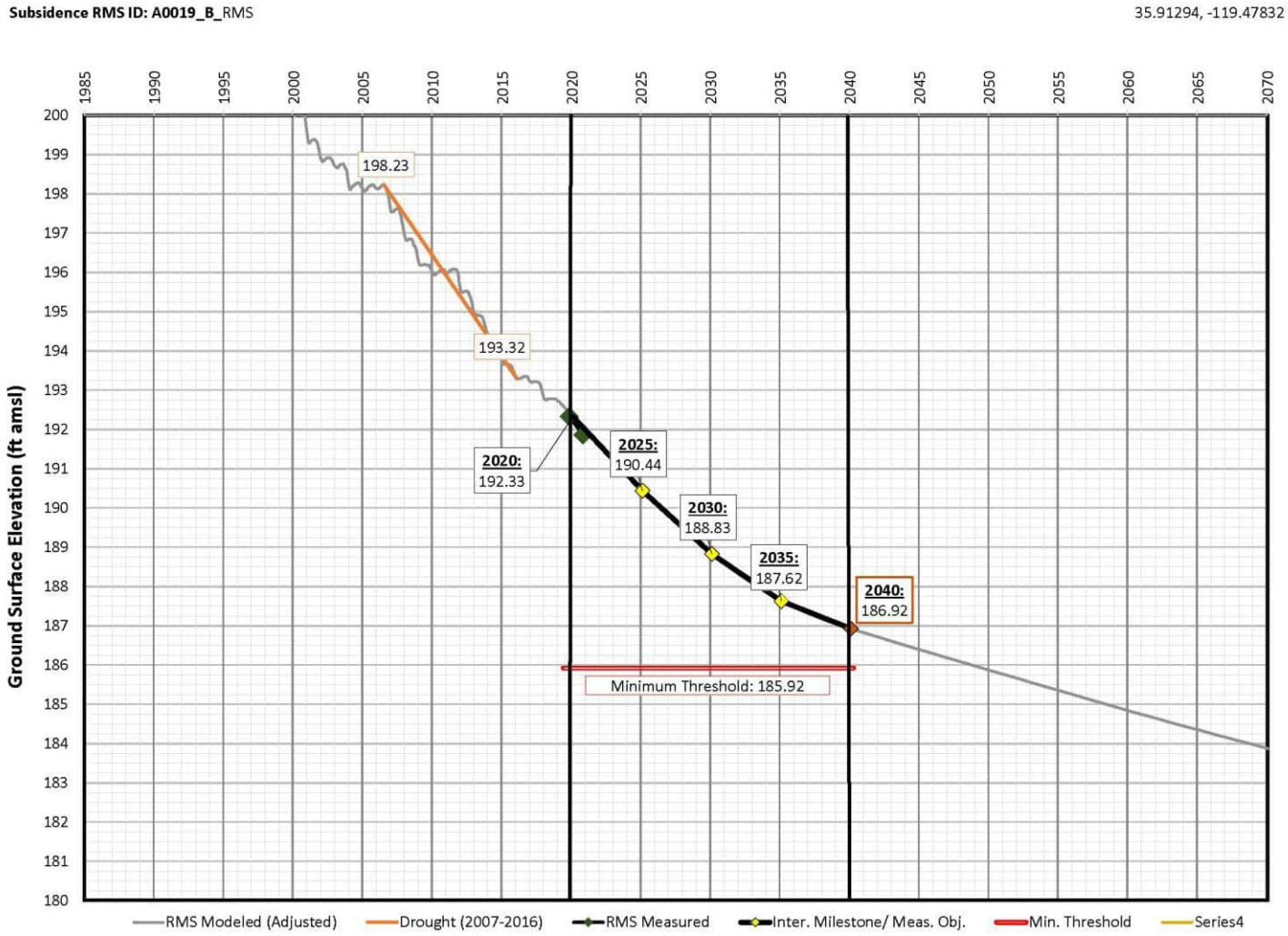

Tule Subbasin
Sustainable Groundwater Management Act
Tule Subbasin
Groundwater Quality Analysis
Ambient
Total Dissolved Solids
2017-2022
Agricultural Water Quality Goal:
450 mg/L
Legend
Tule Subbasin
Lake Success
Major Roads
Roads
Friant-Kern Canal
Waterways
Constituent Sampling Wells
Total Dissolved Solids (mg/L)
0 - 112.5
112.5 - 225
225 - 337.5
337.5 - 450
450+
4CREEKS
Waukena
Corcoran
Plainview
Strathmore
Woodville
Tipton
Poplar
Porterville
LAKE SUCCESS
Pixley
Teviston
Terra Bella
Ducor
Alpaugh
Earlimart
Allensworth
Richgrove
Delano
Kings County
Tulare County
Tulare County
Kern County
Dear Creek
1 inch = 3 miles
Created by 4Creeks
7/8/2022
Well Data Source:
GAMA
Miles

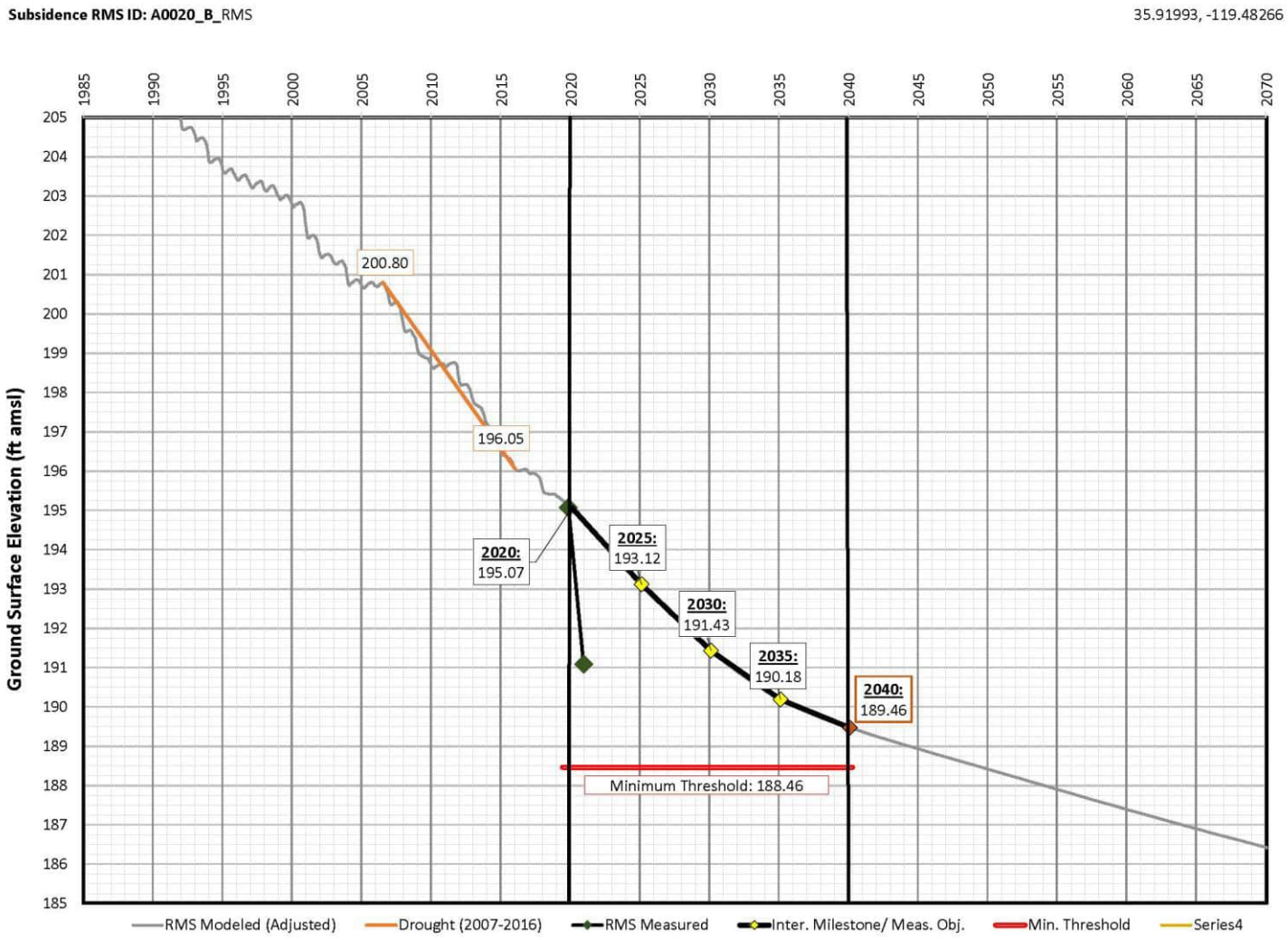
Exhibit 3-3. RMS Land Subsidence Charts




Subsidence RMS ID: A0017_B_RMS
35.87675, -119.48743
Ground Surface Elevation (ft amsl)
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
215
214
213
212
211
210
209
208
207
206
205
204
203
202
201
200
199
198
197
196
195
209.24
205.48
2020:
204.40
2025:
202.73
2030:
201.24
2035:
200.04
2040:
199.11
Minimum Threshold: 198.00
RMS Modeled (Adjusted)
Drought (2007-2016)
RMS Measured
Inter. Milestone/ Meas. Obj.
Min. Threshold
Series4


Subsidence RMS ID: A0018_B_RMS
35.88767, -119.52478
Ground Surface Elevation (ft amsl)
200.40
196.92
2020:
196.14
2025:
195.41
2030:
194.32
2035:
193.14
2040:
192.20
Minimum Threshold: 191.15
RMS Modeled (Adjusted)
Drought (2007-2016)
RMS Measured
Inter. Milestone/ Meas. Obj.
Min. Threshold
Series4


Subsidence RMS ID: A0019_B_RMS
35.91294, -119.47832
Ground Surface Elevation (ft amsl)
198.23
193.32
2020:
192.33
2025:
190.44
2030:
188.83
2035:
187.62
2040:
186.92
Minimum Threshold: 185.92
RMS Modeled (Adjusted)
Drought (2007-2016)
RMS Measured
Inter. Milestone/ Meas. Obj.
Min. Threshold
Series4


Subsidence RMS ID: A0020_B_RMS
35.91993, -119.48266
Ground Surface Elevation (ft amsl)
200.80
196.05
2020:
195.07
2025:
193.12
2030:
191.43
2035:
190.18
2040:
189.46
Minimum Threshold: 188.46
RMS Modeled (Adjusted)
Drought (2007-2016)
RMS Measured
Inter. Milestone/ Meas. Obj.
Min. Threshold
Series4

4. Monitoring Networks

4.1 Introduction to Monitoring Networks § 354.32

23 Cal. Code Regs. § 354.32 Introduction to Monitoring Networks*. This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the GSP.*

The GSAs in the Tule subbasin have prepared a coordinated Monitoring Plan, the Tule Subbasin Monitoring Plan[4] (TSMP; **Appendix B1**), as **Attachment 1** to the Tule Subbasin Coordination Agreement (**Appendix B**)[5]. This section of the GSP summarizes the Tule Subbasin monitoring network by providing reference to the TSMP and, providing any additional information that directly relates to the Alpaugh GSA monitoring network for each sustainability indicator applicable to the Tule Subbasin.

4.2 Monitoring Network

4.2.1 Monitoring Network Objective § 354.34(a); § 354.34(b)

23 Cal. Code Regs. § 354.34 Monitoring Network*. **(a)** Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.*

***(b)** Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation.*

The objectives used in developing the subbasin monitoring plan are provided **Chapter 1.1** of the Tule Subbasin Monitoring Plan.

4.2.1.1 Progress Towards Achieving Measurable Objective § 354.34(b)(1); § 354.34(b)(2); § 354.34(b)(3); § 354.34(b)(4)

23 Cal. Code Regs. § 354.34 Monitoring Network*. **(b)** …The monitoring network objectives shall be implemented to accomplish the following:*

***(1)** Demonstrate progress toward achieving measurable objectives described in the Plan.*

***(2)** Monitor impacts to the beneficial uses or users of groundwater.*

***(3)** Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.*

***(4)** Quantify annual changes in water budget components.*

Annually Alpaugh GSA will prepare reports documenting the results from the prior year monitoring activities. Utilizing the data collected each year, the Tule Subbasin Data Management System and the Groundwater Flow Model will be updated and calibrated to match current groundwater conditions. This

[4] Thomas Harder & Co., 2022b

[5] Tule Subbasin Technical Advisory Committee, August 2019

data and groundwater flow model will be evaluated each year to quantify any changes to Alpaugh GSA water budget components.

Each year during the GSP implementation period, results from annual monitoring will be compared to the interim milestones and minimum threshold numerical targets established in **Section 3** of this GSP. The interim milestones for the various sustainability indicators may be adjusted to adapt to the data collected if the numerical values remain in the operational flexibility above the minimum threshold. If data indicates an exceedance of a minimum threshold, adjustments to the Project and Management Actions described under **Section 5** will be evaluated by Alpaugh GSA's Governing Board of Directors.

Minimum thresholds, interim milestones, and measurable objectives were established at each RMS within Alpaugh GSA and quantitative value for minimum thresholds and measurable objectives are provided in **Section 3.5** of this GSP. Criteria for selecting RMS were correlated to the beneficial users of groundwater within the area. Additional discussion for potential impacts to beneficial users of groundwater relative to the established minimum threshold for each of the applicable sustainability indicators is provided in **Section 1.4.3**, **Section 2.5** and **Section 3.5** of this GSP.

4.2.2 Monitoring Network Design § 354.34(j)

23 Cal. Code Regs. § 354.34 Monitoring Network. (j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

The Alpaugh GSA monitoring network has been established to monitor data from the four (4) sustainability indicators that may have potential to cause significant and unreasonable effects within the Tule Subbasin (defined in **Section 3.4**), including:

- Chronic lowering of groundwater levels
- Reduction of groundwater storage;
- Degraded water quality, and
- Land subsidence.

The sustainability indicators of seawater intrusion and depletion of interconnected surface water are not applicable to the Tule Subbasin (**Section 3.4**).

The following sections provide a brief summary of the process, information and procedures that were incorporated into the development in the Alpaugh GSA monitoring network and is supported by the TSMP, which was developed for all GSAs within the Tule Subbasin to meet the requirements of SGMA regulation pertaining to the monitoring networks.

The TSMP is intended to adapt to the data being collected, allowing for the addition or removal of monitoring features, changes in monitoring frequency, and update to alternative monitoring methodologies, as the monitoring evolves during the GSP Implementation period.

4.2.2.1 Monitoring Network Rationale § 354.34(g)(1)(3)

23 Cal. Code Regs. § 354.34 Monitoring Network. (g) *Each Plan shall describe the following information about the monitoring network:*

(1) *Scientific rationale for the monitoring site selection process.*

(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*

The rationale and process for selecting RMS is described in Chapter 2.0 of the TSMP relative to the sustainability indicator being described.

The minimum thresholds, measurable objectives and interim milestones for the four (4) applicable sustainability indicators have been established at the RMS within Alpaugh GSA and the quantitative values are listed in **Section 3.5** of this GSP.

4.2.2.2 Spatial Density and Frequency of Measurement § 354.34(d); § 354.34(f)(1); § 354.34(f)(2); § 354.34(f)(3); § 354.34(h)

23 Cal. Code Regs. § 354.34 Monitoring Network. (d) *The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.*

(f) *The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:*

> ***(1)*** *Amount of current and projected groundwater use.*
>
> ***(2)*** *Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.*
>
> ***(3)*** *Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.*

(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*

The locations of RMS sites in the subbasin are provided in the TSMP as Figure A1-2, Figure A1-6, Figure A1-7, and Figure A1-8, with additional details listed in TSMP Table A1-1, Table A1-2, Table A1-3, and Table A1-6 of the TSMP. RMS sites within Alpaugh GSA are presented in **Figure 4-1**.

The criteria considered during selection of RMS location included primarily: aquifer characteristics, current and projected groundwater uses, and beneficial uses and users of groundwater and is discussed throughout Chapter 2.0 of the TSMP for each sustainability indicator.

Existing monitoring features and monitoring network wells were utilized as RMS if the technical data of these sites was adequate for purposes of the monitoring network under this GSP. The areas where existing monitoring features and networks did not provide adequate coverage of sustainability indicators were identified as data gaps in Chapter 4.0 of the TSMP, and recommended monitoring features needed to assess data gaps were provided.

The locations and frequency measurement of RMS sites are described in **Section 4.2.3**.

4.2.2.3 Monitoring Protocols and Reporting Standards § 354.34(g)(2); § 354.34(i)

23 Cal. Code Regs. § 354.34 Monitoring Network. (g) *Each Plan shall describe the following information about the monitoring network:*

(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for*

monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.

Throughout Chapter 2.0 of the TSMP, monitoring protocols relative to each sustainability indicator are described in the corresponding subchapters. Additionally, a subbasin wide data management system (DMS) is described (Chapter 5.0, TSMP) to provide a consistent database amongst the Tule Subbasin GSAs for data and reporting standards.

4.2.2.4 Existing Monitoring § 354.34(e); § 354.34(f)(4)

***23 Cal. Code Regs. § 354.34 Monitoring Network**. **(e)** A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*

***(f)** The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:*

> ***(4)** Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.*

Table A1-9 in Chapter 5.3 of the TSMP list existing data sources and monitoring programs that are coordinated with the Tule Subbasin monitoring networks.

4.2.3 Representative Monitoring § 354.36(a); § 354.36(b)(1); § 354.36(b)(2); § 354.34(c)

***23 Cal. Code Regs. § 354.36 Representative Monitoring**. Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:*

***(a)** Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.*

***(b)** Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:*

> ***(1)** Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.*
>
> ***(2)** Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.*

***(c)** The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.*

Chapter 3.0 of the TSMP describes representative monitoring in the Tule Subbasin by identifying one or more RMS within each management area for monitoring one or multiple sustainability indicators. **Sections 4.2.3.1** through **4.2.3.6** of this GSP reference the TSMP chapter for the corresponding sustainability indicator and further provides a list of each RMS in Alpaugh GSA, including identifying the management area the RMS is assigned to represent.

4.2.3.1 Chronic Lowering of Groundwater Levels § 354.34(c)(1)(A); § 354.34(c)(1)(B)

***23 Cal. Code Regs. § 354.34 Monitoring Network**. **(c)** Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*

***(1)** Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:*

> ***(A)** A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.*
>
> ***(B)** Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.*

Groundwater levels will be monitored as described in Chapter 2.1 of the TSMP. Alpaugh GSA will monitor groundwater levels at RMS shown on **Figure 4-1**. The methods used to establish the RMS and the frequency of monitoring are discussed in Chapter 3.1 of the TSMP. Existing and proposed RMS identified for monitoring groundwater levels in the upper and lower aquifer in the Tule Subbasin are included in Table A1-1 and Table A1-3 and mapped in Figure A1-2 of the TSMP.

Within Alpaugh GSA, twelve (12) RMS have been identified for monitoring groundwater levels semiannually (spring and fall). **Table 4-1** list these RMS and describes the aquifer and management area the monitoring site is representative of, and well construction details.

Figure 4-1. RMS for Monitoring Groundwater Levels

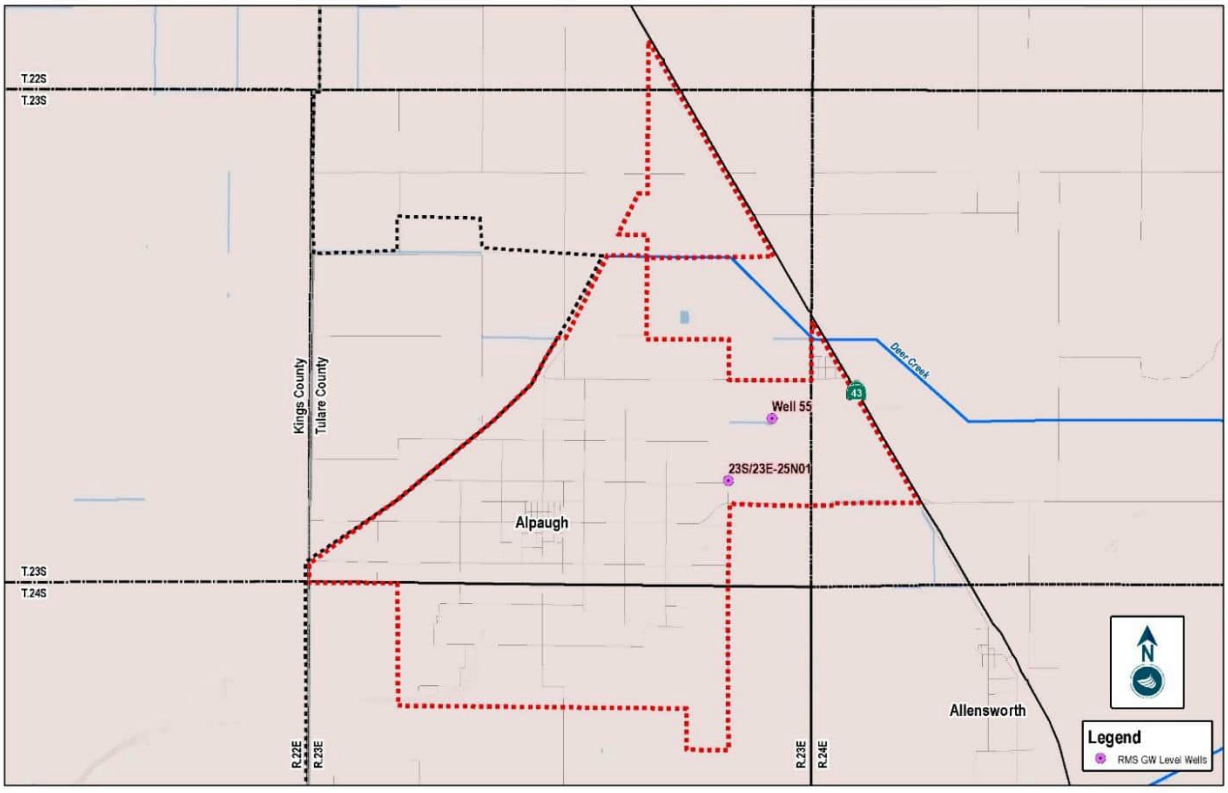


Table 4-1. RMS for Monitoring Groundwater Levels

RMS Well ID	Management Area	Aquifer	Total Depth (ft bgs)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)
23S/23E-25N01	Alpaugh ID Service	Lower	1550	702	1504
Well 55	Alpaugh ID Service	Lower	1459	707	1459

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

23 Cal. Code Regs. § 354.34 Monitoring Network. (c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*

(2) *Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.*

Annual change groundwater storage within Alpaugh GSA will estimated using either of the methods identified in Section 3.6 of the *Tule Subbasin Coordination Agreement*, utilizing groundwater level data as a proxy for the calculation. The estimated change in annual groundwater in storage will be calculated by the Groundwater Flow Model using the groundwater level data collected each year for each management area, Alpaugh GSA, and the Tule Subbasin.

4.2.3.3 Seawater Intrusion § 354.34(c)(3)

23 Cal. Code Regs. § 354.34 Monitoring Network. (c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*

(3) *Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.*

Seawater intrusion does not occur in the Tule Subbasin for reasons described in Chapter 2.3.3 of the *Tule Subbasin Setting.*

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

23 Cal. Code Regs. § 354.34 Monitoring Network. (c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*

(4) *Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.*

Degraded water quality will be monitored as described in Chapter 2.4 and monitoring locations are shown on Figure A1-6 of the TSMP. Alpaugh GSA will evaluate groundwater quality conditions using data collected under separate groundwater quality regulatory programs. These programs include public water systems, for compliance with the requirements of Title 22[6] Consumer Confidence Reports (CCR), Tule Basin Water Quality Coalition (TBWQC)[7] for compliance with the requirements of General order R5-2013-0120 and other sources that would provide additional representation of groundwater quality conditions.

The Constituent of Concern (COC) vary depending on the suitability of the groundwater, whether agricultural or drinking water beneficial use associated with the RMS well. Each of the COC to be monitored by Alpaugh GSA at the RMS wells within each management area to serve as indicators for changes in groundwater quality are identified in **Section 3.**

The analysis used to determine the beneficial uses at each RMS well consisted of querying DWR well completion reports, public water systems, and schools using ArcGIS. The detailed breakdown of the steps to conduct analysis is described below.

1. Create a layer in ArcGIS by combining data from the following:

[6] California Division of Drinking Water, 2018

[7] Tule Basin Water Quality Coalition (TBWQC), 2017

- Well locations and well types from DWRs Well Completion Report Mapping Application
- Boundaries of SWDIS Public Water Systems
- Boundaries of Community/Urban areas from LAFCO

2. Overlay groundwater quality locations of RMS wells and create 1 mile buffer for analyzing.
3. Summarize the data identified in step 1 relative to each groundwater quality RMS well 1-mile buffer.
4. Define the groundwater quality RMS well as representative of drinking water and/or agricultural beneficial pumping beneficial use.

Wells types are categorized as drinking water, agricultural, or not applicable based on breakdown in **Table 4-2. Categories of Well** Types.

Table 4-2. Categories of Well Types

Drinking Water	Agricultural	Not Applicable
Domestic	Irrigation - Agricultural	Cathodic Protection
Public	Other Irrigation	Destruction Monitoring
Water Supply	Water Supply Irrigation - Agricultural	Destruction Unknown Soil Boring
Water Supply Domestic	Water Supply Irrigation - Agriculture	Monitoring
Water Supply Public	Water Supply Stock or Animal Watering	Other Destruction
		Test Well
		Test Well Unknown
		Unknown
		Vapor Extraction
		Vapor Extraction n/a
		Water Supply Industrial
		Blanks

Within Alpaugh GSA one (1) RMS has been identified for monitoring groundwater quality annually. Each have been designated as a drinking water RMS well or Agricultural RMS well based on the results from the above-described analysis and are displayed as such in **Figure 4-2**. **Table 4-1** lists these RMSs and describes the aquifer, represented beneficial use with corresponding COC

Figure 4-2. RMS for Monitoring Groundwater Quality

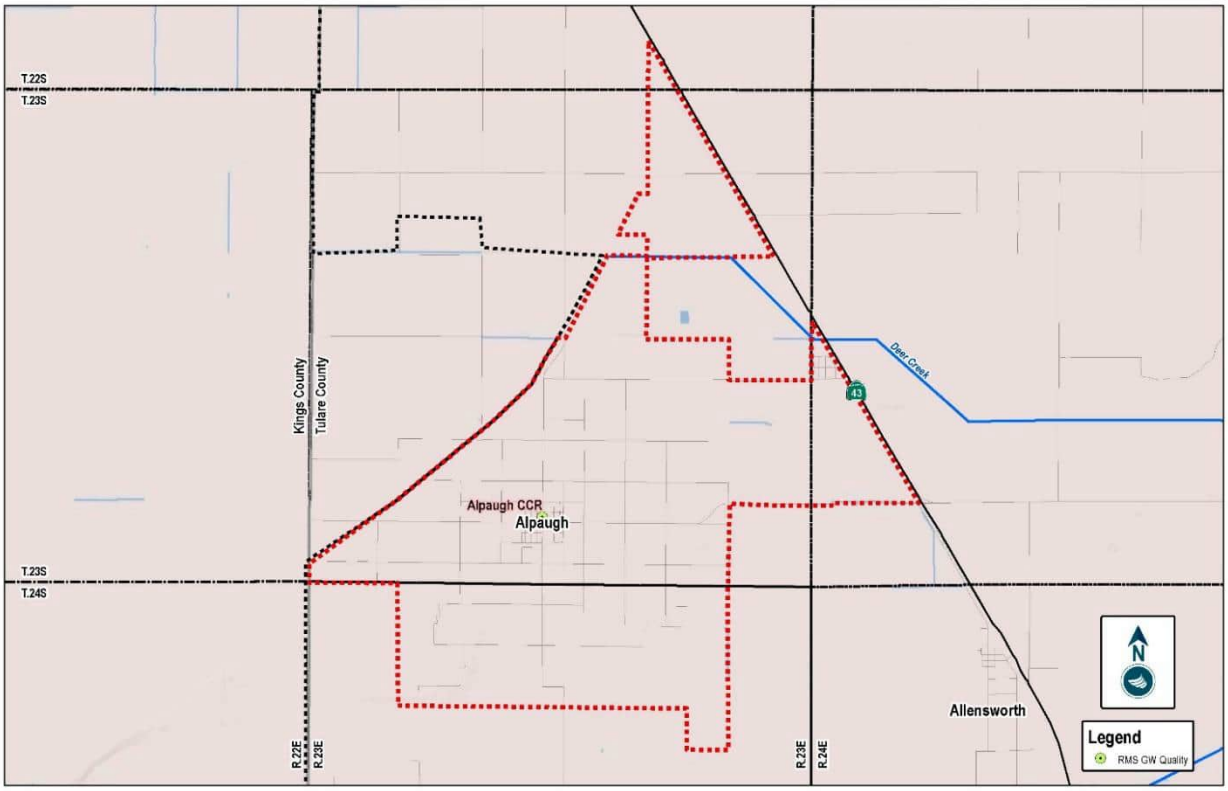


Table 4-3. RMS for Monitoring Groundwater Quality

RMS ID	Management Area	Aquifer	Lat	Long	Well Depth (ft bgs)	Top of Perforation (ft bgs)	Bottom of Perforation (ft bgs)
Alpaugh CSD	Alpaugh ID	N/A	N/A	N/A	N/A	N/A	N/A

4.2.3.5 Land Subsidence § 354.34(c)(5)

23 Cal. Code Regs. § 354.34 Monitoring Network. (c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*

(5) *Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.*

Land subsidence within the Tule Subbasin will be monitored as described in Chapter 2.5 and monitoring locations are shown on Figure A1-7 of the TSMP. Within the GSA, RMS for land subsidence will consist of GPS monitoring sites supplemented by InSAR data when available, monitored annually. RMSs for land subsidence are shown in **Figure 4-3** and listed in **Table 4-4.**

Figure 4-3. RMS for Monitoring Land Subsidence

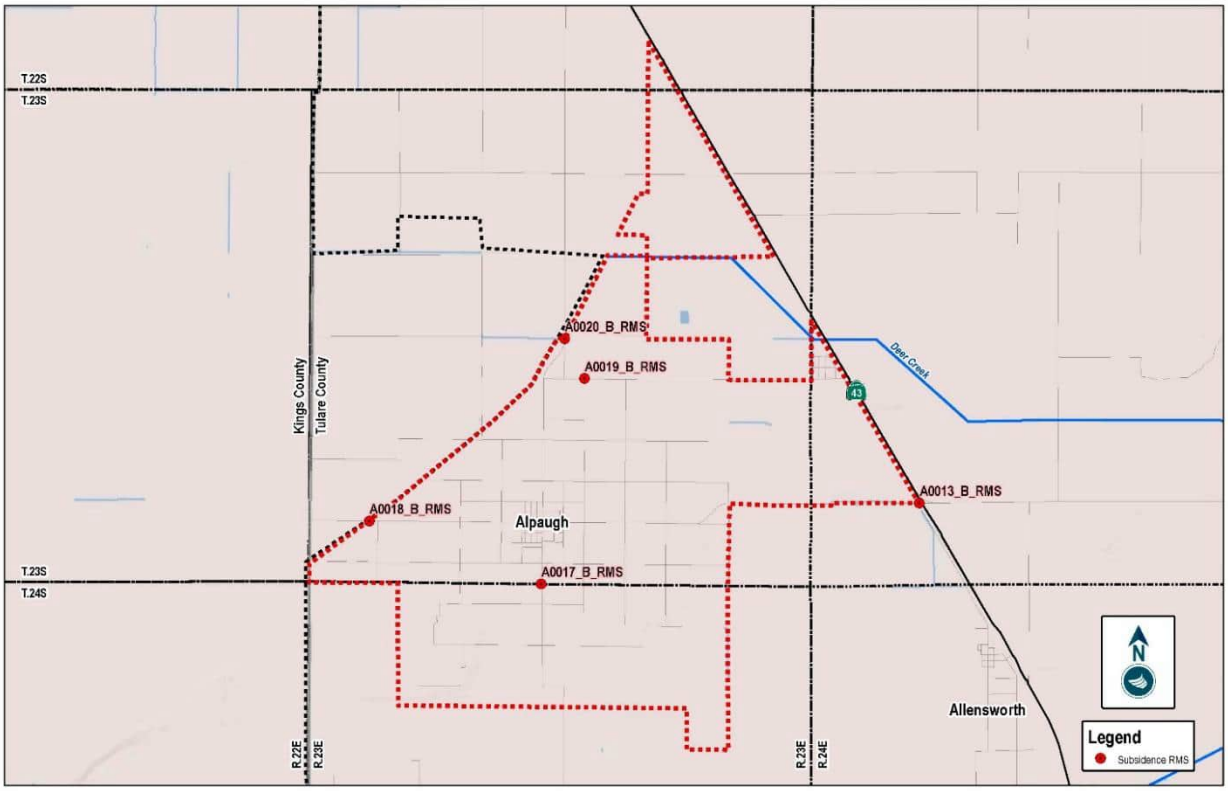


Table 4-4. RMS for Monitoring Land Subsidence

RMS ID	Management Area	GPS Coordinates Latitude	Longitude
A0013_B_RMS	Alpaugh ID Service Area	35.89131	-119.40555
A0017_B_RMS	Alpaugh ID Service Area	35.87675	-119.48743
A0018_B_RMS	Alpaugh ID Service Area	35.88767	-119.52478
A0019_B_RMS	Alpaugh ID Service Area	35.91294	-119.47832
A0020_B_RMS	Alpaugh ID Service Area	35.91993	-119.48266

4.2.3.6 Interconnect Surface Water § 354.34(c)(6)(A); § 354.34(c)(6)(B); § 354.34(c)(6)(C); § 354.34(c)(6)(D)

23 Cal. Code Regs. § 354.34 Monitoring Network. (c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*

(6) *Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:*

(A) *Flow conditions including surface water discharge, surface water head, and baseflow contribution.*

(B) *Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.*

(C) *Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.*

(D) *Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.*

Interconnected surface water does not occur in the Tule Subbasin for reasons described in **Chapter 2.3.6** of the Tule Subbasin Setting.

4.3 Assessment and Improvement of Monitoring Network § 354.38(a); § 354.38(e)(1); § 354.38(e)(2); § 354.38(e)(3); § 354.38(e)(4)

23 Cal. Code Regs. § 354.38 Assessment and Improvement of Monitoring Network*. (**a)** Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*

(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*

(1) *Minimum threshold exceedances.*

(2) *Highly variable spatial or temporal conditions.*

(3) *Adverse impacts to beneficial uses and users of groundwater.*

(4) *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

Chapter 4.0 of the TSMP provides the following general statement regarding the monitoring network developed for the Tule Subbasin:

> *"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."*

Annually, data would be collected that will provide for a better understanding of the groundwater conditions in the Tule Subbasin and how the actual groundwater conditions react to the projects and management actions proposed by each GSA within the subbasin. At a minimum, the monitoring network will be evaluated on 5-year basis and adjustments will be made accordingly. Additionally, when minimum threshold exceedances or adverse impacts to beneficial uses and users of groundwater within and adjacent to the subbasin occur, the monitoring networks will be evaluated for potential improvement to better understand the sources and causation leading to these occurrences.

4.3.1 Data Gaps § 354.38(b); § 354.38(c)(1); § 354.38(c)(2); § 354.38(d)

23 Cal. Code Regs. § 354.38 Assessment and Improvement of Monitoring Network*. **(b)** Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*

(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*

(1) *The location and reason for data gaps in the monitoring network.*

(2) *Local issues and circumstances that limit or prevent monitoring.*

(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*

Chapter 4.1 in the TSMP identifies data gaps with the Tule Subbasin and provides recommended features to address the data gaps.

Of the data gaps described in Chapter 4.1 of the TSMP, groundwater monitoring is the predominant data gap within Alpaugh GSA. To address the data gaps, new dedicated monitoring wells have been identified for monitoring the various aquifers within Alpaugh GSA and are described in Chapters 2.1.1.1 and 2.1.1.2 and shown on Figure A1-2 of the TSMP. Funding generating during the GSP Implementation Period, described in **Section 6.3** of this GSP, may be used to further develop the monitoring features where there are data gaps.

4.4 Reporting Monitoring Data to the Department § 354.40

23 Cal. Code Regs. § 354.40 Reporting Monitoring Data to the Department*. Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.*

Chapter 5.0 of the TSMP provides a detailed description of the Tule Subbasin Data Management System, that Alpaugh GSA will utilize for reporting monitoring data according to the standardized monitoring protocols at RMS discussed within this GSP.

Data stored in the DMS will be assembled in standardized formats as required for the annual and 5-year reports to the Department.

5. Projects and Management Actions

5.1 Introduction (Reg. §354.42)

This section describes the projects and management actions that Alpaugh GSA, its member agencies, and/or its regional partners intend to undertake to achieve the Sustainability Goal of the Tule Subbasin and maintain sustainable groundwater conditions thereafter over the planning and implementation horizon.

5.2 Projects and Management Actions (Reg. §354.44)

As a result of the Tule Subbasin's current status as a critically overdrafted basin (DWR 2019b) and the ongoing potential or trajectory of groundwater conditions within the Subbasin to cause undesirable results, Alpaugh GSA has identified the following projects and management actions that it may undertake as a means to establish groundwater sustainability:

1. Increased surface water capture and storage;
2. Changes to cropping patterns;
3. Reduction in nearby pumping through assertion of water rights; and
4. Acquisition or purchase of additional surface water supplies.

Each of the identified actions will increase the Tule Subbasin's overall ability to achieve its Sustainability Goal through one or more of the following effects:

Increased or optimized availability of sustainable water supplies;

Decreased consumptive use of non-sustainable groundwater supplies to mitigate overdraft;

Improved or stabilized groundwater levels;

Reduction or cessation of subsidence near critical infrastructure and across the local area; and

Improved or stabilized water quality for agronomic and municipal purposes.

It is anticipated that there are several actions wherein the agency coordinating and/or administering the undertaking of the action (hereafter, "Lead Entity") will be an agency other than Alpaugh GSA. In these circumstances, Alpaugh GSA is committed to collaborating with the appropriate Lead Entity and providing its support and/or approval, if necessary.

Each individual action includes a description that satisfies GSP regulations §354.44:

"§354.44. Projects and Management Actions.

(a) Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.

(b) Each Plan shall include a description of the projects and management actions that include the following:

(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent. The Plan shall include the following:

(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.

(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.

(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.

(3) A summary of the permitting and regulatory process required for each project and management action.

(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.

(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.

(6) An explanation of how the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.

(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.

(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.

(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

(c) Projects and management actions shall be supported by best available information and best available science.

(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions."

5.2.1 Action 1 – Increased Water Capture and Storage

5.2.1.1 Description

AID proposes to increase the levee height on two of its existing reservoirs in order to receive additional overflows from Deer Creek during periods of above-normal precipitation. The existing levees are approximately 2 feet in height and provide storage capacity of approximately 360 acre-feet. Increasing the levee height to 8 feet, with a water storage depth of 6 feet, would increase the storage capacity to approximately 1,460 acre-feet. A new canal turnout structure and pump station is proposed to make deliveries into the aboveground storage. The captured flows are proposed to be delivered through the AID system to offset groundwater pumping. Captured flows will be measured and recorded. The proposed improvements are shown schematically on **Figure 5-1**.

5.2.1.2 Lead Entity

AID will be the lead entity for this action.

5.2.1.3 Circumstantial Considerations

AID is considering this project to offset an anticipated deficit in future water supply needs.

5.2.1.4 Public Notice Process

Public notice will be provided as a part of the California Environmental Quality Act (CEQA) review for the proposed project improvements.

5.2.1.5 Quantification of Water Budget Impact

Flow data for the residual stream flow in the Deer Creek channel at the AID canal is currently unavailable. However, AID staff indicates that sufficient flows have been available in past years such that the basins could be filled two to three times per year every 2 years.

Assuming flows occur twice per year every other year, it is anticipated that there will be a net reduction of average annual groundwater pumping within AID of approximately 1,380 acre-feet/year as a result of this action.

5.2.1.6 Permitting and Regulatory Process

The project will be subject to CEQA review. Additional regulatory permits are not anticipated but may be identified during the design process.

5.2.1.7 Timeline

AID anticipates implementation of Action 1 within 3 to 5 years. Preliminary engineering activities are anticipated to include geotechnical investigations, land surveying, hydraulic analysis, and CEQA documentation. These preliminary activities would be followed by engineering design and construction of the levees, turnout and pump structures, electrical and control systems. A preliminary timeline is presented below.

Preliminary Engineering and CEQA analysis – 12 months;

Engineering design – 12 months; and

Construction – 12 months.

5.2.1.8 Anticipated Benefits

Implementation of Action 1 is anticipated to result in additional surface water deliveries of approximately 1,380 acre-feet/year to AID and a corresponding reduction in groundwater pumping.

5.2.1.9 Evaluation of Benefits

Evaluation of the benefits of Action 1 will be based on the measurement of captured flows placed in storage. The flow measurements will be included in the annual reporting to Alpaugh GSA.

5.2.1.10 Accomplishment

If implemented, this action will be accomplished through the process described in the timeline (**Section 5.2.1.7**). Accomplishment of this action assumes the sufficient availability of Deer Creek overflows.

5.2.1.11 Legal Authority

AID as a California Irrigation District has the legal authority to undertake this action.

5.2.1.12 Cost and Funding

Cost: Implementation of this action involves the design and construction of improved levees at two existing AID reservoirs to increase the total height to 8 feet (6 feet maximum water depth) and a canal turnout and pump station to deliver water into the resulting aboveground storage. A preliminary cost estimate for implementation of the action is provided in Table 5-1. Refinement of the action and its associated costs would occur during the engineering design activities described in the timeline (**Section 5.2.1.7**).

Table 5-1. Preliminary Cost Estimate for Action 1

Item Number	Item Description	Estimated Cost
1	Earthwork – Levee Height Increase	$5,000,000
2	Canal, Turnout, and Pump Station Improvements	$600,000
SUBTOTAL		$5,600,000
	Design and Contingencies - 30%	$1,680,000
TOTAL		**$7,280,000**

The action will result in increased operation and maintenance (O&M) costs to AID. Ongoing annual O&M costs for facilities are generally estimated to be in the range of 2% of the construction costs. Pumping energy costs will also be incurred for deliveries to the reservoirs. However, these energy costs are anticipated to be insignificant when compared to the energy savings due to avoided groundwater pumping.

Funding: AID anticipates using internal funding for this action.

5.2.1.13 Drought Offset Measures

Drought offset measures are not applicable to this action.

5.2.1.14 Corresponding Attachments

Figure 5-1

5.2.2 Action 2 – Changes to Cropping Patterns

5.2.2.1 Description

Reduction in the overall water use of Alpaugh GSA may be achieved through changes in cropping patterns from one crop type to another with a lower consumptive use per acre or through selective land fallowing. While the choice of crop type is ultimately up to the individual landowner, AID may develop a plan to encourage cropping pattern changes to meet the groundwater Sustainability Goals of the GSA. The following is presented to describe a possible direction based on current cropping patterns within AID and expected water supply needs.

Recent (2018) cropping within the GSA boundaries is estimated to be as follows:

Alfalfa – 2,200 acres,

Grain – 2,000 acres,

Pistachio – 2,2000 acres, and

Pomegranate – 600 acres.

The remainder, or 7,360 acres, of the total 14,360 acres within the GSA boundaries, is fallow or unfarmed.

Crop evapotranspiration (ETc) values have been developed by the Irrigation Training Resource Center (ITRC) for the various crop types by the DWR California Irrigation Management Information System potential evaporation (ETo) Zones (ITRC 2003). The estimated annual ETc values in acre-feet per acre (acre-feet/acre) for the crop types within AID are shown in Table 5-2 below for Zone 15, dry year (annual precipitation of 6.35 inches). It should be noted that the values of ETc include crop use from precipitation as shown in the ETc value for idle land.

Table 5-2. Estimated ETc for Crops within AID

Crop	Estimated Annual ETc (acre-feet/acre)[1]
Alfalfa	4.0
Grain	1.4
Immature Pistachio	2.0
Pistachio	3.0
Immature Pomegranate	3.3
Pomegranate	2.3
Idle (fallow)	0.4

Notes:

ETc: Evapotranspiration from crop consumptive use

Estimated water needs based on the current cropping within Alpaugh GSA and assuming mature pistachio and pomegranate trees are shown in Table 5-3.

Table 5-3. Estimated Current Cropping Pattern and Water Needs

Crop[1]	Gross (acres)	Net (acres)[2]	Annual ETc[3] (acre-feet/acre)	(acre-feet/year)
Alfalfa	2,200	2,090	4.0	8,300
Grain	2,000	1,900	1.4	2,600
Pistachio	2,200	2,090	3.0	6,200
Pomegranate	600	570	3.3	1,900
Idle	7,360	6,990	0.4	2,700
Totals	**14,360**	**13,640**		**21,700**

Notes:

Based on recent (2018) cropping estimates and assuming mature pistachio and pomegranate trees.

Net acreage estimated at 95% of gross acres.

Crop consumptive use per ITRC for Zone 15, dry year.

Potential crop pattern changes were assumed to be limited to annual crops such as grain and alfalfa. It is assumed that acreage planted to permanent crops would remain because much of that acreage is recently planted. However, the economic feasibility of changes in cropping patterns will need to be evaluated by AID and individual landowners to determine how best to implement this action.

Reducing the cropped acreage for alfalfa would have the greatest potential for water savings due to its higher ETc value. This reduction may be made economically feasible by the installation of subsurface drip irrigation (SDI) systems on a portion of the existing cropped acreage. Published data by the University of California, Davis indicate that a 25 to 40% increase in crop yield can be achieved through the installation of SDI systems with alfalfa (University of California Cooperative Extension 2014). In other words, the same yield of alfalfa can potentially be grown on 25 to 40% less acreage. The increased irrigation efficiency with SDI will also result in a decrease in groundwater pumping costs. These benefits would need to be compared against the SDI system installation and O&M costs as a part of the overall evaluation.

Table 5-4 provides a potential future cropping pattern assuming a reduction in alfalfa acreage of approximately 40 percent to 1,320 acres. This could result in an additional 880 unfarmed acres. The acreage of the remaining crops is assumed to be unchanged and crop water requirements for pomegranate and pistachios are based on mature crops. As a part of this action, installation of SDI is proposed for the 1,320 Alfalfa acres as well as 580 acres of grain (for a total of 1,900 acres) to allow for crop rotation in future years.

Table 5-4. Potential Future Cropping Pattern with SDI on Alfalfa

Crop	Gross (acres)	Net (acres)[1]	Annual ETc[2] (acre-feet/acre)	(acre-feet/year)
Alfalfa[3]	1,320	1,250	4.0	4,900
Grain	2,000	1,900	1.4	2,600
Pistachio	2,200	2,090	3.0	6,200
Pomegranate	600	570	3.3	1,900
Idle	8,240	7,830	0.4	3,000
Totals	**14,360**	**13,640**		**18,600**

Notes:

Net acreage estimated at 95% of gross acres.

Crop consumptive use per ITRC for Zone 15, dry year.

Assumes a 40% reduction in alfalfa acres from current estimated acreage and an associated 880-acre increase in idle or unfarmed acreage.

The estimated annual decrease in water usage, or increase in water left in groundwater storage, for proposed Action 2 would be the estimated ETc of 21,700 acre-feet/year from Table 5-3 minus the estimated ETc of 18,600 acre-feet/year from Table 5-4 or 3,100 acre-feet/year.

5.2.2.2 Lead Entity

AID will be the lead entity for this action.

5.2.2.3 Circumstantial Considerations

AID is considering this project to offset an anticipated deficit in future water supply needs.

5.2.2.4 Public Notice Process

Public notice is anticipated to be provided through landowner notices and public workshops. Other methods of public notice would depend on how the action is implemented. For example, changes to farm irrigation practices and equipment installed by landowners would not be subject to CEQA analysis.

5.2.2.5 Quantification of Water Budget Impact

The overall water budget impact of the proposed action is anticipated to be approximately 3,100 acre-feet/year.

5.2.2.6 Permitting and Regulatory Process

Regulatory permits are not anticipated for crop pattern changes and installation of farm irrigation systems.

5.2.2.7 Timeline

Implementation of Action 2 would be subject to additional evaluation and public input which are anticipated to include landowner workshops. The evaluation phase may include the development of an implementation plan that addresses incentives for participation in the program. The evaluation phase is anticipated to occur over several years. For purposes of analysis, the implementation of Action 2 is assumed to be phased in over a 10-year period from 2020 to 2030. The actual installation of the proposed SDI equipment can be accomplished in a few months.

5.2.2.8 Anticipated Benefits

Implementation of Action 2 is anticipated to result in a reduction in water usage of approximately 3,100 acre-feet/year. Other benefits include a reduction in groundwater pumping due to the increased irrigation efficiency of SDI.

5.2.2.9 Evaluation of Benefits

As set forth in the Coordination Agreement for the Tule Subbasin, crop and riparian evapotranspiration (ET) are to be estimated for the Tule Subbasin by utilizing sensing from Landsat satellites and the mapping ET at high resolution with internal calibration (METRIC) model. The Tule Subbasin Technical Advisory Committee will provide these data for Alpaugh GSA.

If implemented, evaluation of the benefits of Action 2 will be based on a comparison of the METRIC data provided annually to Alpaugh GSA to the estimated available water supplies for continued sustainability.

5.2.2.10 Accomplishment

If implemented, this action will be accomplished through the process described in the timeline (**Section 5.2.2.7**).

5.2.2.11 Legal Authority

AID as a California Irrigation District has the legal authority to undertake this action.

5.2.2.12 Cost and Funding

Cost: Implementation of this action involves the installation of SDI systems on acreage currently farmed with alfalfa as the primary crop. A total of 1,900 acres is included within this initial cost estimate based on the analysis provided under the Description (**Section 5.2.2.1**). The 1,900 acres represents 1,320 acres planted in alfalfa with 580 acres planted in grain to allow for crop rotation with alfalfa in future years.

The preliminary cost estimate for implementation of Action 2 is shown in Table 5-5. Cost information for the installation and operation of the SDI system was provided by Netafim (Netafim 2019; **Appendix C**). Installation of the SDI system improvements is estimated to be about $2,620 per acre. The SDI system will

require annual O&M to control rodents, make repairs, and flush the system to keep drip lines from clogging. These costs are estimated to be about $120 per acre per year.

Table 5-5. Preliminary Cost Estimate for Action 2

Item Number	Item Description	Estimated Quantity	Unit Cost	Estimated Cost
1	Installation of SDI System	1,900 acres	$2,620 per acre	$4,978,000
SUBTOTAL		N/A	N/A	$4,978,000
Contingencies		30%	N/A	$1,493,400
TOTAL				**$6,471,400**

Funding: Funding needs would be determined based on the results of the cost evaluation process. Installation of SDI systems would occur on individual farms, the owners of which would be responsible for their ongoing operation and maintenance. It is anticipated that funding would initially come from participating landowners, which may be eligible for loans or grants. AID may explore a future incentive program to encourage cropping pattern or irrigation system changes.

5.2.2.13 Drought Offset Measures

Drought offset measures are not applicable to this action.

5.2.2.14 Corresponding Attachments

Appendix C: Netafim Cost Data

5.2.3 Action 3 – Reduction in Nearby Pumping through Assertion of Water Rights

5.2.3.1 Description

AID has operated since 1915, putting pumped groundwater to beneficial agricultural use within the Tule Subbasin. As noted in **Section 2** and **Appendix B2**, the Tule Subbasin has been in a state of long-term overdraft for decades, to which SGMA legislation (in part) and this GSP are responding. Recently, despite the persistent basin-wide overdraft conditions, agricultural groundwater pumping has recently increased in "white areas" (land that is not within a water district), for example as noted in the Executive Summary of the Tri-County Water Authority GSP:

> *The Southeast Area is not in a water district (designated herein as a "white area") and relies entirely on groundwater. Irrigated agriculture was minimal in the Southeast Area until about the turn of the 21st century. Since that time there has been significant development of tree crops, mainly pistachios, in the area.*
>
> (Tri-County Water Authority 2019; Section ES-1, Introduction)

This new consumptive use of pumped groundwater is negatively impacting long-established agricultural operations within Alpaugh GSA, by engaging in consumptive use of groundwater to which Alpaugh GSA and its member entities are entitled. Over the last 30 years, Alpaugh GSA has recharged the Tule Subbasin at a rate of approximately 1,000 acre-feet/year, and is now asked to reduce their consumptive use of groundwater by over 75% in response to abuse of groundwater supplies by groundwater pumpers outside of Alpaugh GSA. In other words, Alpaugh GSA has been asked to repair undesirable conditions caused by others after decades of responsible groundwater management by Alpaugh GSA members.

If Alpaugh GSA is faced with accepting restrictions on activities that have been responsibly managed for decades because of pumping by pumpers with what Alpaugh GSA believes are junior water rights, Alpaugh GSA will pursue legal strategies that will result in less consumptive use of groundwater in or adjacent to the Tule Subbasin. The community of Alpaugh is severely disadvantaged economically (**Section 1.4.1.10**), and the reduction in agricultural activities that would be necessary in the absence of the historical water supply would cause great economic harm to the already-disadvantaged residents. Despite this, to maintain progress toward the SGMA Sustainability Goals, during each 5-year period beginning in 2025, Alpaugh GSA will, as management actions, seek to either identify additional surface-water supply; and/or identify equivalent reductions in acreage to reduce groundwater demand; and/or if Alpaugh GSA believes that it has superior water rights to third parties, Alpaugh GSA may seek to establish and/or exercise those superior water rights against an equivalent amount of pumping instead of or in addition to obtaining additional surface water supply or identifying reductions. Through either management actions or the assertion of its water rights, Alpaugh GSA will maintain the ability of its members to access groundwater in a sustainable fashion that continues AID's good stewardship of groundwater resources. If Alpaugh GSA asserts its water rights and is entirely successful, groundwater pumping in nearby areas will cease in an amount sufficient for the GSA to continue agricultural activities indefinitely, to approximately the same degree as the recent past.

5.2.3.2 Lead Entity

Alpaugh GSA will be the lead entity for this action.

5.2.3.3 Circumstantial Considerations

5.2.3.4 Alpaugh GSA is considering this project to offset an anticipated deficit in future water supply needs.

5.2.3.5 Public Notice Process

Public notice is anticipated to be provided through landowner notices and public workshops as required.

5.2.3.6 Quantification of Water Budget Impact

The water budget impact would be equal to the amount of groundwater pumping reduction achieved.

5.2.3.7 Permitting and Regulatory Process

Regulatory permitting requirements would depend on the specific groundwater pumpers that legal action is taken against.

5.2.3.8 Timeline

Implementation is assumed to occur gradually beginning in 2020 and achieving sustainability by 2040. The implementation schedule assumes that pumping equivalent to 20% of Alpaugh GSA's excess consumptive use of groundwater over its safe yield allocation will be eliminated by 2030, 50% by 2035, 80% by 2040, and 100% thereafter. Legal procedures and argumentation could take 7 to 10 years to complete.

5.2.3.9 Anticipated Benefits

The reduction in pumping outside of Alpaugh GSA would directly offset groundwater pumping in Alpaugh GSA.

5.2.3.10 Evaluation of Benefits

The reduction in pumping outside of Alpaugh GSA would be identified during legal procedures. The amount of groundwater pumping that is stopped by Action 3 will be tabulated and included in the annual accounting prepared for the GSA.

5.2.3.11 Accomplishment

Implementation of Action 3 would be subject to the additional water needs identified through the implementation of Actions 1 and 2.

5.2.3.12 Legal Authority

The GSA as a California GSA has the legal authority to undertake this action.

5.2.3.13 Cost & Funding

Cost: The cost of legal filings and litigation depends on the specific groundwater pumpers prescribed against, the legal advice they receive, and whether agreements are made or litigation is necessary. The preliminary estimated cost of this action is $1,000,000.

Funding: Funding of legal consultation is anticipated to be provided from the GSA's annual budget.

5.2.3.14 Drought Offset Measures

Drought offset measures are not applicable to this action.

5.2.3.15 Corresponding Attachments

None.

5.2.4 Action 4 – Acquisition or Purchase of Additional Surface Water Supplies

5.2.4.1 Description

AID may purchase additional surface water as needed to meet future demands not satisfied through the implementation of Actions 1, 2, and 3. The amount purchased would be subject to the AID's needs and the cost of available supplies. With the implementation of Actions 1 and 2, a shortfall in future water supply needs of approximately 5,000 to 6,000 acre-feet/year may still be incurred. Under Action 4, AID will investigate options for acquisition or purchase of additional water supplies.

5.2.4.2 Lead Entity

AID will be the lead entity for this action.

5.2.4.3 Circumstantial Considerations

AID is considering this project to offset an anticipated deficit in future water supply needs.

5.2.4.4 Public Notice Process

Public notice is anticipated to be provided through landowner notices and public workshops and CEQA documentation as required for the water source.

5.2.4.5 Quantification of Water Budget Impact

The water budget impact would be equal to the surface water purchased or acquired.

5.2.4.6 Permitting and Regulatory Process

Regulatory permitting requirements would depend on the water source.

5.2.4.7 Timeline

Implementation of Action 4 would be subject to the additional water needs identified through the implementation of Actions 1 and 2. Implementation is assumed to occur gradually beginning in 2025 and achieving sustainability by 2040.

5.2.4.8 Anticipated Benefits

The acquisition or purchase of additional supplies would directly offset groundwater pumping.

5.2.4.9 Evaluation of Benefits

The quantity of surface water entering AID will be measured and included in the annual accounting prepared for the GSA.

5.2.4.10 Accomplishment

Implementation of Action 4 would be subject to the additional water needs identified through the implementation of Actions 1 and 2.

5.2.4.11 Legal Authority

AID as a California Irrigation District has the legal authority to undertake this action.

5.2.4.12 Cost and Funding

Cost: The cost of surface water would depend on the quantity, source, and timing of water purchases. Assuming a purchase price of $500 per acre-feet for 5,000 acre-feet/year, the preliminary estimated annual cost would be $2,500,000.

Funding: Funding of additional water purchases is anticipated to be provided from the AID's annual budget.

5.2.4.13 Drought Offset Measures

Drought offset measures are not applicable to this action.

5.2.4.14 Corresponding Attachments

None.

6. GSP Implementation

This section discusses GSP implementation, including estimated costs and funding sources, schedule, and reporting on GSP progress. This section satisfies the following GSP regulations:

"§354.6 (e) An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs."

"§350.4 (f) A Plan will be evaluated, and its implementation assessed, consistent with the objective that a basin be sustainably managed within 20 years of Plan implementation without adversely affecting the ability of an adjacent basin to implement its Plan or achieve and maintain its sustainability goal over the planning and implementation horizon."

6.1 GSP Implementation Cost Estimate

The estimated costs associated with the implementation of the Alpaugh GSP are presented in Table 6-1 below.

Table 6-1. Estimated Costs for GSP Implementation

Item	Description	Estimated Cost
Annual Monitoring	Annual monitoring for water elevations, water quality, and subsidence	$25,000
Projects and Management Actions	See Section 5 for description of projects and management actions	Action 1: $7,280,000
		Action 2: $6,471,400
		Action 3: $1,000,000
		Action 4: up to $2,500,000/year at $500/acre-foot
Annual Report	Annual reporting per DWR requirements	$25,000
Administration of GSA	Administration, legal, data management, coordination with adjacent GSAs	$100,000
5-Year GSP Update and Report	GSP update per DWR requirements	$200,000

6.2 GSP Implementation Schedule

Section 5 presents projects and management actions that will help to achieve sustainability during the 20-year period ending in 2040. A schedule summarizing the timing of projects, management actions, and reporting is presented in Table 6-2.

Table 6-2. Estimated GSP Implementation Schedule

Year(s)	Description
2020	Public outreach
2020-2040+	Annual monitoring for water elevations, water quality, and subsidence
2025, 2030, 2035, 2040	Submit 5-year GSP Update and Assessment
2020-2030	Implement Management Actions 1 and 2
2020-2030	Implement 20% of Management Action 3 or 4
2030-2035	Implement 50% of Management Action 3 or 4
2035-2040	Implement 80% of Management Action 3 or 4
2040+	Sustainable; 100% of Management Action 3 or 4 implemented

A projected schedule of water budget impacts is provided as Table 6-3, assuming successful completion of Action 1 and 2, and successful implementation of Action 3, Action 4, or some combination of the two. The combined impact of the Actions on Alpaugh GSA's consumptive use of groundwater is also depicted on **Figure 6-1**.

Table 6-3. Projected Alpaugh GSA Action Impacts to the Water Budget

Water Year	Agricultural Consumptive Use of Groundwater (acre-feet)	Municipal Consumptive Use of Groundwater (acre-feet)	Surface Water Deliveries (acre-feet)	Action 1: Increased Water Capture and Storage (acre-feet)	Action 2: Changes to Cropping Patterns (acre-feet)	Action 3 and/or 4: Reduction in Nearby Pumping and/or Increased Surface-Water Purchases (acre-feet)
2020	10,366	121	3,680	275	-	-
2021	10,366	121	3,680	275	-	-
2022	10,056	121	3,680	275	310	-
2023	9,746	121	3,680	275	620	-
2024	9,436	121	3,680	275	930	-
2025	9,126	121	3,680	275	1,240	-
2026	6,670	121	3,680	1,375	1,550	1,046
2027	6,422	121	3,680	1,375	1,860	984
2028	6,174	121	3,680	1,375	2,170	922
2029	5,926	121	3,680	1,375	2,480	860
2030	5,678	121	3,680	1,375	2,790	798
2031	4,327	121	3,680	1,375	3,100	1,840
2032	4,327	121	3,680	1,375	3,100	1,840
2033	4,327	121	3,680	1,375	3,100	1,840
2034	4,327	121	3,680	1,375	3,100	1,840
2035	4,327	121	3,680	1,375	3,100	1,840
2036	3,223	121	3,680	1,375	3,100	2,943
2037	3,223	121	3,680	1,375	3,100	2,943
2038	3,223	121	3,680	1,375	3,100	2,943
2039	3,223	121	3,680	1,375	3,100	2,943
2040	3,223	121	3,680	1,375	3,100	2,943
2040+	2,487	121	3,680	1,375	3,100	3,679

Notes:

- = No change.

6.3 Sources of Funding

Alpaugh GSA has the authority to impose fees, charges, and assessments as needed to finance the implementation of the GSP including the projects and management actions identified in **Section 5**. Alpaugh GSA may also pursue alternative funding sources such as state or federal grants or loans. Alpaugh GSA has identified several potential sources to fund GSP implementation. As the GSP is implemented and updated, funding sources may change.

Potential sources of funding include:

Alpaugh GSA general fund,

Irrigation district general funds,

Land-based assessment fees,

Over-pumping penalties,

Grant programs, and

Federal and state agency programs.

6.4 Reporting

Alpaugh GSA will participate in the monitoring programs outlined in **Section 4** and detailed in the TSMP. Monitoring data will be used to evaluate progress toward the sustainability goal and to identify whether undesirable results are occurring or approaching. Monitoring data will be reported to and maintained in the data management system discussed in Section 5 of the TSMP. Annual reporting and 5-year assessments will be used by Alpaugh GSA to guide decisions regarding projects and management actions and will be made available to Subbasin stakeholders.

6.4.1 Annual Reporting

Annual reports of groundwater conditions and GSP progress will be submitted to DWR beginning on April 1, 2020, and made available to Tule Subbasin stakeholders. In addition to providing monitoring data to DWR, annual reports will be used by Alpaugh GSA to compare monitoring data to the sustainable management criteria, and to adjust projects and management actions as needed to achieve and maintain sustainability. The requirements for annual reports are reproduced below:

"§356.2 Annual Reports. Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(a) General information, including an executive summary and a location map depicting the basin covered by the report.

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:

(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.

(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.

(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.

(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.

(4) 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. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.

(5) Change in groundwater in storage shall include the following:

(A) Change in groundwater in storage maps for each principal aquifer in the basin.

(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.

(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report."

6.4.2 5-year GSP Assessments

5-year GSP assessment reports will be submitted to DWR beginning in 2025 and made available to Tule Subbasin stakeholders. The 5-year assessments will report on Alpaugh GSA's progress toward achieving The Sustainability Goal in the Subbasin. The requirements for annual reports are reproduced below:

"§356.4. Periodic Evaluation by Agency. Each Agency shall evaluate its Plan at least every five years and whenever the Plan is amended, and provide a written assessment to the Department. The assessment shall describe whether the Plan implementation, including implementation of projects and management actions, are meeting the sustainability goal in the basin, and shall include the following:

(a) A description of current groundwater conditions for each applicable sustainability indicator relative to measurable objectives, interim milestones and minimum thresholds.

(b) A description of the implementation of any projects or management actions, and the effect on groundwater conditions resulting from those projects or management actions.

(c) Elements of the Plan, including the basin setting, management areas, or the identification of undesirable results and the setting of minimum thresholds and measurable objectives, shall be reconsidered and revisions proposed, if necessary.

(d) An evaluation of the basin setting in light of significant new information or changes in water use, and an explanation of any significant changes. If the Agency's evaluation shows that the basin is experiencing overdraft conditions, the Agency shall include an assessment of measures to mitigate that overdraft.

(e) A description of the monitoring network within the basin, including whether data gaps exist, or any areas within the basin are represented by data that does not satisfy the requirements of Sections 352.4 and 354.34(c). The description shall include the following:

(1) An assessment of monitoring network function with an analysis of data collected to date, identification of data gaps, and the actions necessary to improve the monitoring network, consistent with the requirements of Section 354.38.

(2) If the Agency identifies data gaps, the Plan shall describe a program for the acquisition of additional data sources, including an estimate of the timing of that acquisition, and for incorporation of newly obtained information into the Plan.

(3) The Plan shall prioritize the installation of new data collection facilities and analysis of new data based on the needs of the basin.

(f) A description of significant new information that has been made available since Plan adoption or amendment, or the last five-year assessment. The description shall also include whether new information warrants changes to any aspect of the Plan, including the evaluation of the basin setting, measurable objectives, minimum thresholds, or the criteria defining undesirable results.

(g) A description of relevant actions taken by the Agency, including a summary of regulations or ordinances related to the Plan.

(h) Information describing any enforcement or legal actions taken by the Agency in furtherance of the sustainability goal for the basin.

(i) A description of completed or proposed Plan amendments.

(j) Where appropriate, a summary of coordination that occurred between multiple Agencies in a single basin, Agencies in hydrologically connected basins, and land use agencies.

(k) Other information the Agency deems appropriate, along with any information required by the Department to conduct a periodic review as required by Water Code Section 10733."

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Figures

COSUMNES

EASTERN SAN JOAQUIN

TRACY

MODESTO

TURLOCK

MERCED

DELTA-MENDOTA

CHOWCHILLA

MADERA

KINGS

WESTSIDE

KAWEAH

PLEASANT VALLEY

TULARE LAKE

TULE

KETTLEMAN PLAIN

KERN COUNTY

WHITE WOLF

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY

N

0 10 20 Miles

1 " = 20 miles

Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

San Joaquin Valley Basin Regional Map

Date 07/2022	Jacobs	Figure 1-1
Project No. W8Y18200		

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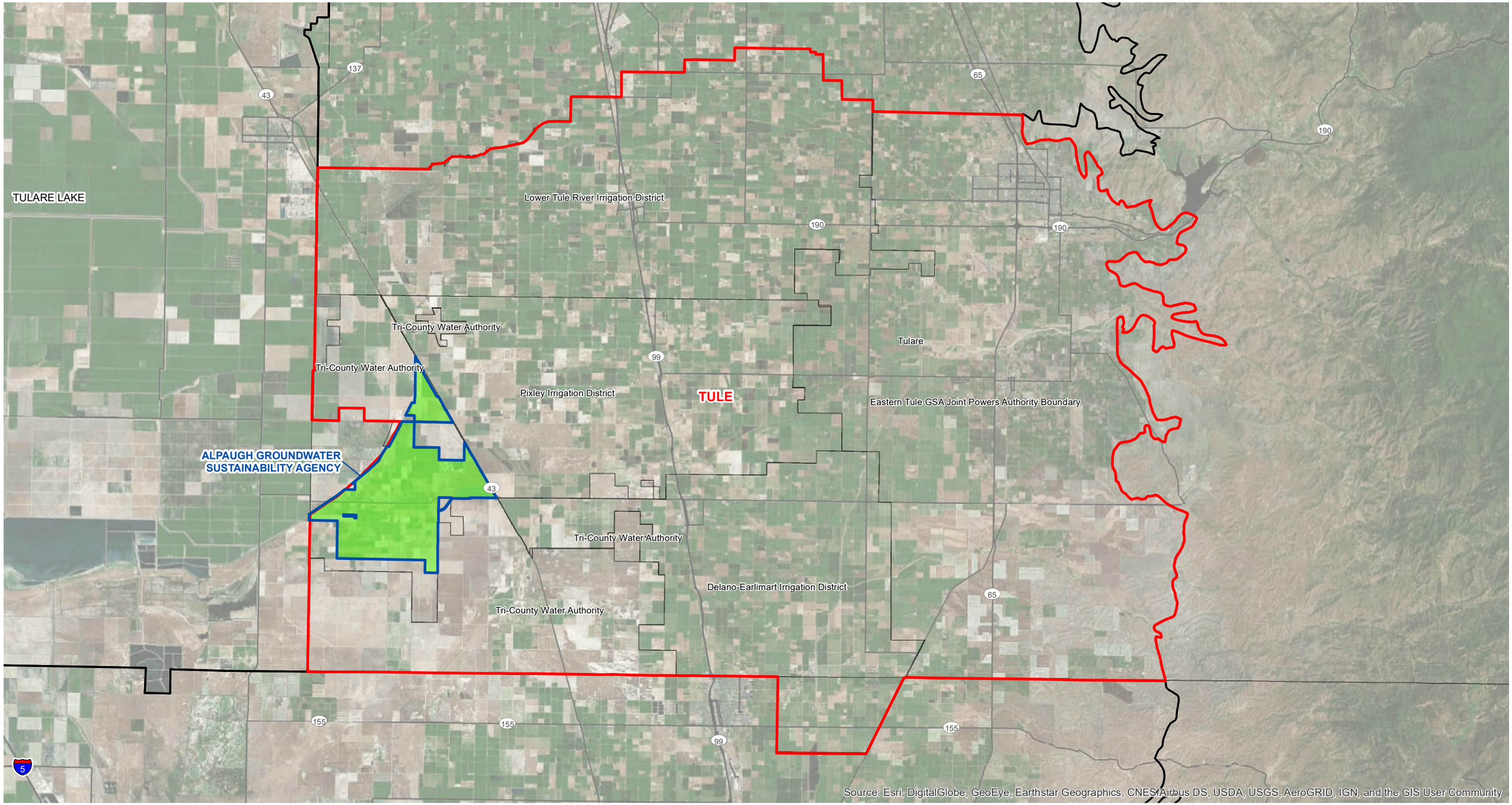

LEGEND

ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY

N

0 10,000 20,000 Feet

1 " = 20,000 feet

Tule Subbasin of the San Joaquin Valley Basin Regional Map

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 1-2

Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

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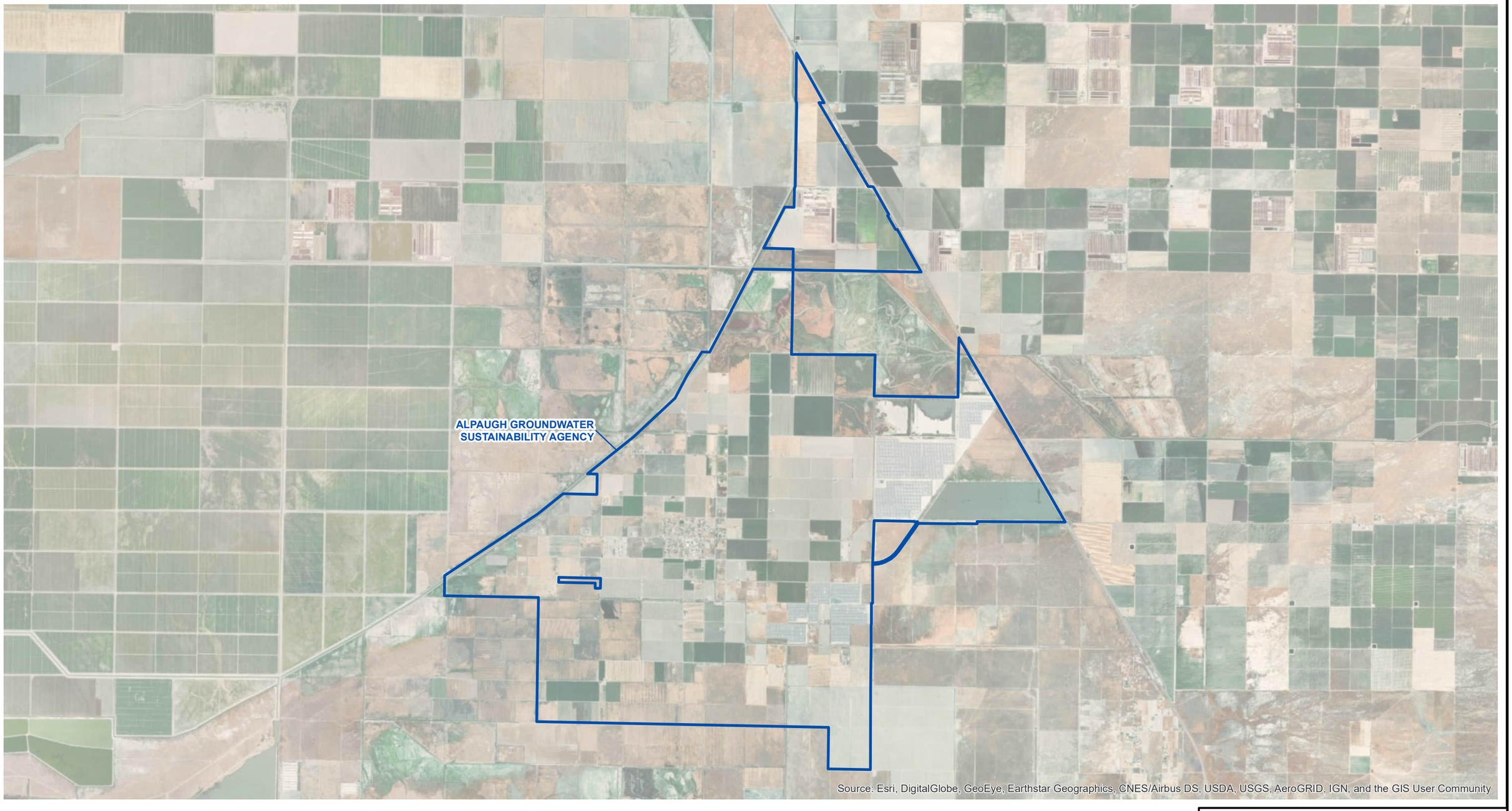

N

0 3,000 6,000 Feet

1 " = 6,000 feet

Alpaugh Groundwater Sustainability Agency Map

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 1-3

Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

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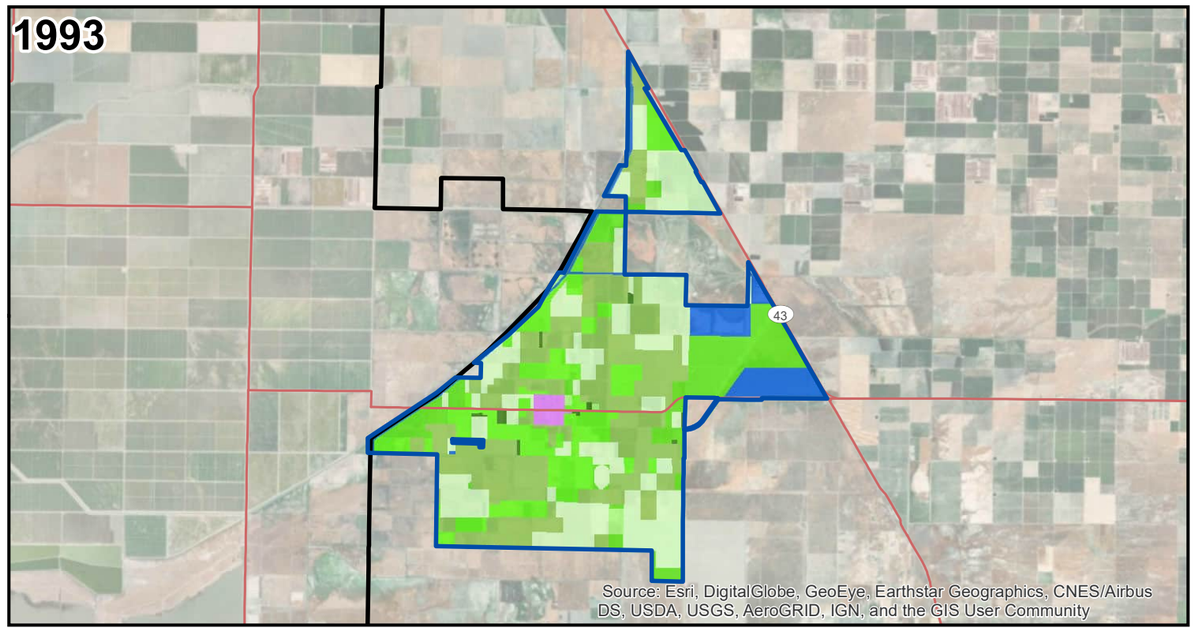

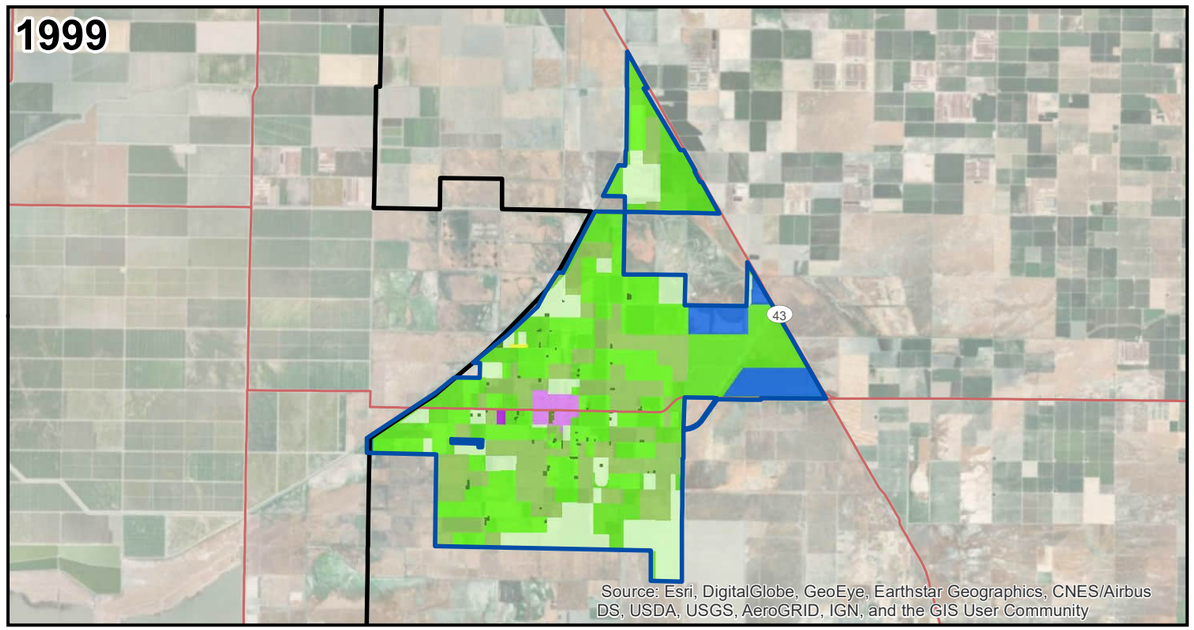

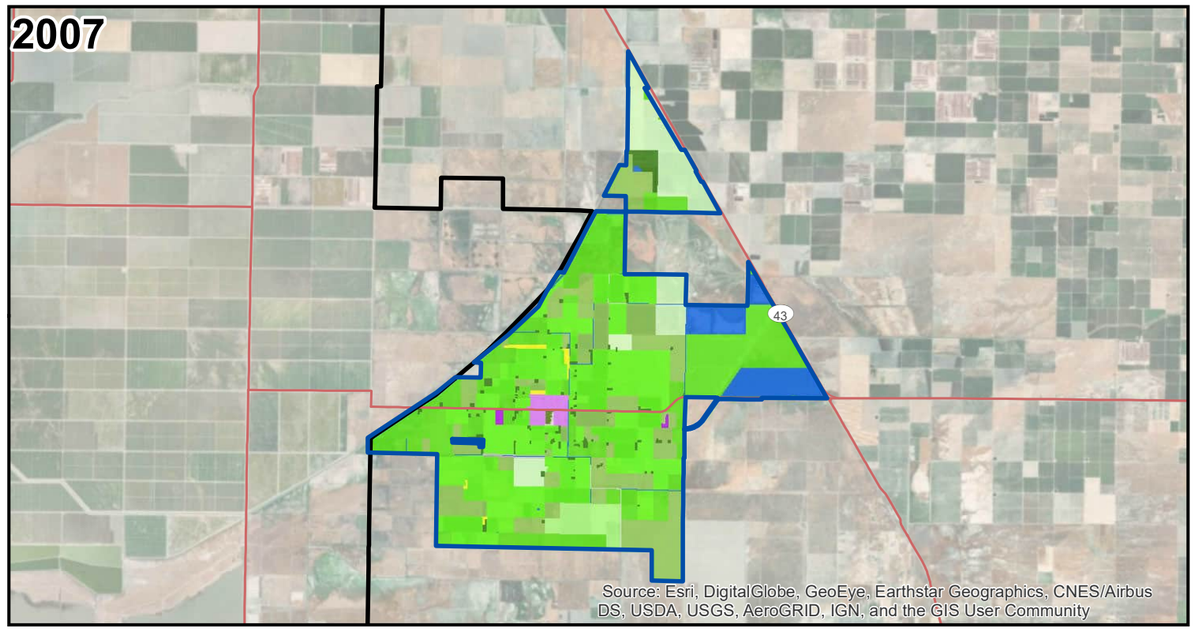

Legend

- Alpaugh Groundwater Sustainability Agency
- Agricultural Land Use, Field Crops
- Agricultural Land Use, Grain and Hay Crops
- Agricultural Land Use, Idle
- Agricultural Land Use, Pasture
- Native Vegetation, Native Vegetation
- Native Vegetation, Water Surface
- Semiagricultural Land Use, Semiagricultural and Incidental
- Urban Land Use, Urban
- Urban Land Use, Urban - Industrial
- Urban Land Use, Urban - Residential
- Urban Land Use, Urban - Landscape
- Urban Land Use, Urban - Vacant
- Unclassified, Outside Study Area

N

0 6,500 13,000 Feet

1 " = 13,000 feet

Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

Land Use Map

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 1-4

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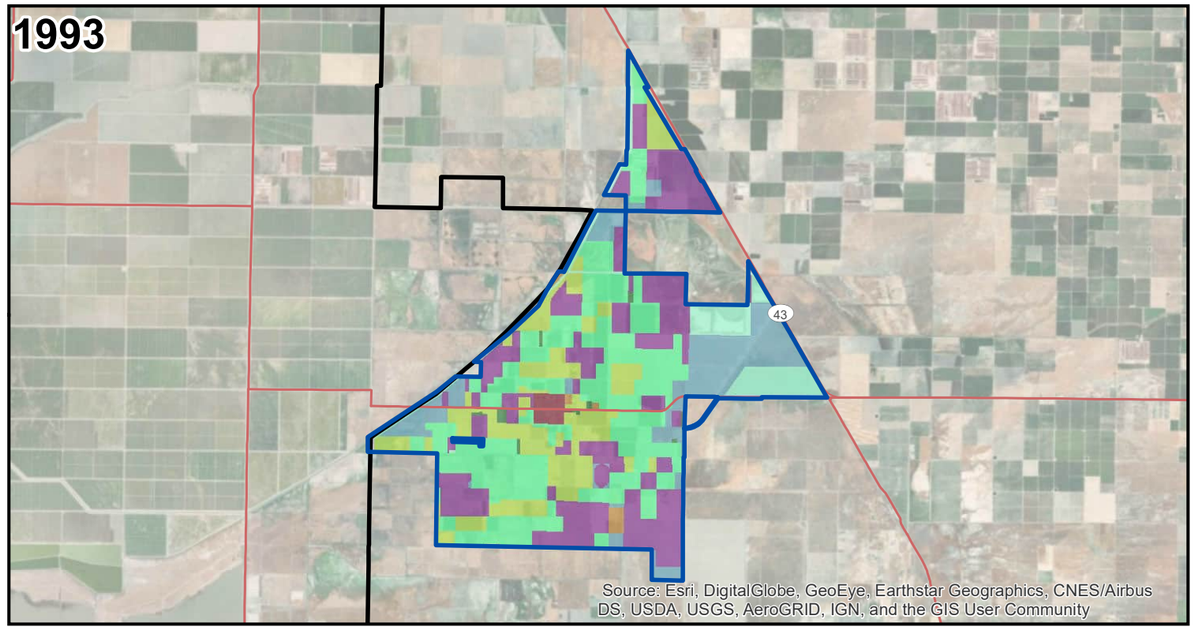

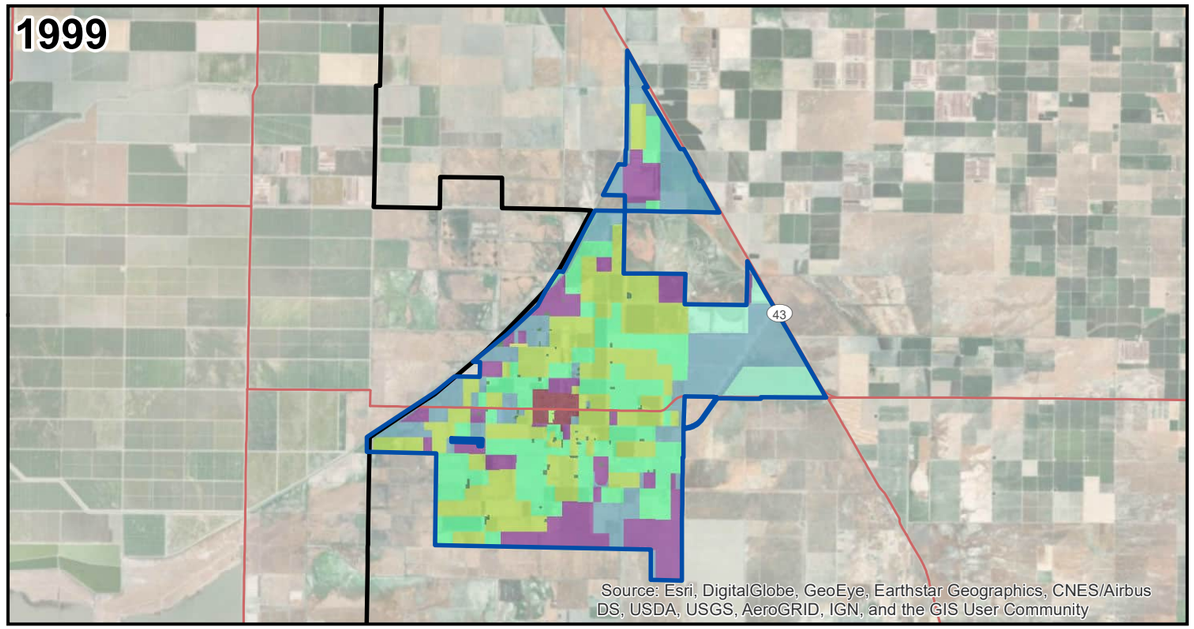

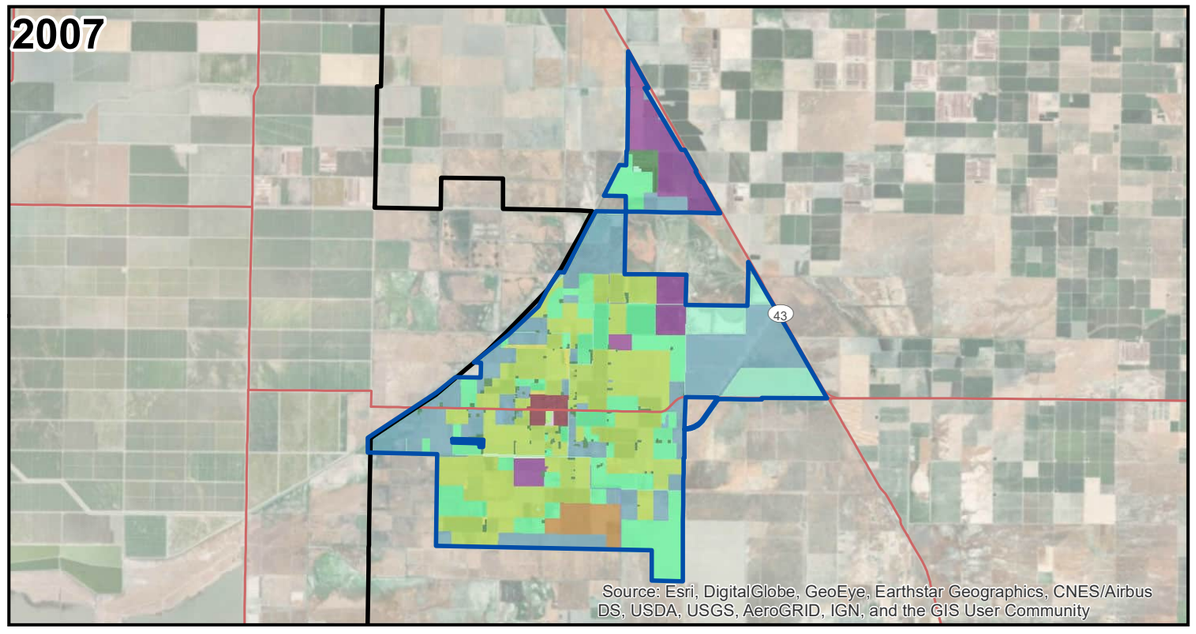

Legend

- ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY
- ALL OTHER VALUES
- GRAIN AND HAY CROPS
- FIELD CROPS
- PASTURE
- IDLE
- SEMIAGRICULTURAL & INCIDENTAL TO AGRICULTURE
- NATIVE VEGETATION
- RIPARIAN VEGETATION
- WATER SURFACE
- URBAN
- URBAN LANDSCAPE
- INDUSTRIAL
- RESIDENTIAL
- VACANT

N

0 6,500 13,000 Feet

1 " = 13,000 feet

Crop Pattern Map

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 1-5

Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

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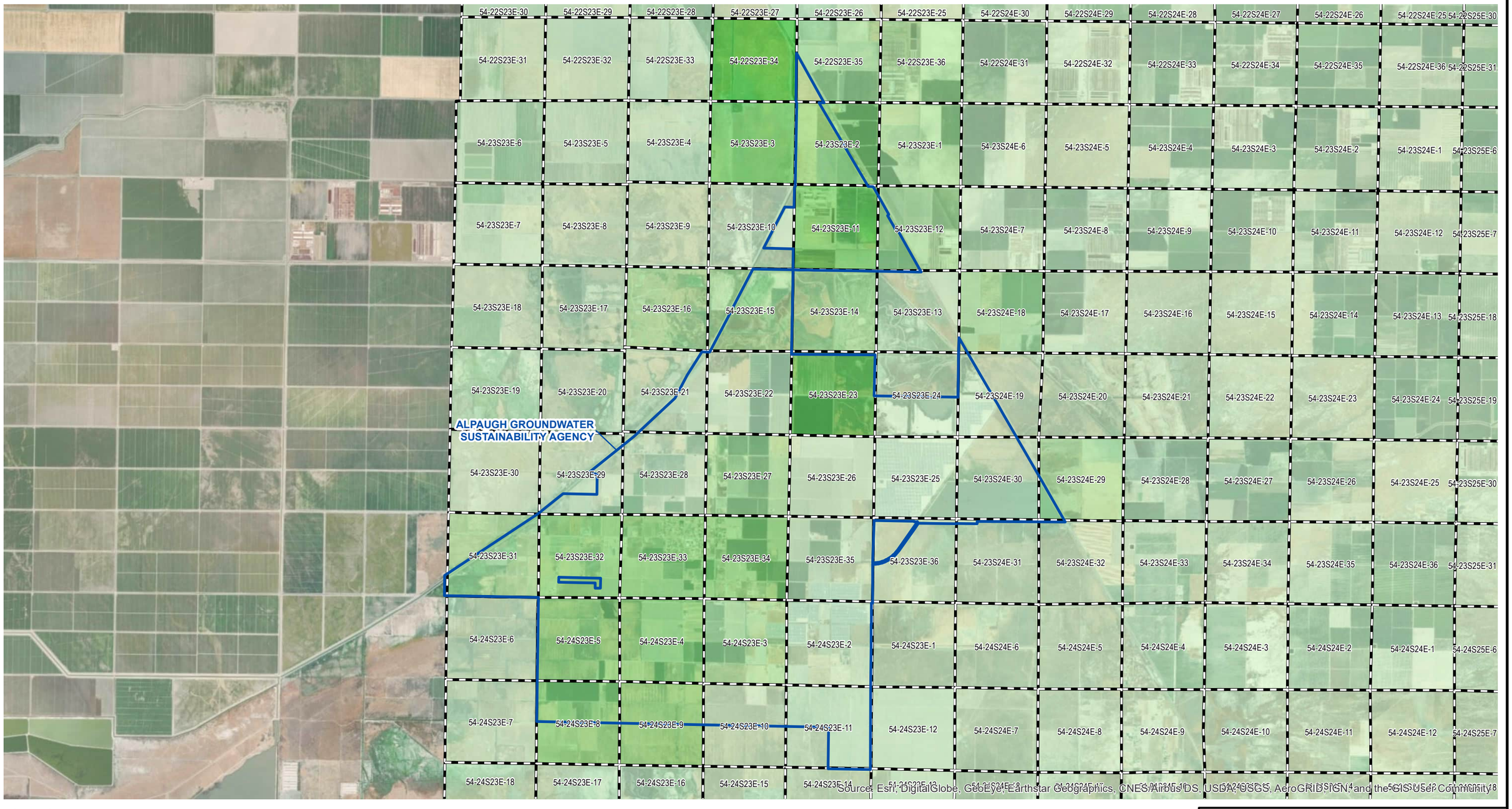

Legend

- Alpaugh Groundwater Sustainability Agency

WellCount

- 0 - 1
- 2 - 4
- 5 - 7
- 8 - 11
- 12 - 17

Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

Source:
i. Well density data obtained from the California Water Boards GAMA Groundwater Information System Website: https://geotracker.waterboards.ca.gov/gama/gamamap/public/default.asp?CMD=runreport&myaddress=35.88771421569641%2C+-119.48787864180298&zl=16# , accessed online on 1/16/2019.
ii. Where multiple logs were available for a single well location, only discrete well locations were counted.

N

0 3,000 6,000 Feet

1 " = 6,000 feet

Well Density

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 1-6

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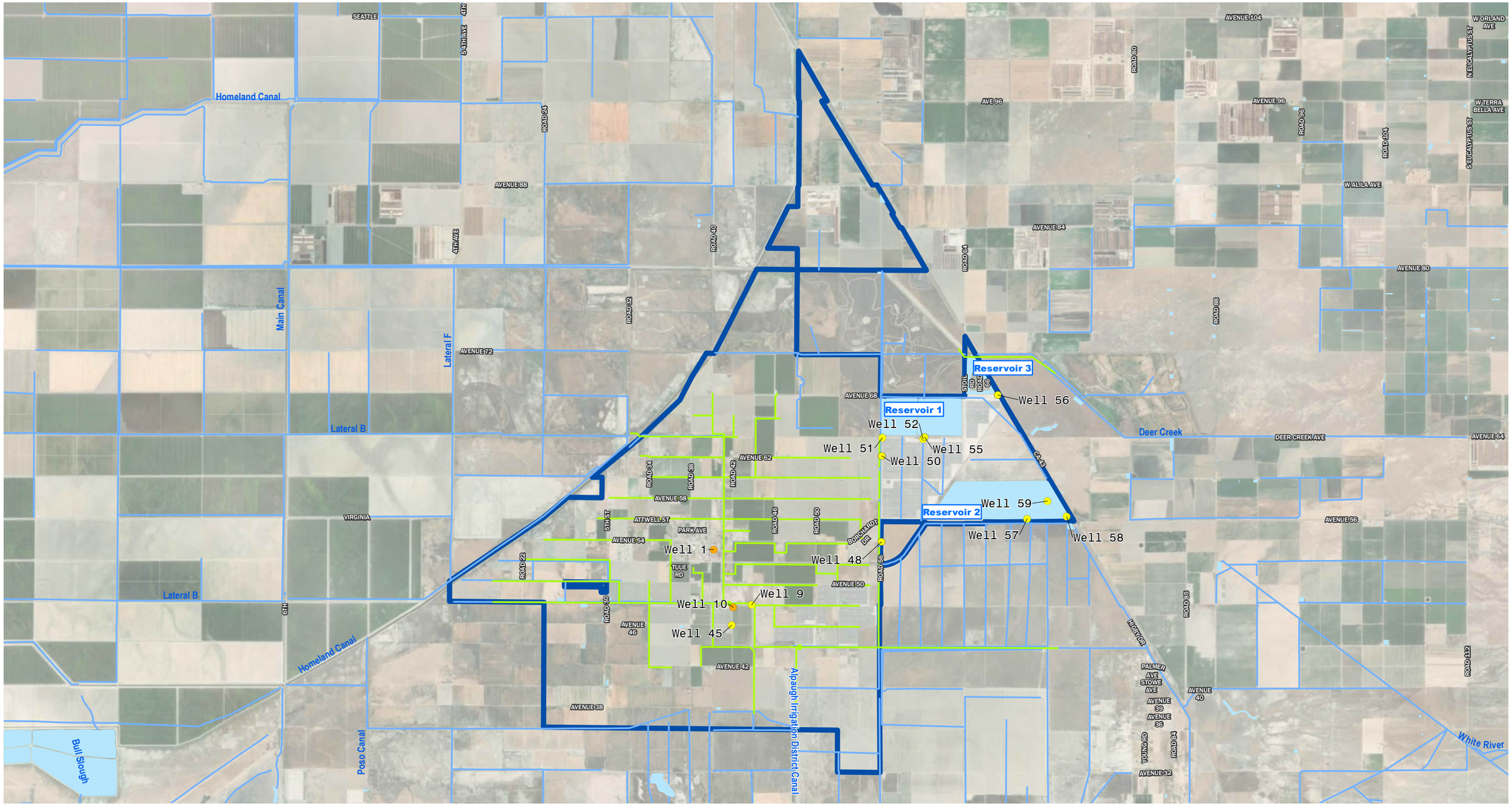

Legend

- Alpaugh Community Services District Water-Supply Well
- Alpaugh Irrigation District Water-Supply Well
- Canal - Alpaugh Irrigation District Water Irrigation System
- Canal Ditch
- Water Body
- Alpaugh Groundwater Sustainability Agency

Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

Source:
1. Alpaugh Irrigation District Water Irrigation System from Keller and Wegley CAD Drawing 4092.dwg
2. NHD = National Hydrography Dataset, version 2.2.1, downloaded from ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/Hydrography/NHD/State/HighResolution/GDB/NHD_H_California_State_GDB.zip

N

0 3,000 6,000 Feet

1 " = 6,000 feet

Surface Water Features and Infrastructure

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 1-7

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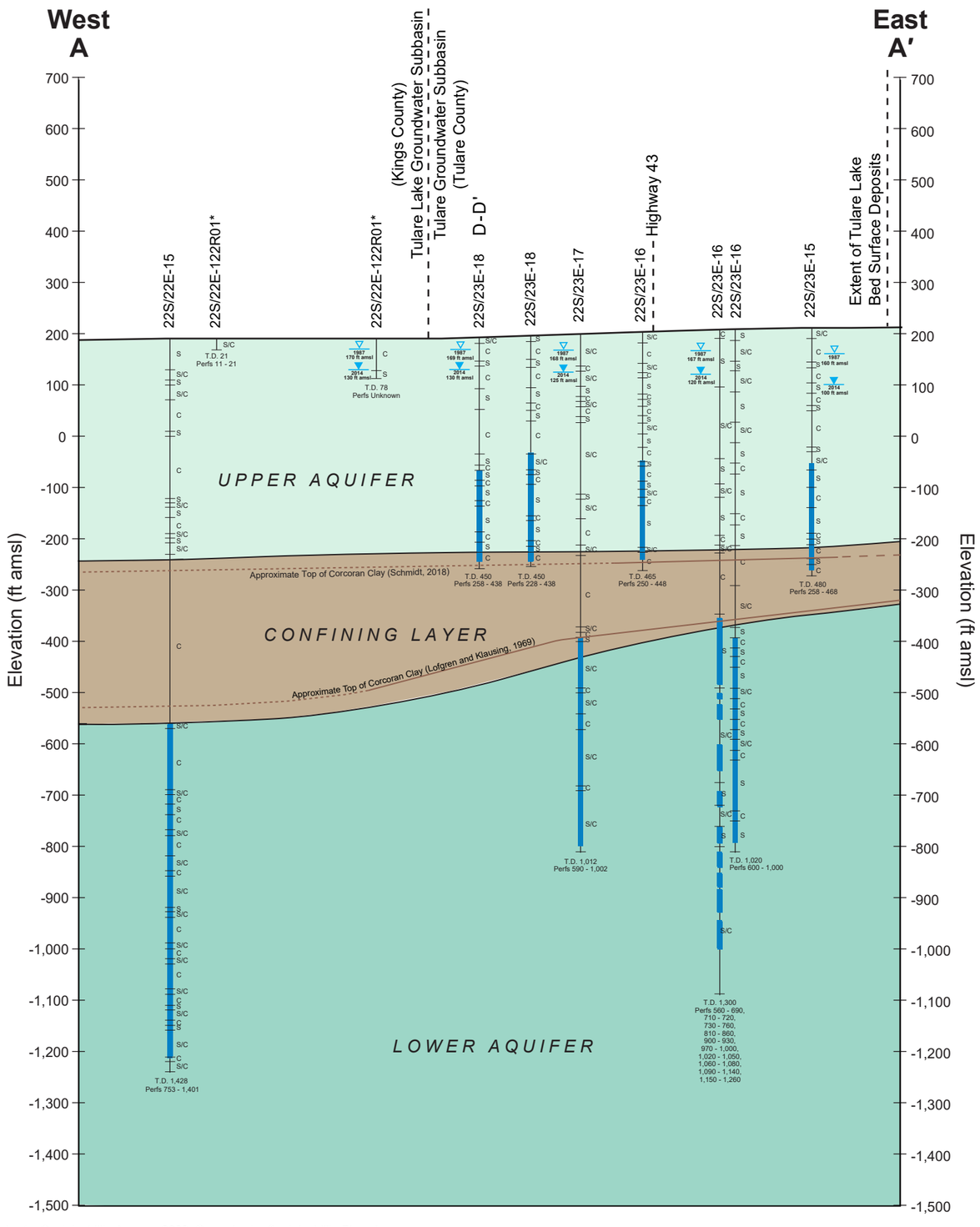
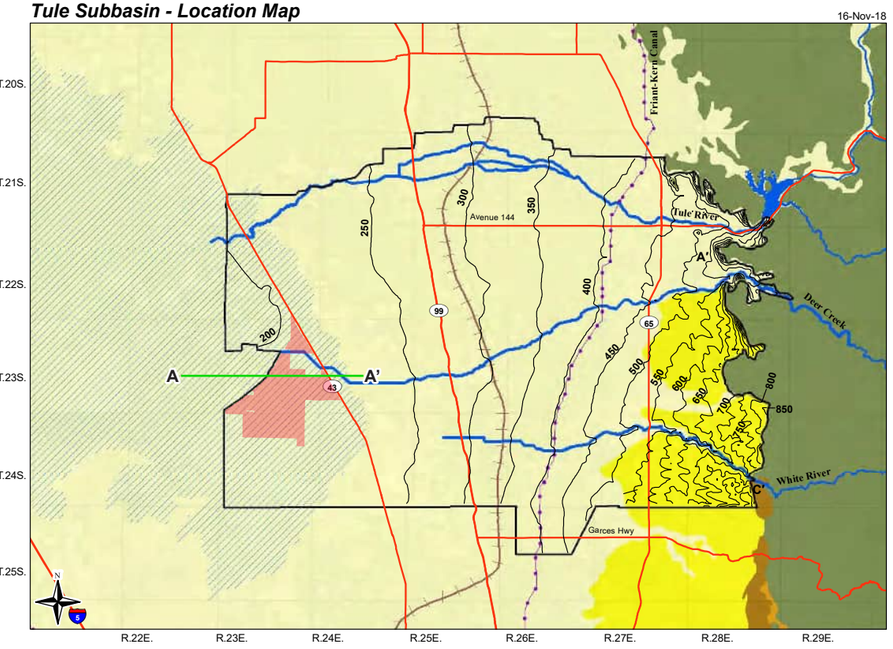


Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

Tule Subbasin - Location Map

16-Nov-18



Map Features

- Land Surface Elevation Contour (ft amsl)
- Cross Sections
- 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 and California Aqueduct
- Major Hydrologic Feature
- Alpaugh GSA
- Basin Boundary
- State Highway/Major Road

Note: Basemap source esri.com

0 3 6 12 Miles

NAD 83 State Plane Zone 4

Corcoran Clay from USGS Professional Paper 1766, http://water.usgs.gov/GIS/dsdl/pp1766_CorcoranClay.zip

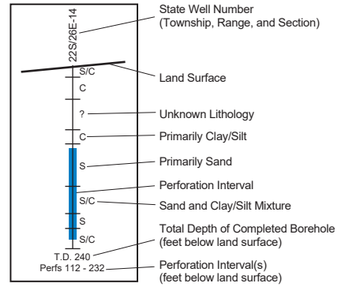
Notes: Lithologic data from Department of Water Resources Well Compeletion Reports.

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

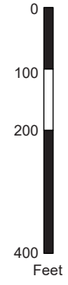
Brackish Water Interface based on Planert and Williams, 1995

Conceptual Hydrogeologic Cross-Section developed from Harder (2018) *Draft Tule Subbasin Setting* report. Distances and scales are approximate.

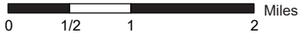
Legend



Vertical Scale



Horizontal Scale



CROSS SECTION A-A'

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 2-1

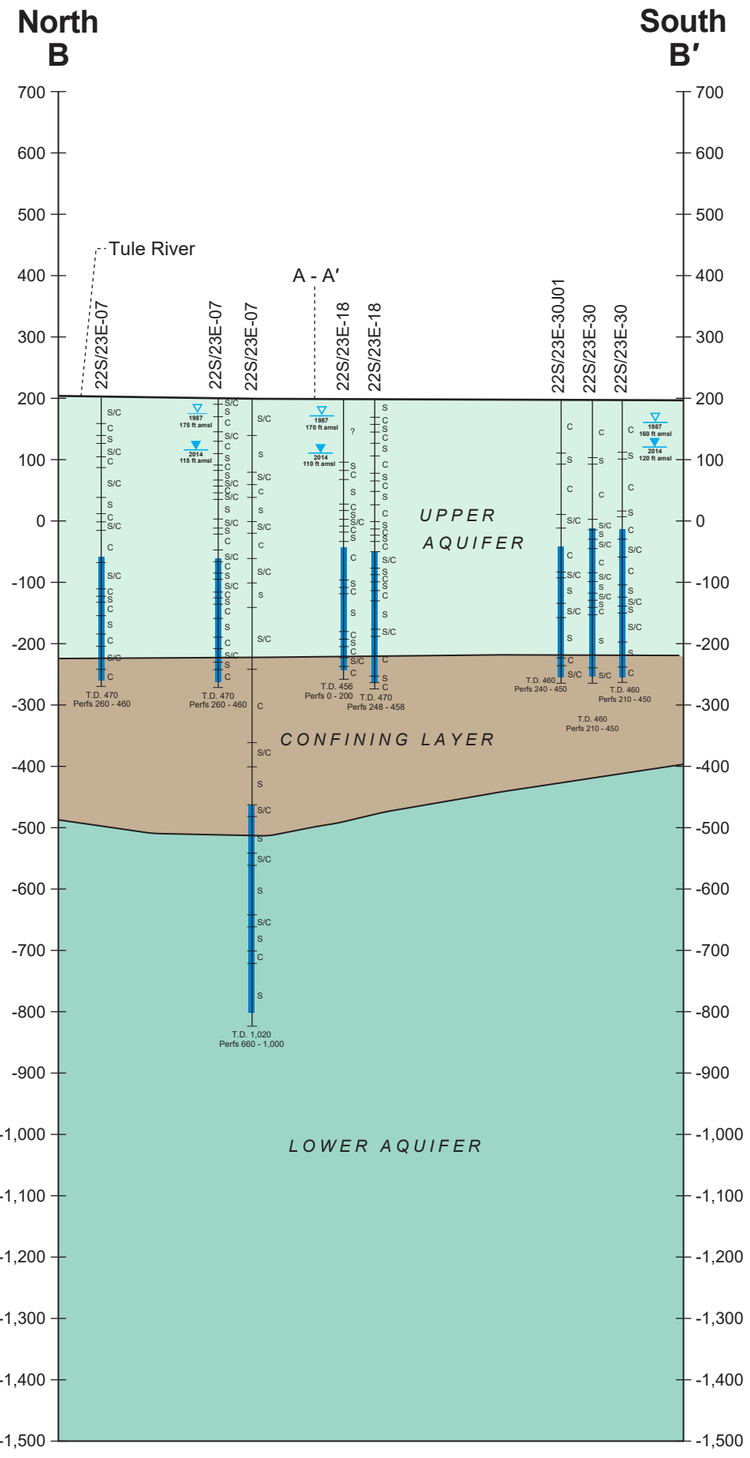
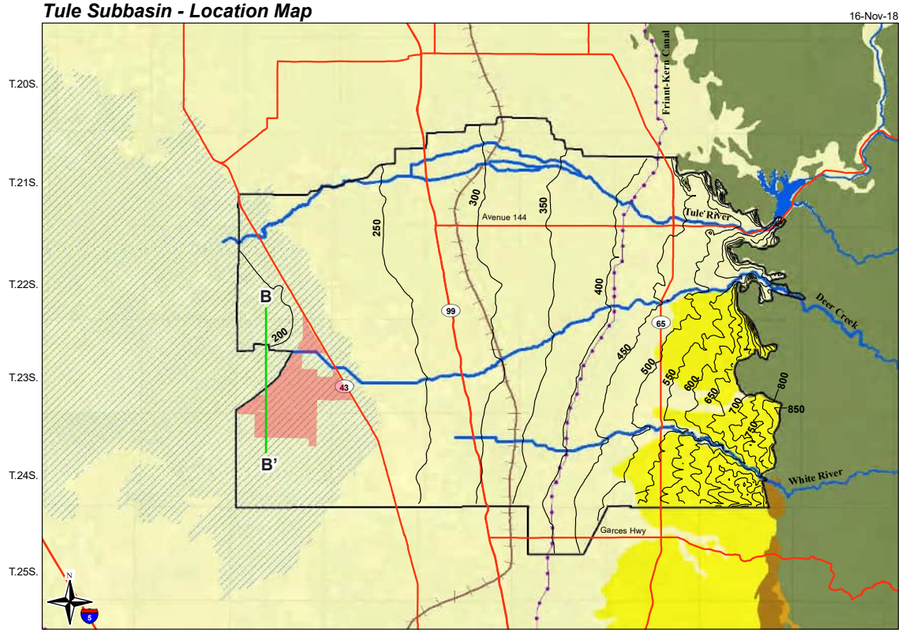


Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

Tule Subbasin - Location Map

16-Nov-18



Note: Basemap source esri.com

0 3 6 12 Miles

NAD 83 State Plane Zone 4

Corcoran Clay from USGS Professional Paper 1766, http://water.usgs.gov/GIS/dsdl/pp1766_CorcoranClay.zip

Map Features

- Land Surface Elevation Contour (ft amsl)
- Cross Sections
- 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 and California Aqueduct
- Major Hydrologic Feature
- Alpaugh GSA
- Basin Boundary
- State Highway/Major Road

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

Conceptual Hydrogeologic Cross-Section developed from Harder (2018) *Draft Tule Subbasin Setting* report. Distances and scales are approximate.

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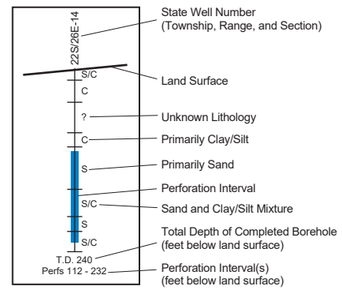
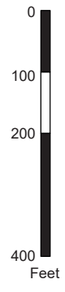
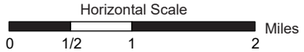


Vertical Scale



Horizontal Scale



CROSS SECTION B-B'

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 2-2

60571181 ALPAUGH GSA GSP PREP

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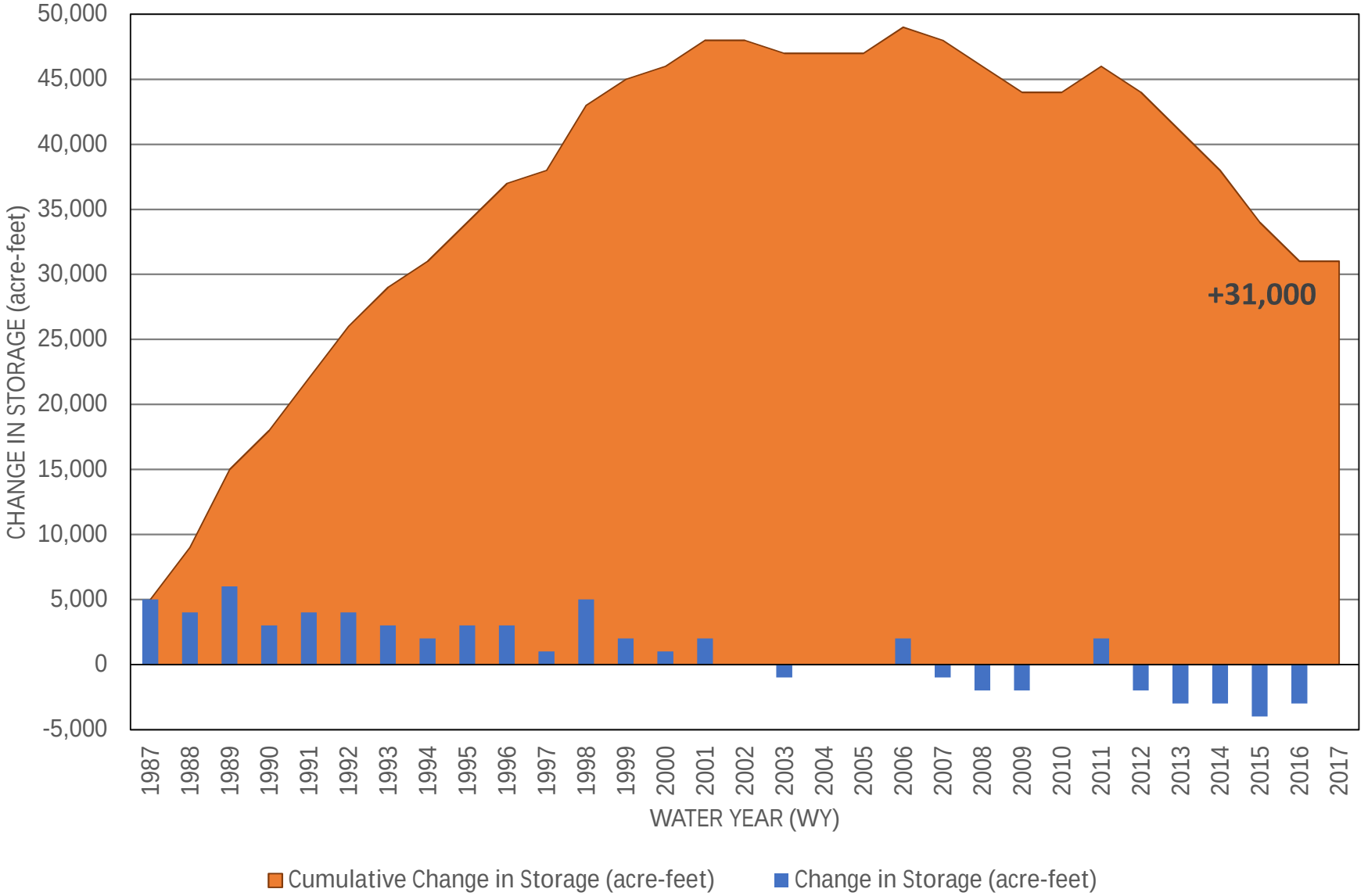
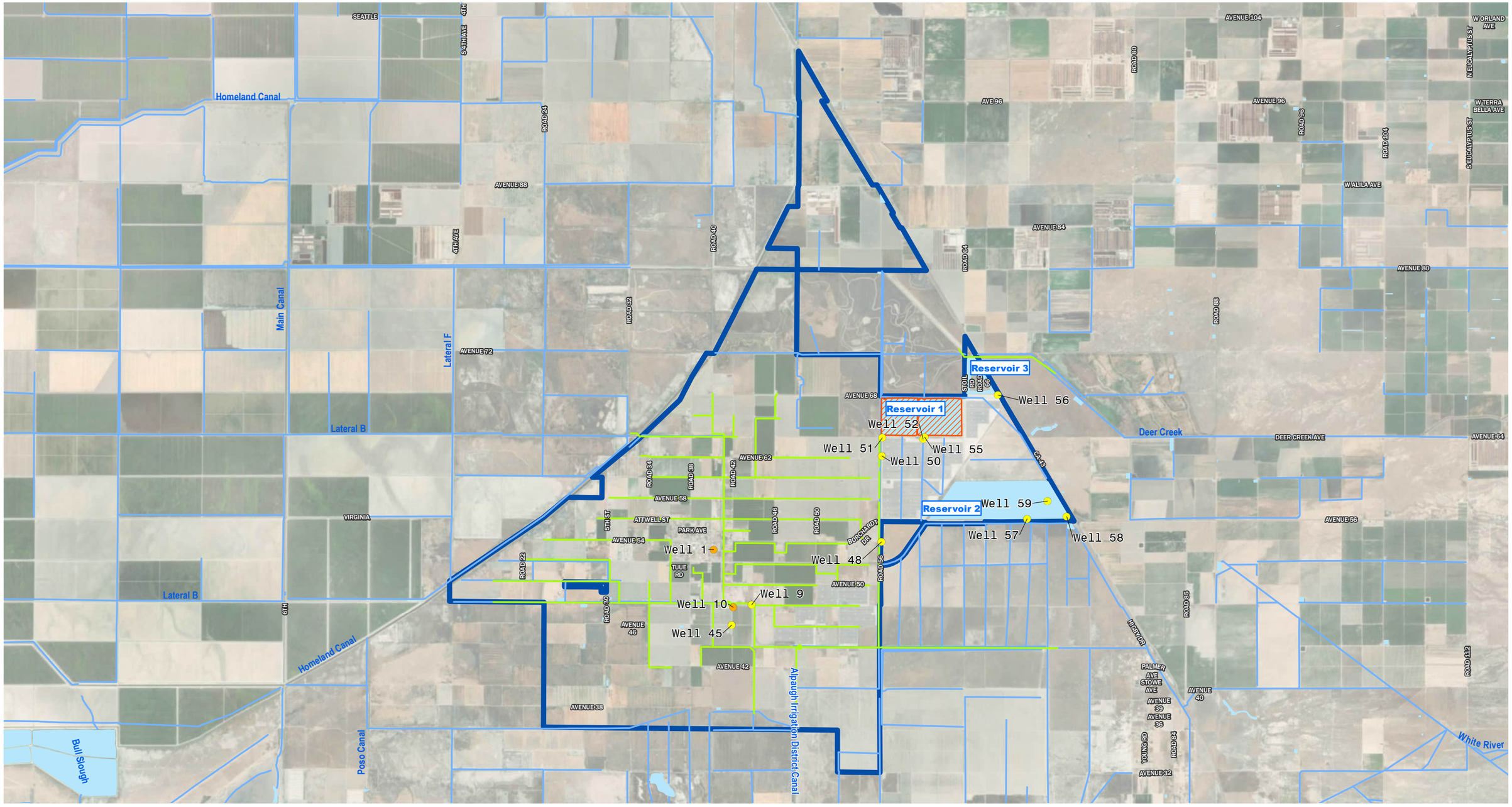
FIGURE 2-3

ALPAUGH GSA CHANGE IN GROUNDWATER STORAGE WY1987 T**HROUGH** WY2017





Legend

- Alpaugh Community Services District Water-Supply Well
- Alpaugh Irrigation District Water-Supply Well
- Canal - Alpaugh Irrigation District Water Irrigation System
- Canal Ditch
- Alpaugh Groundwater Sustainability Agency
- Location of Reservoirs for Proposed Increased Water Capture and Storage Improvements

Source:
1. Alpaugh Irrigation District Water Irrigation System from Keller and Wegley CAD Drawing 4092.dwg
2. NHD = National Hydrography Dataset, version 2.2.1, downloaded from ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/Hydrography/NHD/State/HighResolution/GDB/NHD_H_California_State_GDB.zip

N

0 3,000 6,000 Feet

1 " = 6,000 feet

Increased Water Capture and Storage - Action 1

Date 07/2022

Project No. W8Y18200

Jacobs

Figure 5-1

Figure source: Alpaugh Groundwater Sustainability Agency, 2020. Groundwater Sustainability Plan. January.

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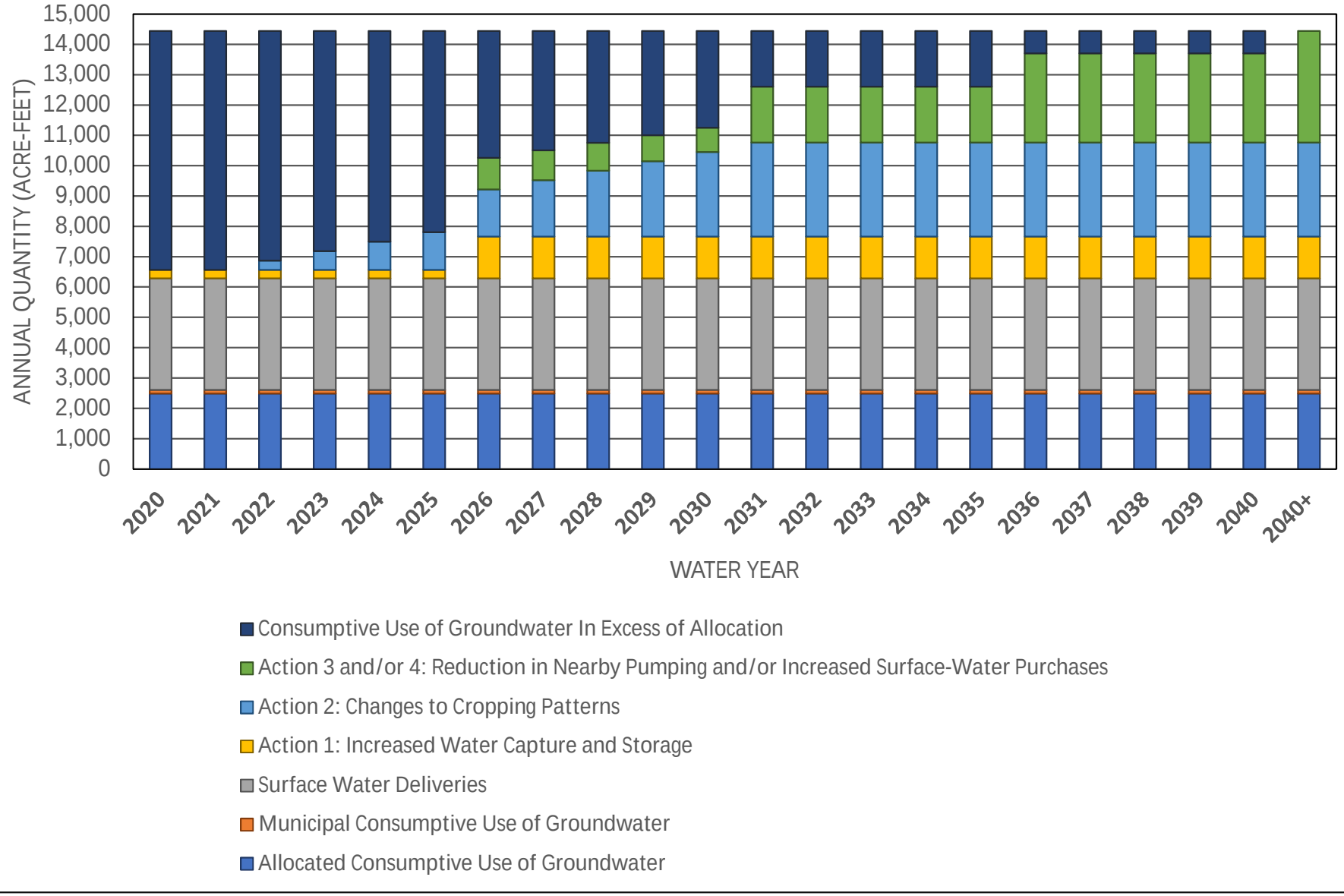
FIGURE 6-1
IMPACT OF MANAGEMENT ACTIONS



Tule Subbasin Setting Appended Figures

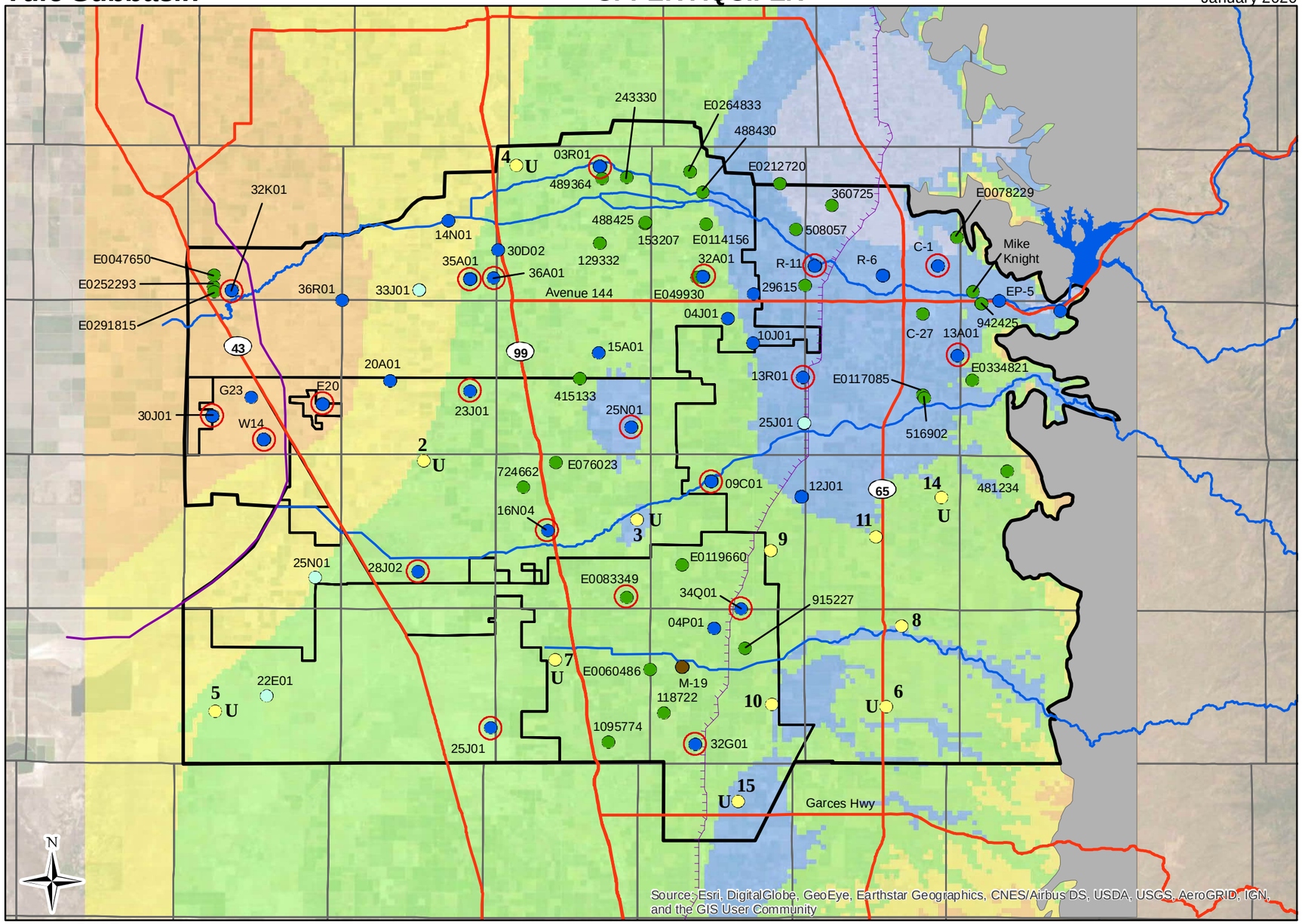
Tule Subbasin

UPPER AQUIFER

January 2020

T.20S.
T.21S.
T.22S.
T.23S.
T.24S.
T.25S.

R.22E. R.23E. R.24E. R.25E. R.26E. R.27E. R.28E. R.29E.



0 2.5 5 10 Miles

NAD 83 State Plane Zone 4

Thomas Harder & Co. Groundwater Consulting

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

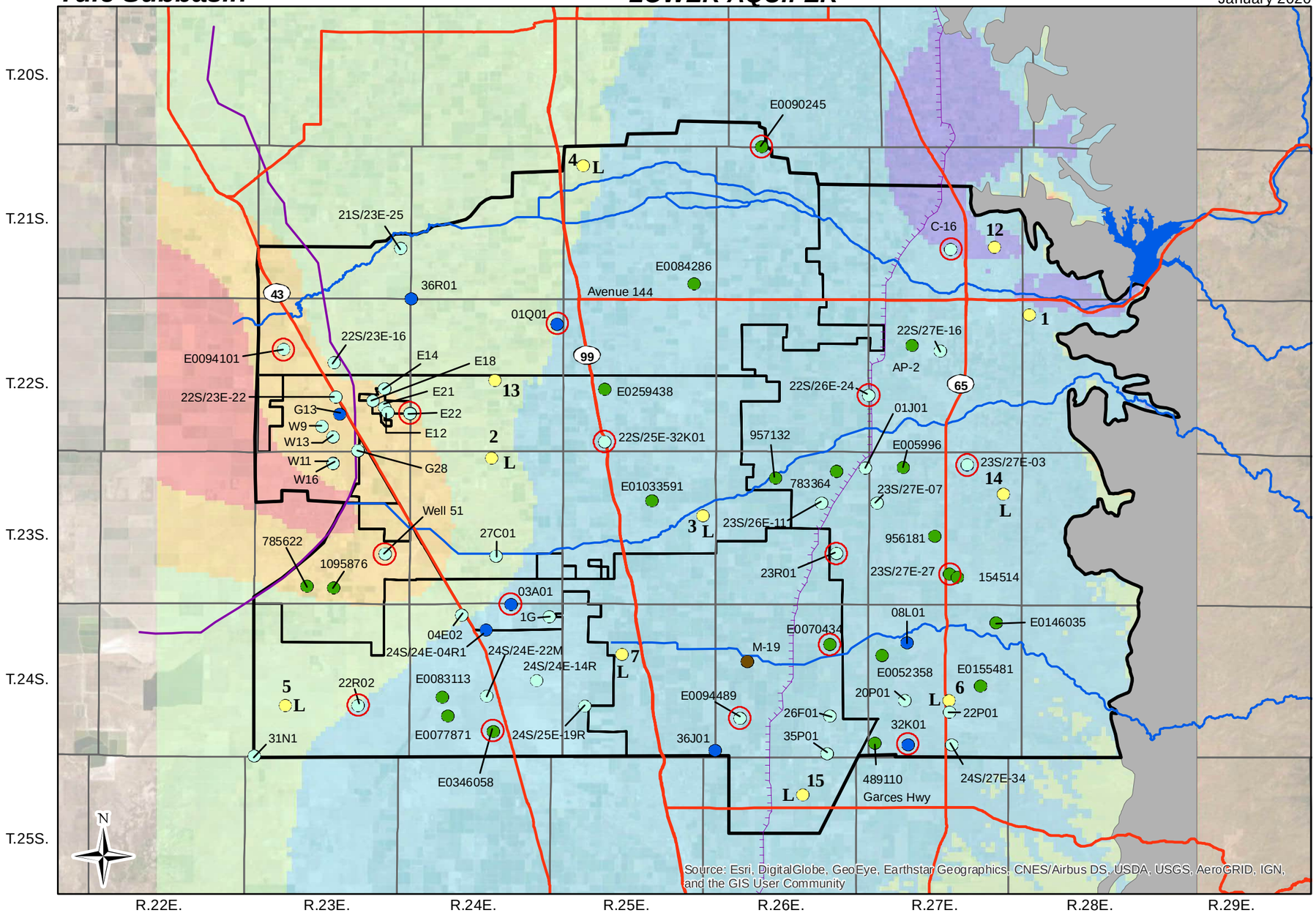
*Numbers indicate order of priority for construction (1 = highest priority, 10 = lowest priority)

Existing and Proposed Upper Aquifer Groundwater Level Monitoring Well Locations

Figure A1-2

Tule Subbasin — LOWER AQUIFER

January 2020



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)

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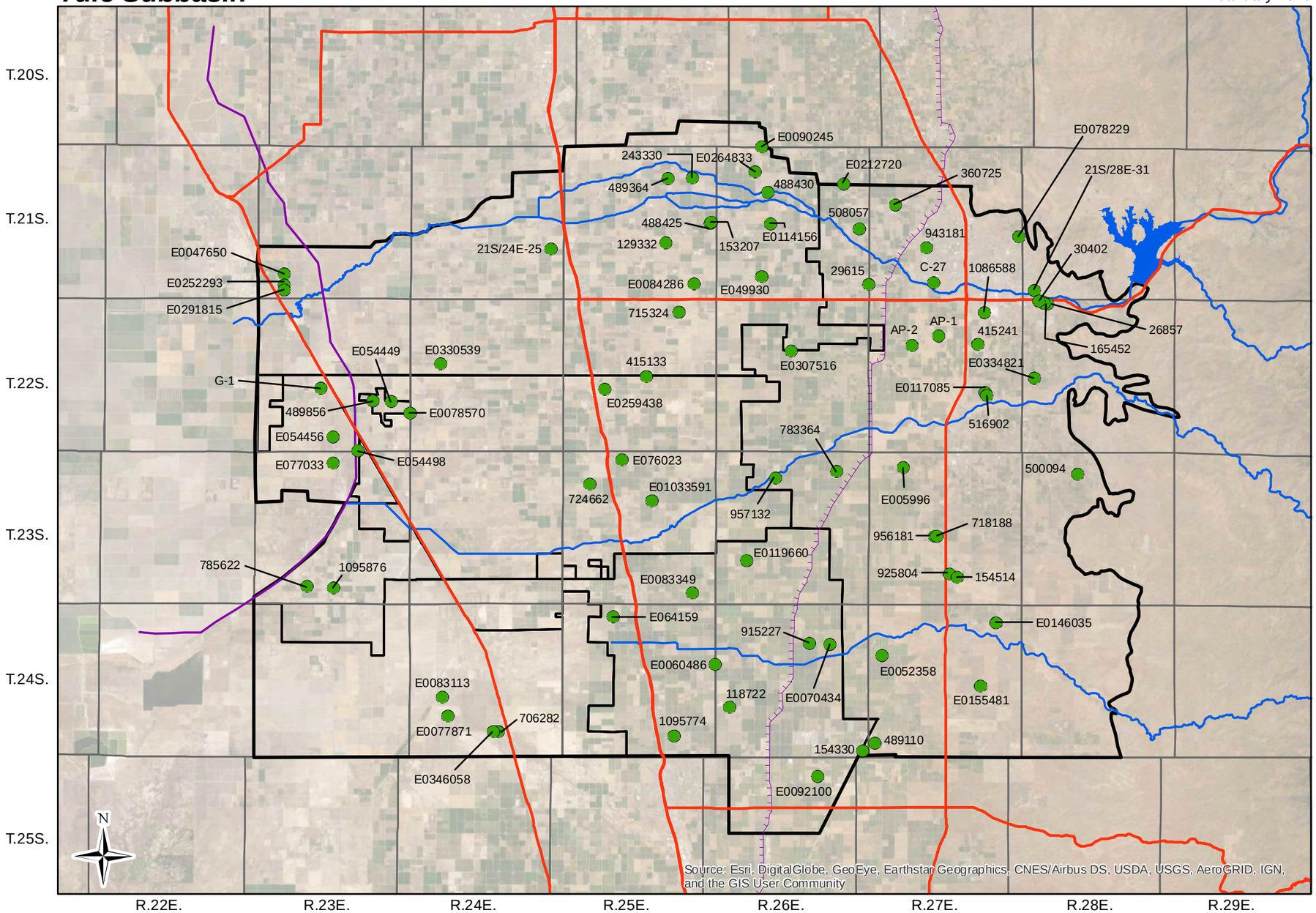
Existing and Proposed Lower Aquifer Groundwater Level Monitoring Well Locations

Figure A1-5

Tule Subbasin

January 2020

Tule Subbasin Monitoring Plan



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

Thomas Harder & Co.
Groundwater Consulting

0 2.5 5 10 Miles

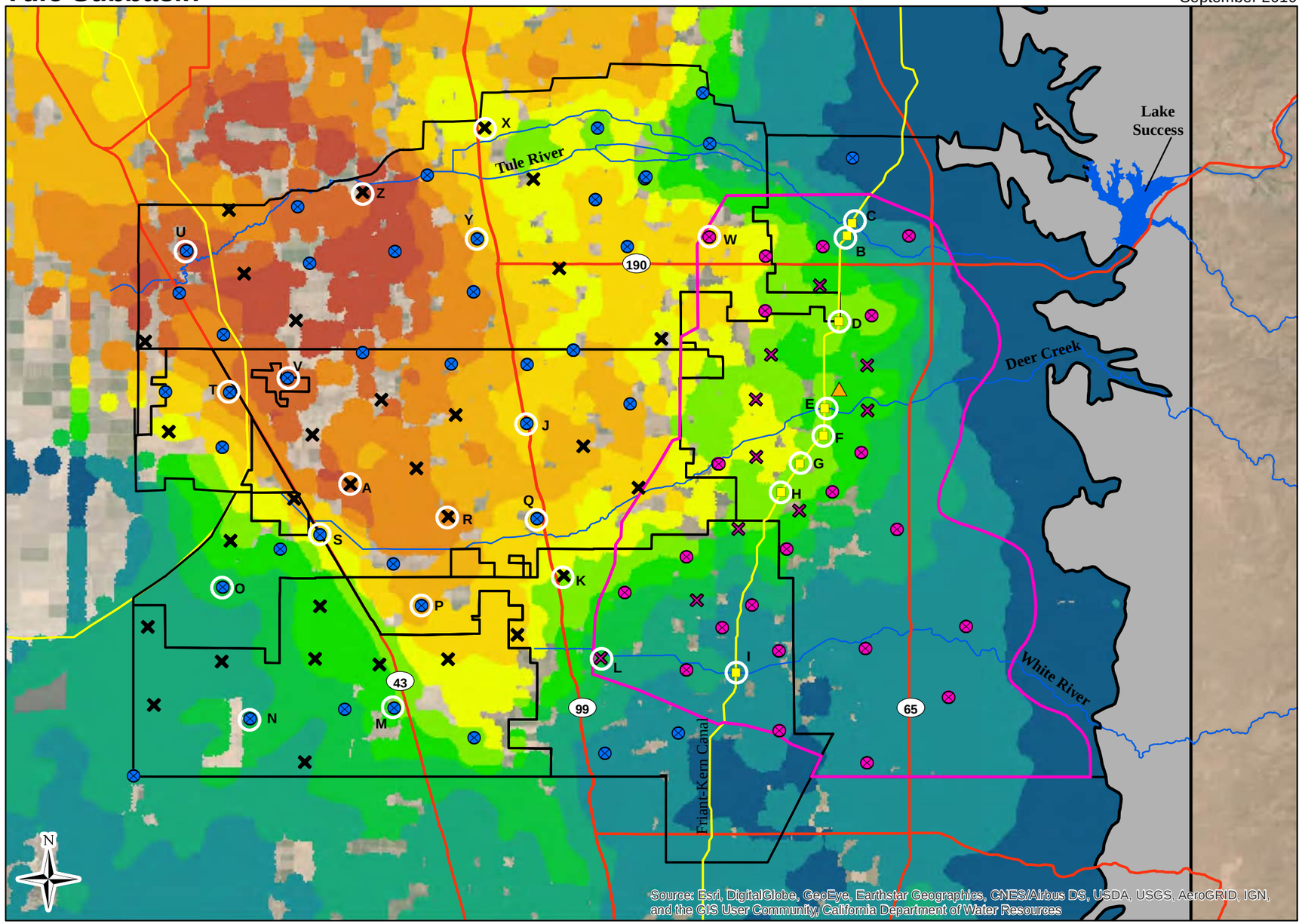
NAD 83 State Plane Zone 4

Groundwater Quality Monitoring Network

Figure A1-7

Tule Subbasin

September 2019



0 0.5 1 2 3 4 5 6 7 8 9 10 Miles

NAD 83 State Plane Zone 4

Thomas Harder & Co.
Groundwater Consulting

Tule Subbasin Monitoring Plan

Map Features

InSAR Subsidence from 2015 to 2018 (ft)

- -2.75 to -2.50
- -2.50 to -2.25
- -2.25 to -2.00
- -2.00 to -1.75
- -1.75 to -1.50
- -1.50 to -1.25
- -1.25 to -1.00
- -1.00 to -0.75
- -0.75 to -0.50
- -0.50 to -0.25
- -0.25 to 0
- 0 to 0.25
- 0.25 to 0.50

Proposed Representative Monitoring Site at Well Site - Annual Monitoring

GPS Monitoring Location at Well Site - Annual Monitoring

Proposed Representative Monitoring Site at Well Site - Quarterly Monitoring

GPS Monitoring Location at Well Site - Quarterly Monitoring

Proposed Representative Monitoring Site - Stand Alone GPS Station - Annual Monitoring

Stand Alone GPS Station - Annual Monitoring

Proposed Representative Monitoring Site - Stand Alone GPS Station - Quarterly Monitoring

Stand Alone GPS Station - Quarterly Monitoring

Existing Representative Monitoring Site

Existing USGS Extensometer

Friant-Kern Canal Land Subsidence Monitoring Zone

GSA Boundaries

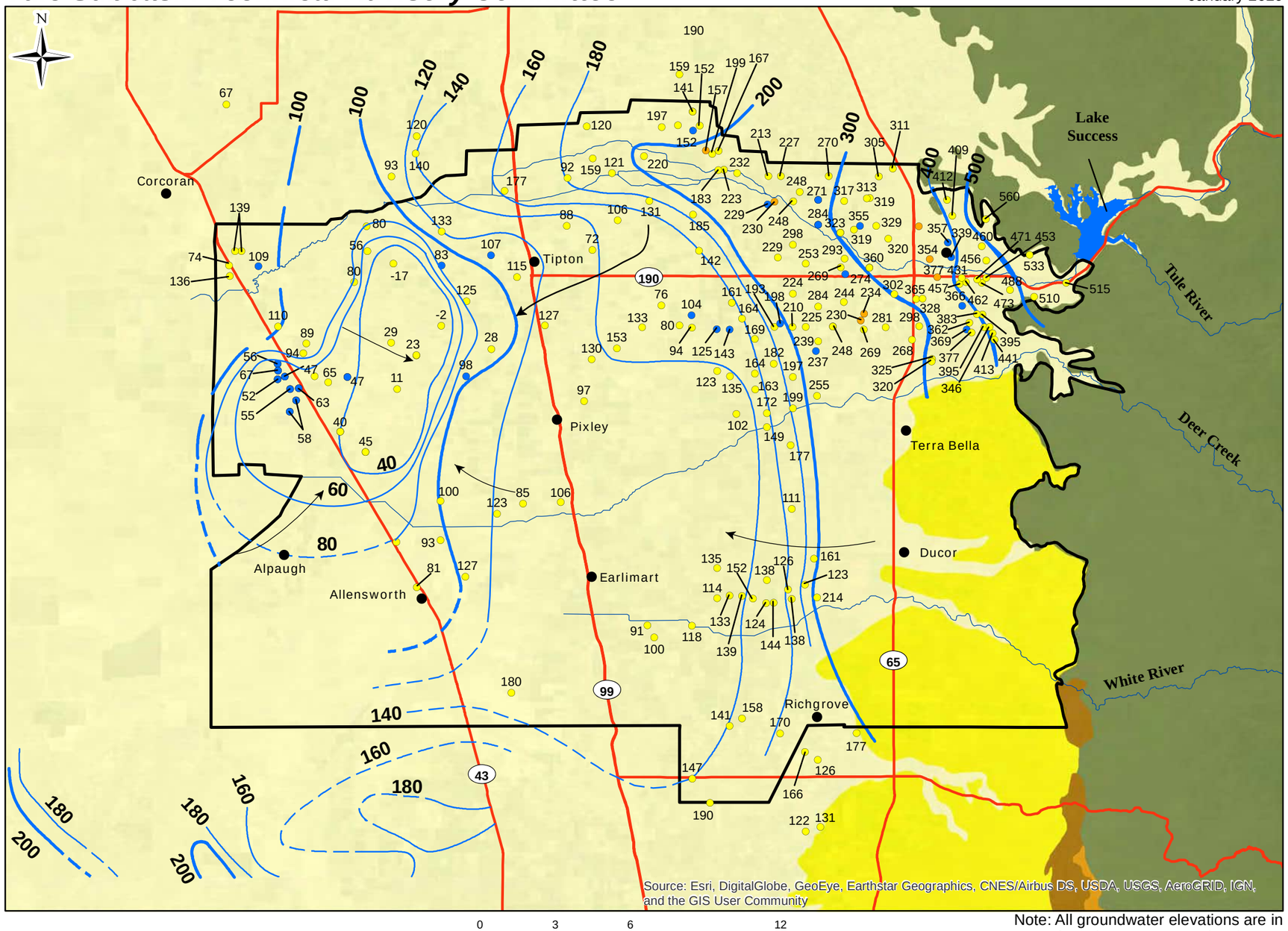
Canal

Major Hydrologic Feature

Freeway/State Highway

Land Subsidence Monitoring Features

Figure A1-8



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

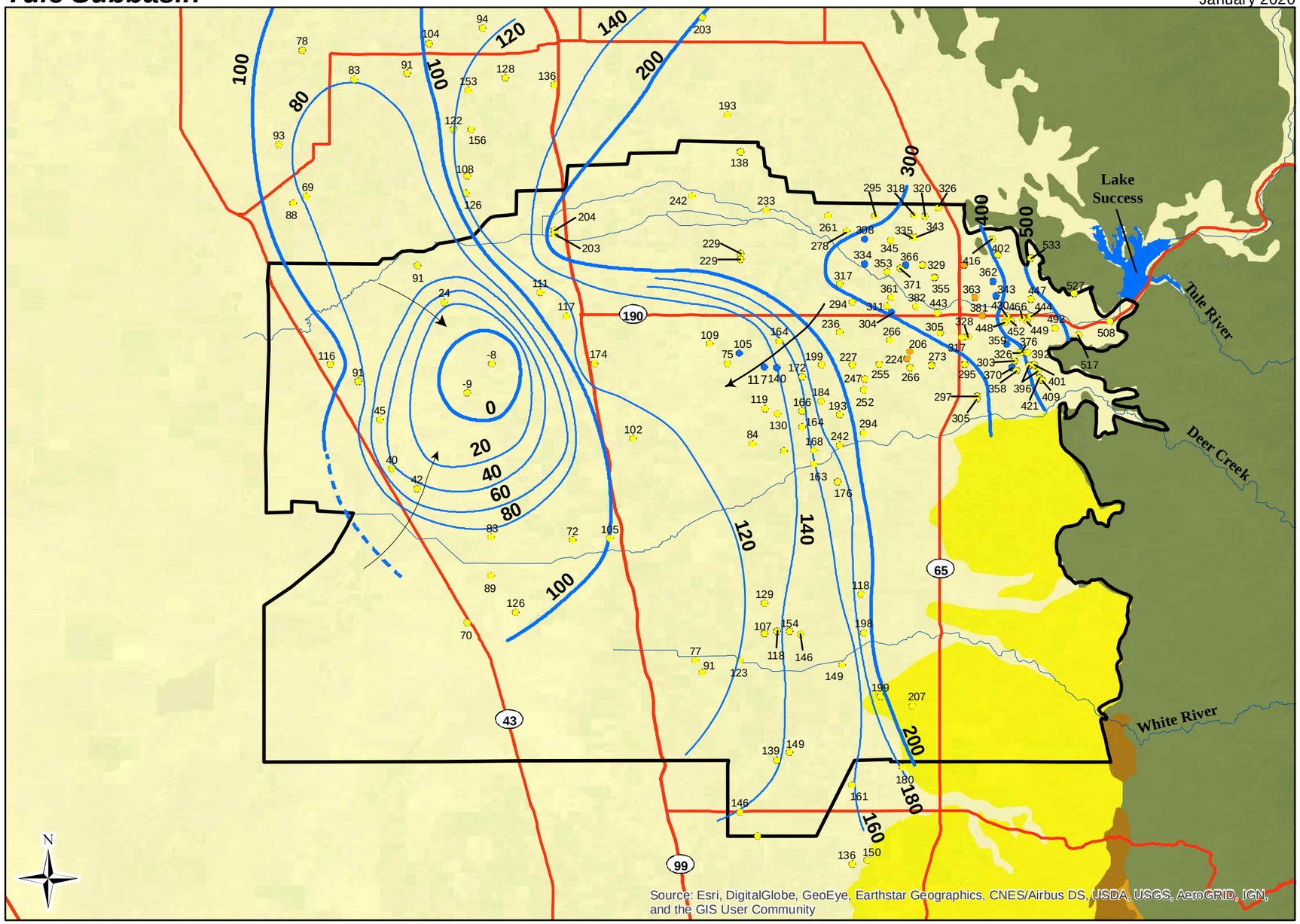
Groundwater contours shown south of the Tule Subbasin and west of Highway 43 are depicted based on Water-Level Elevations And Direction of Groundwater Flow For the Upper Zone (Spring 2017)

Spring 2017 Upper Aquifer Groundwater Elevation Contours

Figure 2-17

Tule Subbasin

January 2020



Map Features

- 140 Groundwater Elevation Contour (Dashed where Approximate)
- Groundwater Flow Direction
- Unknown Perforation Interval
- Composite Perforation Interval
- Shallow Perforation Interval
- Basin Boundary
- Major Hydrologic Feature
- State Highway/Major Road
- Surficial Deposits
- Tertiary Loosely Consolidated Deposits
- Non-Marine Sedimentary Rocks
- Marine Sedimentary Rocks
- Crystalline Basement

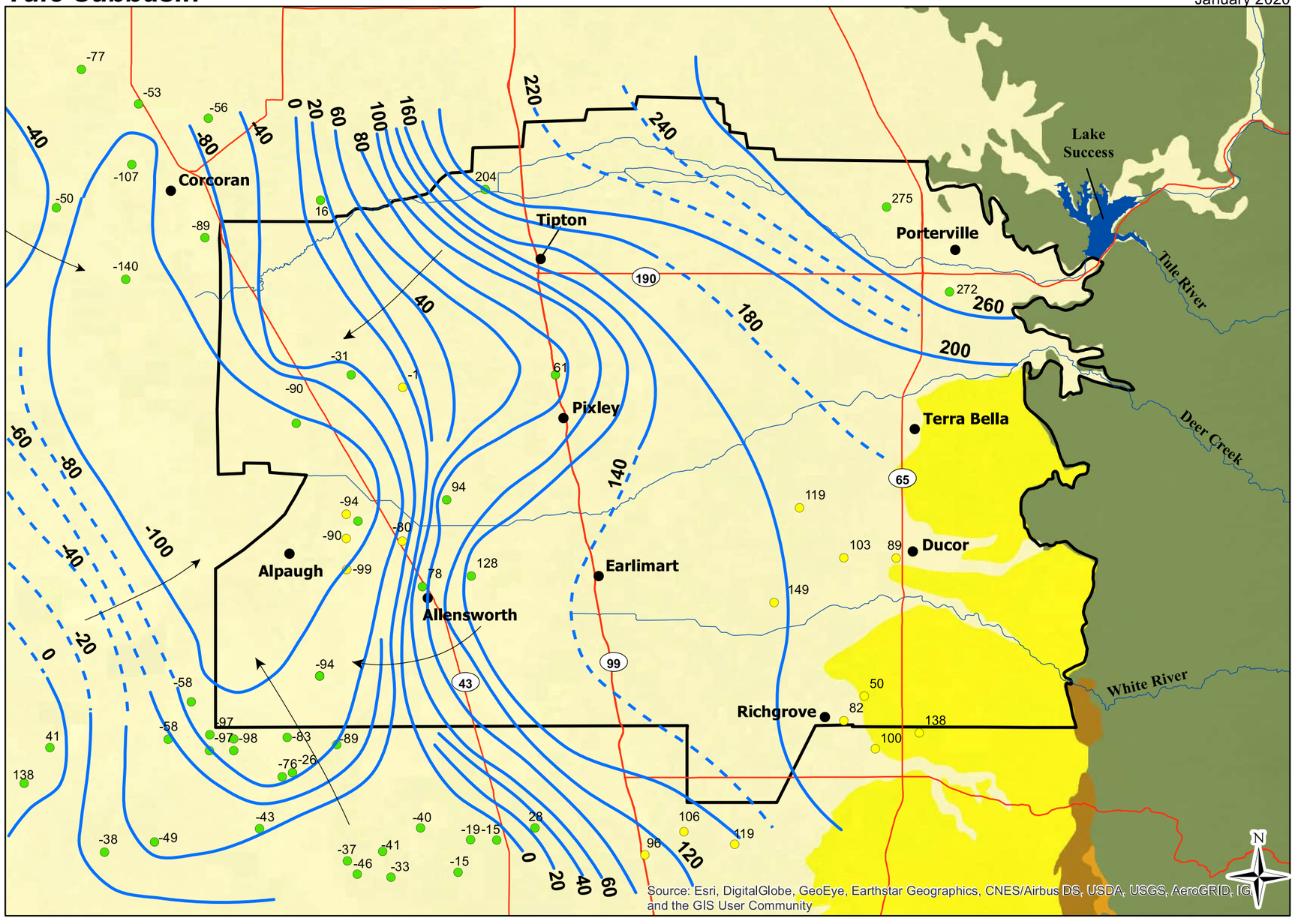
Thomas Harder & Co.
Groundwater Consulting

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.

Fall 2010 Lower Groundwater Elevation Contour Map

Figure 2-19

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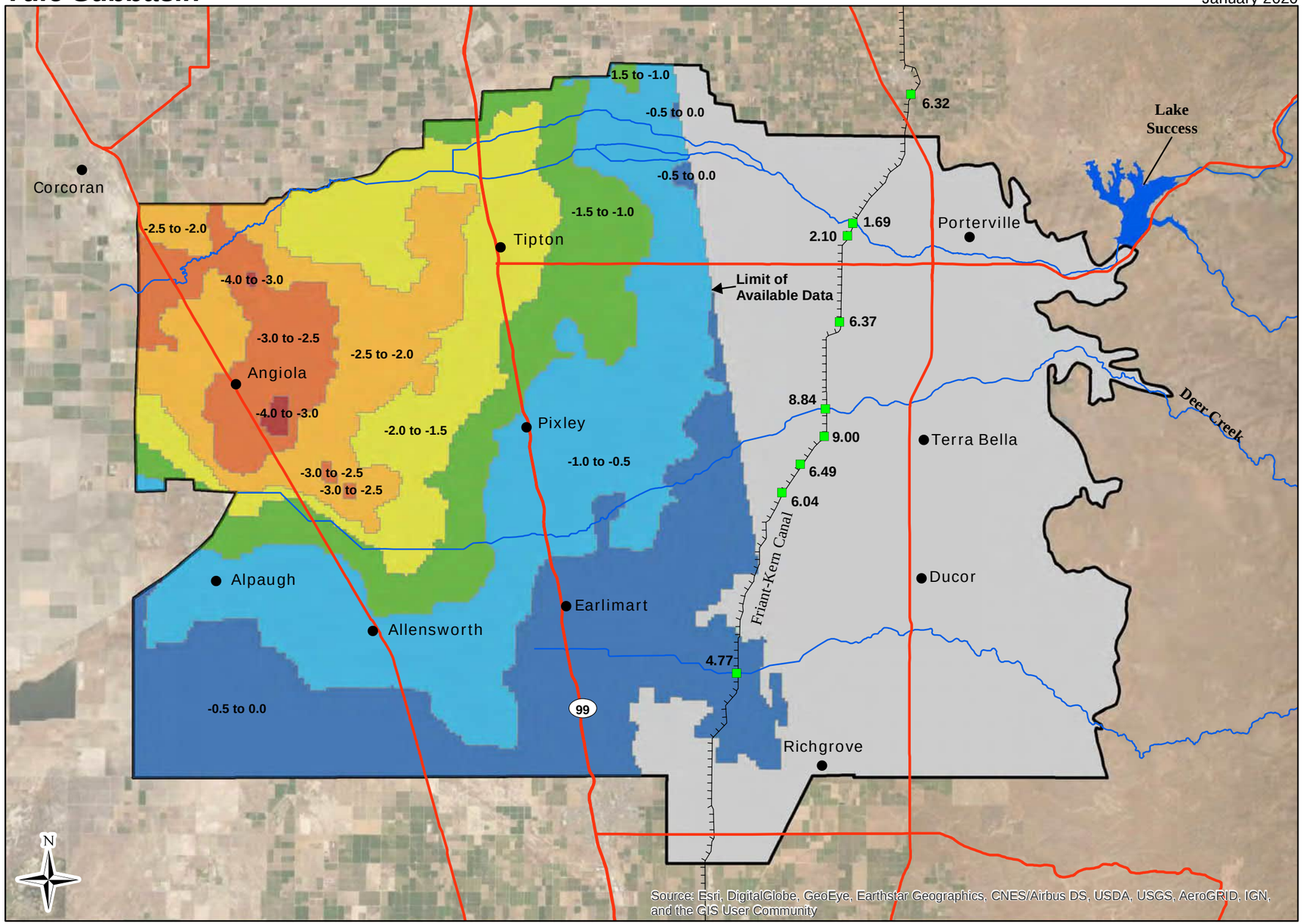
Tule Subbasin

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

2007 to 2011 Land Subsidence

Figure 2-24

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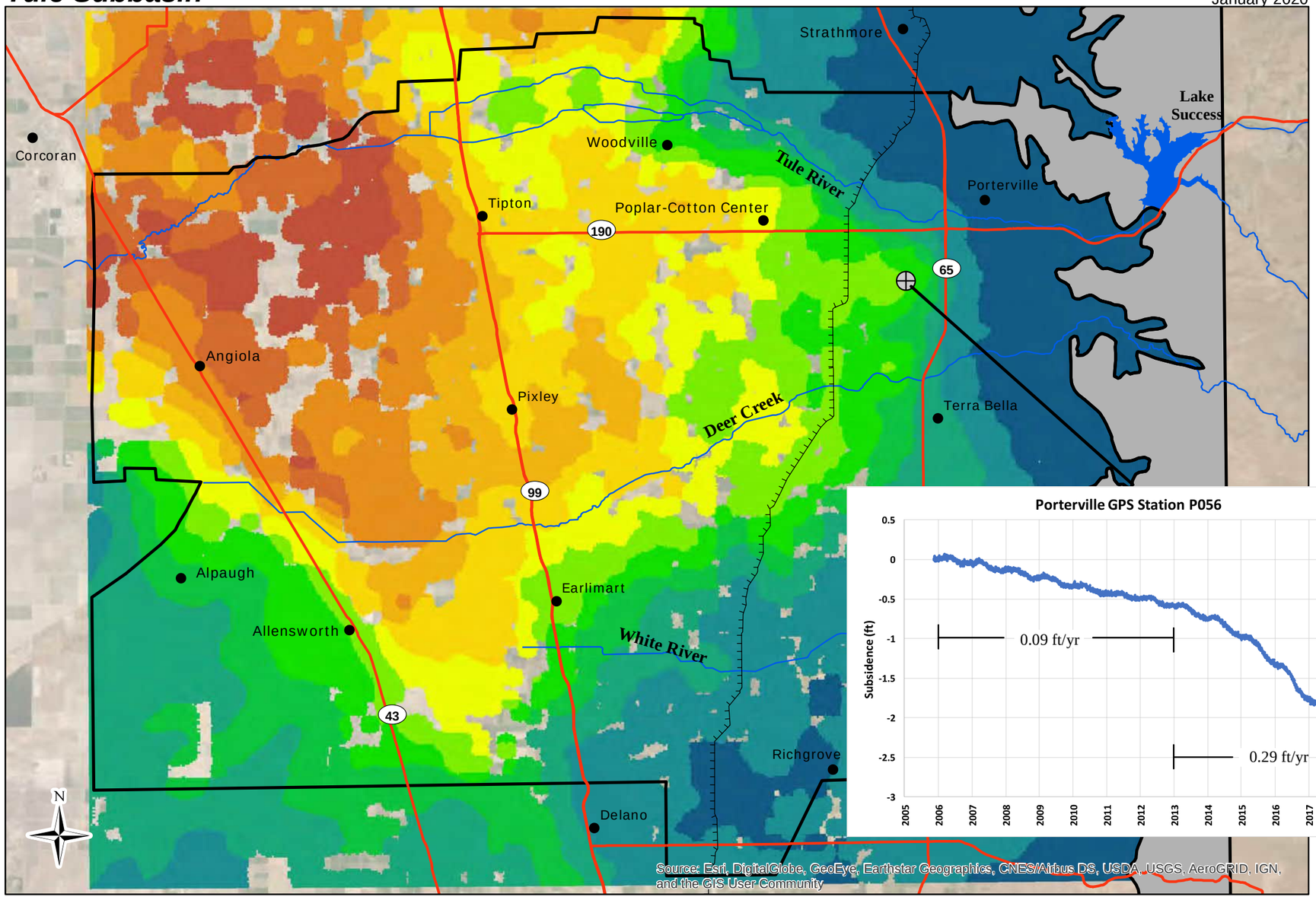
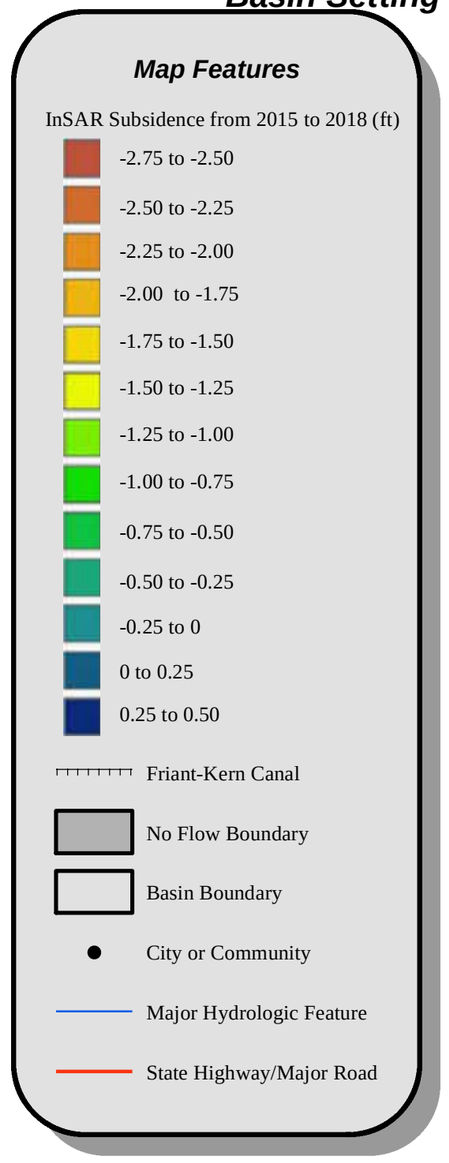
Tule Subbasin

January 2020





0 2 4 8 Miles

NAD 83 State Plane Zone 4

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Groundwater Consulting

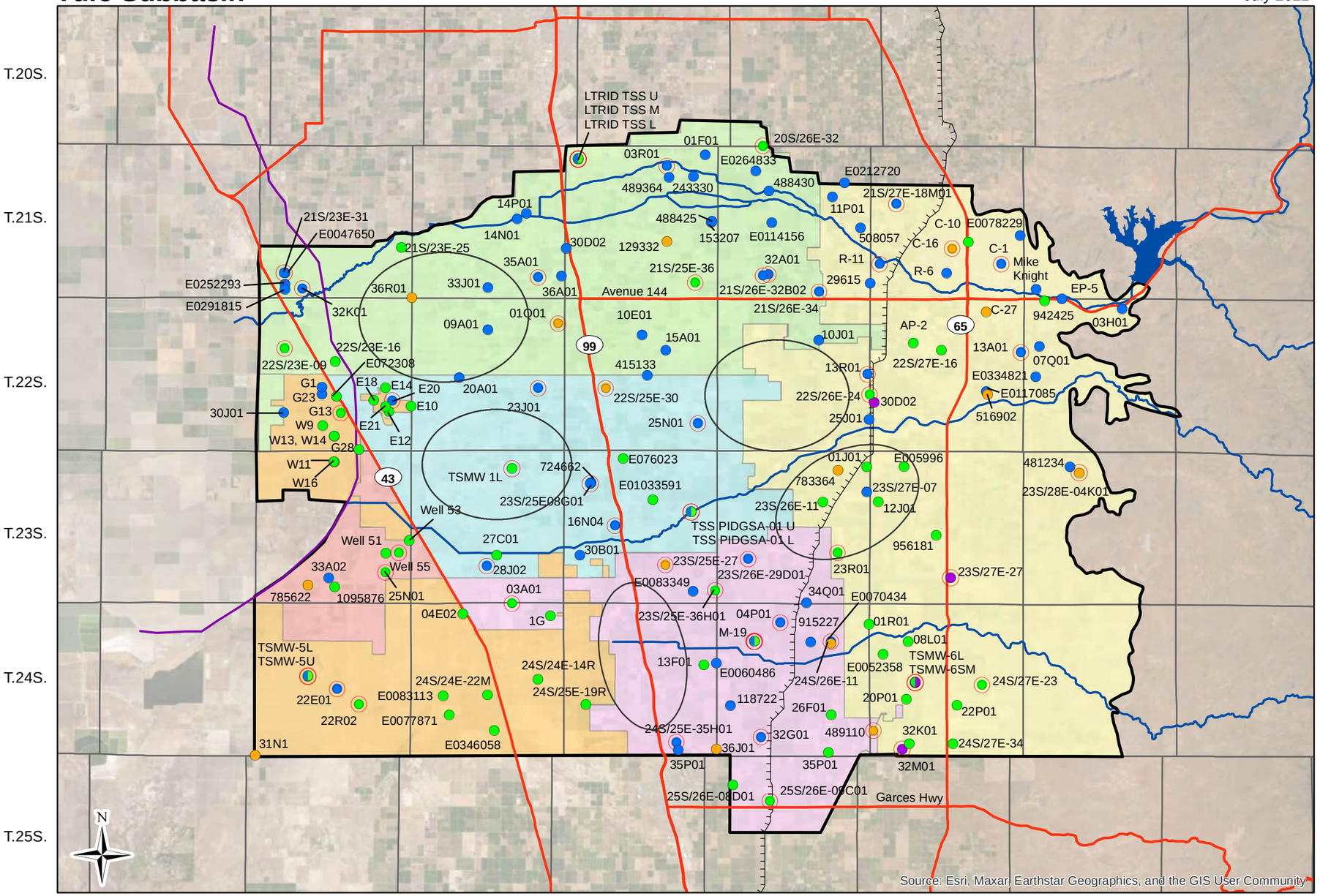
2015 to 2018 Land Subsidence

Figure 2-25

Tule Subbasin Monitoring Plan Appended Figures

Tule Subbasin

July 2022



Tule Subbasin Monitoring Plan

Map Features

- Upper Aquifer Well
- Upper Aquifer RMS Well
- Lower Aquifer Well
- Lower Aquier RMS Well
- Composite Aquifer Well
- Composite Aquifer RMS Well
- Santa Margarita Well
- Santa Margarita RMS Well
- Alpaugh GSA
- Delano-Earlimart I.D. GSA
- Eastern Tule GSA
- Lower Tule River I.D. GSA
- Pixley I.D. GSA
- Tri-County Water Authority GSA
- Basin Boundary
- Canal
- Friant-Kern Canal
- State Highway
- Major Hydrologic Feature

: Areas targeted for future monitoring wells.

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Groundwater Level Monitoring Network

Figure A1-2

Tule Subbasin

July 2022

T.20S.
T.21S.
T.22S.
T.23S.
T.24S.
T.25S.

E0090245
243330
E0264833
E0212720
360725
E0078229
21S/28E-31
489364
488430
508057
488425
153207
E0114156
943181
129332
21S/24E-25
30402
E0047650
E0252293
E0291815
29615
C-27
1086588
E0084286
E049930
715324
AP-2
AP-1
415241
26857
165452
E054449
E0330539
415133
E0307516
E0334821
G-1
E0259438
E0117085
489856
E0078570
516902
E054456
783364
E077033
E054498
E076023
500094
724662
E01033591
957132
E005996
956181
718188
E0119660
785622
1095876
925804
154514
E0083349
E064159
E0146035
915227
E0060486
E0052358
E0083113
118722
E0070434
E0155481
E0077871
706282
1095774
489110
154330
E0346058
E0092100

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

R.22E. R.23E. R.24E. R.25E. R.26E. R.27E. R.28E. R.29E.

N

0 2.5 5 10 Miles

NAD 83 State Plane Zone 4

Thomas Harder & Co.
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Tule Subbasin Monitoring Plan

Map Features

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

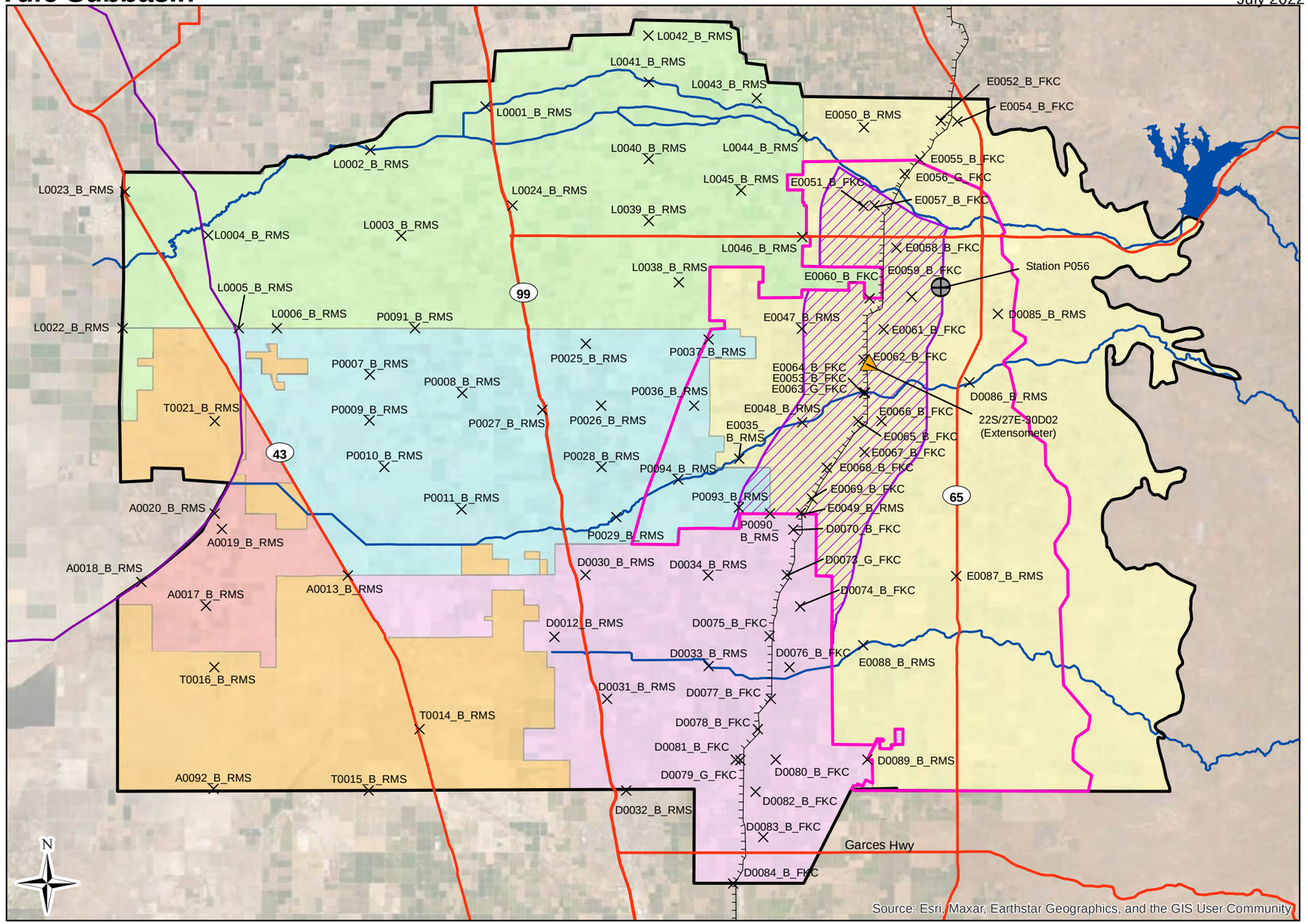
Well Location data from:
Tule Basin Water Quality Coalition, 2017

Groundwater Quality Monitoring Network

Figure A1-6

Tule Subbasin

July 2022



0 2 4 8 Miles

NAD 83 State Plane Zone 4

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Tule Subbasin Monitoring Plan

Map Features

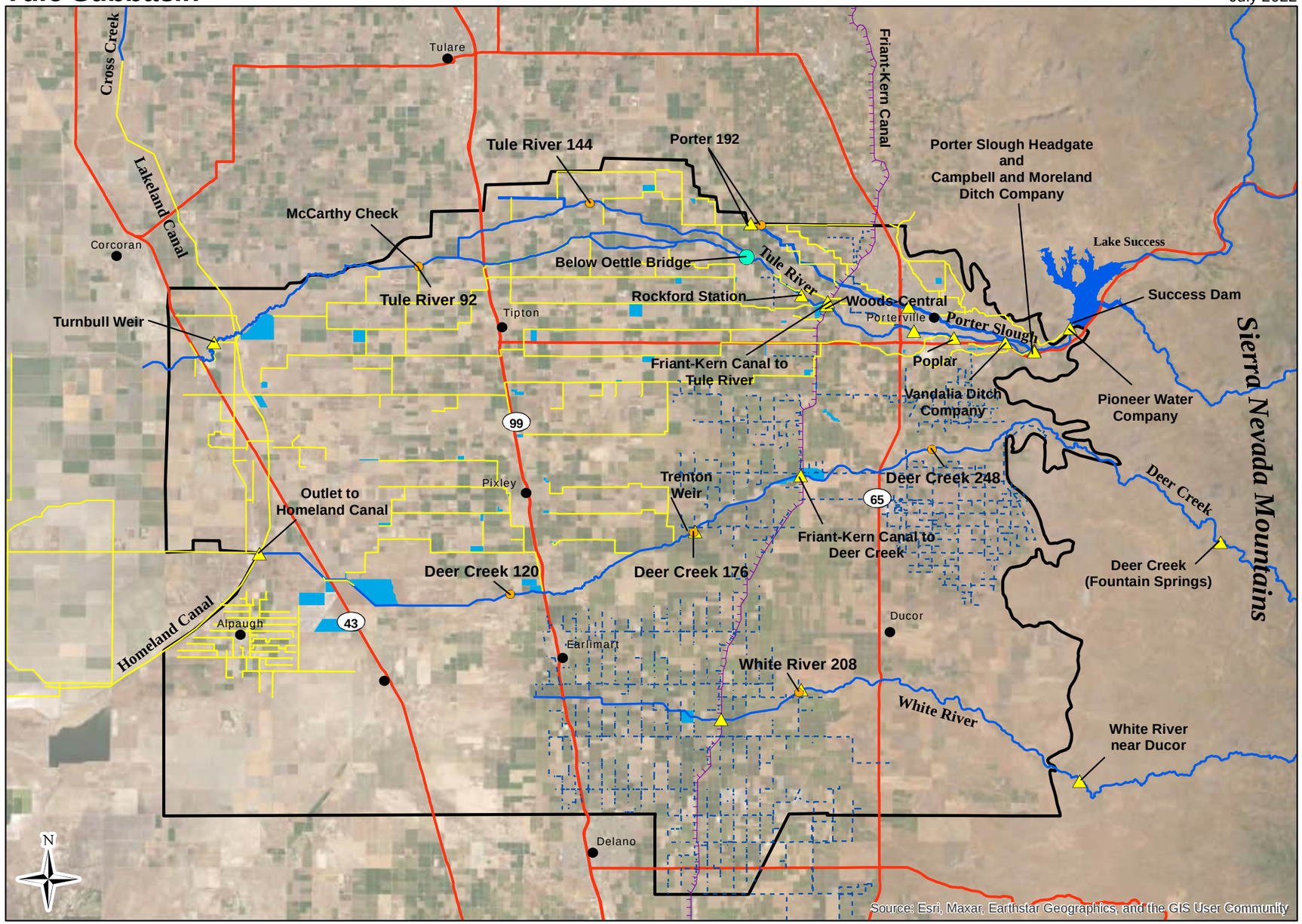
- Land Surface Elevation RMS
- Extensometer
- GPS Station
- Alpaugh GSA
- Delano-Earlimart I.D. GSA
- Eastern Tule GSA
- Lower Tule River I.D. GSA
- Pixley I.D. GSA
- Tri-County Water Authority GSA
- Friant-Kern Canal and California Aqueduct
- Canal
- ETGSA Monitored Area
- ETGSA Management Area
- Basin Boundary
- State Highway

Land Surface Elevation Monitoring Network

Figure A1-7

Tule Subbasin

July 2022



0 2.5 5 10 Miles

NAD 83 State Plane Zone 4

Tule Subbasin Monitoring Plan

Map Features

- Surface Water Sampling Site
- Surface Water Measurement Location
- Surface Water Diversion Location
- Friant-Kern Canal and California Aqueduct
- Canals
- Pipe
- State Highway
- Major Hydrologic Feature
- Basin Boundary
- Artificial Recharge Basin
- City or Community

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Surface Water Monitoring Features

Figure A1-8

Appendix A
Alpaugh GSA Formation

Alpaugh Groundwater Sustainability Agency
5458 Rd. 38
P.O. Box 129
Alpaugh, CA 93201
(559) 949-8323

May 31, 2016

VIA OVERNIGHT MAIL ONLY
Mark Nordberg, GSA Project Manager
Senior Engineering Geologist
Department of Water Resources
901 P Street, Room 213A
P.O. Box 942836
Sacramento, CA 94236

RE: NOTICE OF THE ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY'S ELECTION TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY FOR A PORTION OF THE TULE SUBBASIN

Dear Mr. Nordberg:

Pursuant to California Water Code Section 10723.8, under the Sustainable Groundwater Management Act ("**SGMA**"), the Alpaugh Groundwater Sustainability Agency (the "**GSA**") provides this notice to the Department of Water Resources ("**DWR**") of its election to become a groundwater sustainability agency and to undertake sustainable groundwater management in the portion of the Tule Subbasin (DWR Subbasin 5-22.13) underlying the GSA's boundaries[1]. The Tri-County Water Authority is the only other GSA in the basin.

The GSA was formed through a legal agreement by and between three local public agencies – Alpaugh Irrigation District, Atwell Island Water District and Alpaugh Community Services District. The legal agreement for the formation of the GSA is attached hereto as Exhibit 1. Please note that the members to the GSA anticipate forming a Joint Power Authority to include the same three agencies to operate as the GSA. Upon such formation, the GSA's application will be updated with DWR by submission of the Joint Powers Authority Agreement.

Water Code Section 10723.8(a)(1) requires that this GSA notification include information regarding the service area boundaries of the GSA and the boundaries of the basin the GSA intends to manage. Exhibit 2 hereto includes three (3) maps to satisfy the requirements of Water Code Section 10723.8(a)(1). The first map shows the GSA boundaries in relation to the entire Subbasin. The second map shows the GSA with the boundaries of each member of the GSA identified. Please note that the second map

[1] Boundaries overlap with the boundaries of the Tri-County Water Authority (GSA Notice posted 3/18/16)

District through Tulare County LAFCO. The third map also identifies the entirety of the GSA boundaries.

On May 31, 2016, the GSA held a noticed public hearing in accordance with California Water Code Section 10723(b). Proof of publication in accordance with Government Code Section 6066 is attached hereto as Exhibit 3.

After holding the public hearing, the GSA's Board of Directors adopted Resolution Number 16-1, which is attached hereto as Exhibit 4, electing to become a GSA over the portion of the Tule Subbasin within the GSA's boundary. The GSA will work collaboratively with other duly formed GSA's in the Tule Subbasin to jointly manage groundwater and to develop a Groundwater Sustainability Plan ("**GSP**") or GSPs. The GSA's Board of Directors is planning to negotiate a memorandum of understanding, cooperative agreement(s), or other forms of agreements with other duly formed GSA's within the Tule Subbasin for the purpose of implementing a cooperative, coordinated structure for the management of groundwater and the development of a GSP or GSPs.

Pursuant to California Water Code Section 10723.2, the GSA shall consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing a GSP. An initial list of stakeholders and interested parties include, but are not limited to the following:

a) Holders of overlying groundwater rights, including:

   1) Agricultural users – The GSA area is composed almost entirely of agricultural users within the GSA's boundaries.

   2) Domestic well owners – There are domestic wells within the proposed GSA management area. However, because SGMA excludes "de minimis extractors" it is anticipated that the GSP will exclude most (if not all) domestic wells from such requirements.

b) Municipal well operators – No incorporated cities within the GSA boundary.

c) Public Water Systems – Alpaugh Irrigation District, Atwell Island Water District, and Alpaugh Community Services District.

d) Local land use planning agencies – County of Tulare.

e) Environmental users of groundwater – U.S. Bureau of Land Management.

f) Surface water users, if there is a hydrologic connection between surface and groundwater bodies – None.

g) The Federal Government, including, but not limited to, the military, and managers of federal lands – U.S. Bureau of Land Management.

h) California Native American tribes – None.

i) Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems – The community of Alpaugh.

j) Entities listed in Water Code Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency - None.

The GSA intends to work cooperatively with stakeholders to develop and implement a GSP by collaborating with other qualified GSA's in the Tule Subbasin. The GSA shall maintain a list of interested parties to be included in the formation of a GSP. Interested parties will have opportunities, both formal and informal, to provide input to the GSA throughout the process of developing, operating, and implementing the GSA and GSP. Such opportunities may include, but are not limited to, public comment during the GSA's regular and special meetings, and at other times to be determined and noticed pursuant to Water Code Section 10727.8(a), or otherwise. By this notification, the GSA has provided DWR with all applicable information in California Water Code Section 10723.8(a).

Sincerely,

Ranveig Magden

Ranveig Magden, Chairman
Alpaugh Groundwater Sustainability Agency

EXHIBITS:

Exhibit 1: Legal Agreement (MOU)
Exhibit 2: Maps
Exhibit 3: Proof of Publication of Public Hearing Notice
Exhibit 4: Resolution 16-1

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EXHIBIT "1"

MEMORANDUM OF UNDERSTANDING FORMING THE ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY

This Memorandum of Understanding ("**MOU**") is made and entered into on May 11, 2016, by and between the ALPAUGH IRRIGATION DISTRICT, a California irrigation district ("**AID**"), ATWELL ISLAND WATER DISTRICT, a California water district "(**AIWD**") and the ALPAUGH COMMUNITY SERVICES DISTRICT, a California community services district ("**CSD**"), each a "**Member Agency**" and collectively referred to herein as the "**Member Agencies**."

RECITALS

WHEREAS, on September 16, 2014, California Governor, Jerry Brown, signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, collectively known as the Sustainable Groundwater Management Act ("**SGMA**"); and

WHEREAS, SGMA is intended to create a comprehensive groundwater management system in the State of California, by, among other things, creating local governing agencies, or collections of agencies known as groundwater sustainability agencies (each a "**GSA**"), to develop, coordinate and implement groundwater sustainability plans (each a "**GSP**");

WHEREAS, SMGA empowers local agencies to collectively manage groundwater subbasins on behalf of the landowners within the boundaries of the GSA through the formation of a joint powers authority or other legal agreement;

WHEREAS, each Member Agency is a local agency qualified to individually, or collectively, become a GSA for management of the groundwater subbasin, or portion thereof underlying the property within their collective jurisdictional boundaries;

WHEREAS, the Member Agencies desire to collectively manage the portion of the Tule groundwater subbasin (the "**Subbasin**") within their collective jurisdictional boundaries; and

WHEREAS, the Member Agencies will work collaboratively with other interested agencies to develop and implement a GSP or multiple GSPs to manage the Subbasin pursuant to the requirements of SGMA.

NOW, THEREFORE, in consideration of the mutual covenants and promises set forth herein, and other good and valuable consideration, and incorporating the above recitals herein and exhibits attached hereto, it is mutually understood and agreed between the Member Agencies as follows:

1. **Purpose**. This MOU is entered into by and between the Member Agencies to facilitate a cooperative and ongoing working relationship to comply with SGMA, including, but not necessarily limited to, the formation of a GSA and the negotiation and

implementation of a GSP or multiple GSPs, and the coordination of such GSP(s) with the remainder of the Subbasin.

2. **Alpaugh Groundwater Sustainability Agency**. The Member Agencies hereby establish the Alpaugh Groundwater Sustainability Agency to be a GSA as required by SGMA and managing the portion of the Subbasin as identified and depicted in Exhibit "A" attached hereto and incorporated herein by this reference.

3. **Implementation of GSP**. This MOU sets forth the intent of the Member Agencies to either operate as a GSA under this MOU, or, alternatively, to establish a joint powers authority ("**JPA**") through the negotiation and execution of a joint power agreement, to prepare for approval a GSP for the area located within their collective jurisdictional boundaries. The Member Agencies shall regularly confer for the purposes of determining whether to operate under this MOU or to form a JPA. In the event the Member Agencies agree to form a JPA, the Member Agencies will cooperate and negotiate the terms thereof for the formation of the JPA under California Government Code Section 6500, *et seq.*

4. **Outreach to Other Agencies**. In recognition of the importance of involving all interested agencies in the Subbasin that are or will be involved in efforts to establish a GSA and GSP(s) pursuant to SGMA, the Member Agencies shall work cooperatively with all other GSAs in the Subbasin. Additional agencies with service area boundaries outside the jurisdiction of this GSA, may join and incorporate their service area boundaries or portions thereof into this GSA upon the mutual consent of all Member Agencies.

5. **Powers**. Without, in any way, limiting the powers provided to the GSA under SGMA, this GSA may perform the following functions:

A. Adopt standards and procedures for measuring and reporting groundwater usage and pumping.

B. Develop and implement policy designed to reduce or eliminate overdraft within the boundaries of the GSA.

C. Develop and implement groundwater related best management practices within the boundaries of the GSA.

D. Develop and implement metering, monitoring, and reporting procedures and policies, as necessary and appropriate, related to groundwater pumping.

E. Raise the necessary funds (through Proposition 218 procedures, or otherwise as allowed by law), and incur costs, fees and expenses, and expend money, in furtherance of the development of the GSA,

and development and implementation of a GSP and coordination of GSP(s) within the Subbasin.

F. Collect fees from the Member Agencies, as agreed to by the Member Agencies, to further the purposes of the GSA and implementation of a GSP (including all coordination activities).

6. **Proposed GSA Governing Body**.

A. The GSA shall be governed by a Board of Directors (the "**Board**") that shall consist of five (5) members (each a "**Board Member**") selected as follows:

i. Two (2) Members shall be chosen by CSD;

ii. Two (2) Members shall be chosen by AID; and

iii. One (1) Member shall be chosen by AIWD.

B. The Board Members described herein shall be chosen by the respective governing boards of the Member Agency as identified in Subsection "A" herein above.

C. The Board Members chosen by each Member Agency shall be elected at a public meeting of the respective Member Agencies.

D. There shall be an alternate for each Board Member chosen in the same manner and by the same Member Agency as the Board Member. The alternate shall act in place of the Board Member for whom he or she is an alternate in case of that Board Member's absence or inability to act.

E. The Board Members shall serve for a four (4) year term of office, or until the Member is no longer an eligible official of the Member Agency; or resigns as a Board Member. These Members may serve for more than one (1) term of office. The initial Board Members shall have staggered terms such that one (1) Board Member chosen by each of the Member Agencies shall be elected to a four (4) year term, and one (1) Board Member chosen by each of AID and AIWD shall be elected to a two (2) year term. Each Board Member elected thereafter shall be elected to a four (4) year term.

7. **Board Procedures**. The Board shall have the authorities and obligations provided to it in SGMA and related California regulations, and the authorities and obligations set forth herein:

A. The Board shall be authorized to take action at any meeting at which a quorum is present. A "quorum" shall be a majority (or 50% plus 1) of the Board Members then in office.

B. The Board shall adopt actions for the purpose of regulating, conserving, managing, and controlling the use and extraction of groundwater within the boundaries of the GSA.

C. All actions would be adopted at noticed public hearings by a majority vote of the Board. No ordinance or regulation will be adopted by the Board except at a public hearing. Notice of the hearing would be published in the newspaper of general circulation in the manner provided and pursuant to Section 6066 of the Government Code.

D. The Board will provide notice of the adoption of all actions.

E. The GSA may contract with any of the Member Agencies, or other party selected jointly by the Member Agencies, to provide administrative staff and other services required under SGMA or the GSP developed by this GSA.

F. The GSA shall have the authority to enter into a coordination agreement with other local agencies and/or GSAs for purposes of coordinating a GSP or multiple GSPs within the Subbasin.

8. **GSA Boundaries**. The boundaries of this GSA shall be all land located within the exterior perimeter boundaries of the Member Agencies within the Tule Subbasin, as set forth in Exhibit "A" attached hereto, and as may change from time to time.

9. **Roles and responsibilities of the Member Agencies**. The Member Agencies will work jointly and cooperatively to fulfill the purpose of this MOU, SGMA, and the development and implementation of a GSP within the boundaries of this GSA.

10. **Ongoing Cooperation**. The Member Agencies acknowledge that activities under this MOU will require the frequent interaction between them in order to exploit opportunities and resolve issues that arise. The Member Agencies shall work cooperatively and in good faith to resolve any issues or disputes. The goal of the Member Agencies shall be to preserve flexibility with respect to the establishment and implementation of a GSP in order to maximize the benefits of that GSP to all beneficial users and users of groundwater within the GSA. Notwithstanding the foregoing, nothing in this MOU shall be interpreted to require the Member Agencies jointly to establish the GSA. If the GSA is formed, it shall implement a GSP that complies with the requirement set forth in SMGA that it be coordinated with other GSPs in the basin.

11. **Funding**. Unless agreed to otherwise, each Member Agency's participation in this GSA is at its sole cost and expense. The Member Agencies shall, in good faith, negotiate and determine each Party's proportionate share of costs.

12. **Termination**. This MOU shall remain in effect unless terminated by the mutual written consent of the Member Agencies, or upon thirty (30) days written notice of termination delivered by one (1) Member Agency to the others that is not withdrawn prior to the specified termination date; provided, that upon termination by one (1) Member Agency, the remaining Member Agencies may by mutual written agreement continue this MOU in effect as between the non-terminating Member Agencies, for the governance of the lands lying within the jurisdiction of those non-terminating Member Agencies. Anything to the contrary herein notwithstanding, this MOU shall terminate automatically upon the formation of a JPA by the Member Agencies for the purposes of serving as the GSA, if any.

13. **Amendment**. This MOU and exhibits hereto may only be amended by a subsequent writing, approved and signed by all Member Agencies.

14. **Hold Harmless**. No Member Agency, nor any director or officer of a Member Agency, nor any Member Agency representative, as applicable, shall be responsible for any damage or liability occurring by reason of anything done or admitted to be done by another Member Agency under or in connection with this MOU.

15. **Severability**. Should any provision of this MOU be determined by a court of competent jurisdiction to be void, in excess of a Member Agencies' authority, or otherwise unenforceable, the validity of the remaining provisions of this MOU shall not be effected thereby.

16. **Assignment**. No rights and duties of any other Member Agencies under this MOU may be assigned or delegated without the expressed prior written consent of all of the other Member Agencies, and any attempt to assign or delegate such rights or duties without such consent shall be null and void.

SIGNATURES ON NEXT PAGE

IN WITNESS WHEREOF, the Member Agencies execute this MOU as of the date first set forth above.

ALPAUGH IRRIGATION DISTRICT, a California irrigation district

By: _____
Kenneth Gibbs, Chairman

ATTEST:

_____
Ranveig Magden, Secretary

ATWELL ISLAND WATER DISTRICT, a California water district

By: _____
Jack Mitchell, Chairman

ATTEST:

_____
Gary Gregory, Secretary

ALPAUGH COMMUNITY SERVICES DISTRICT, a California community services district

By: _____
Roger Strickland, Chairman

ATTEST:

_____
John E. Burchard, Secretary

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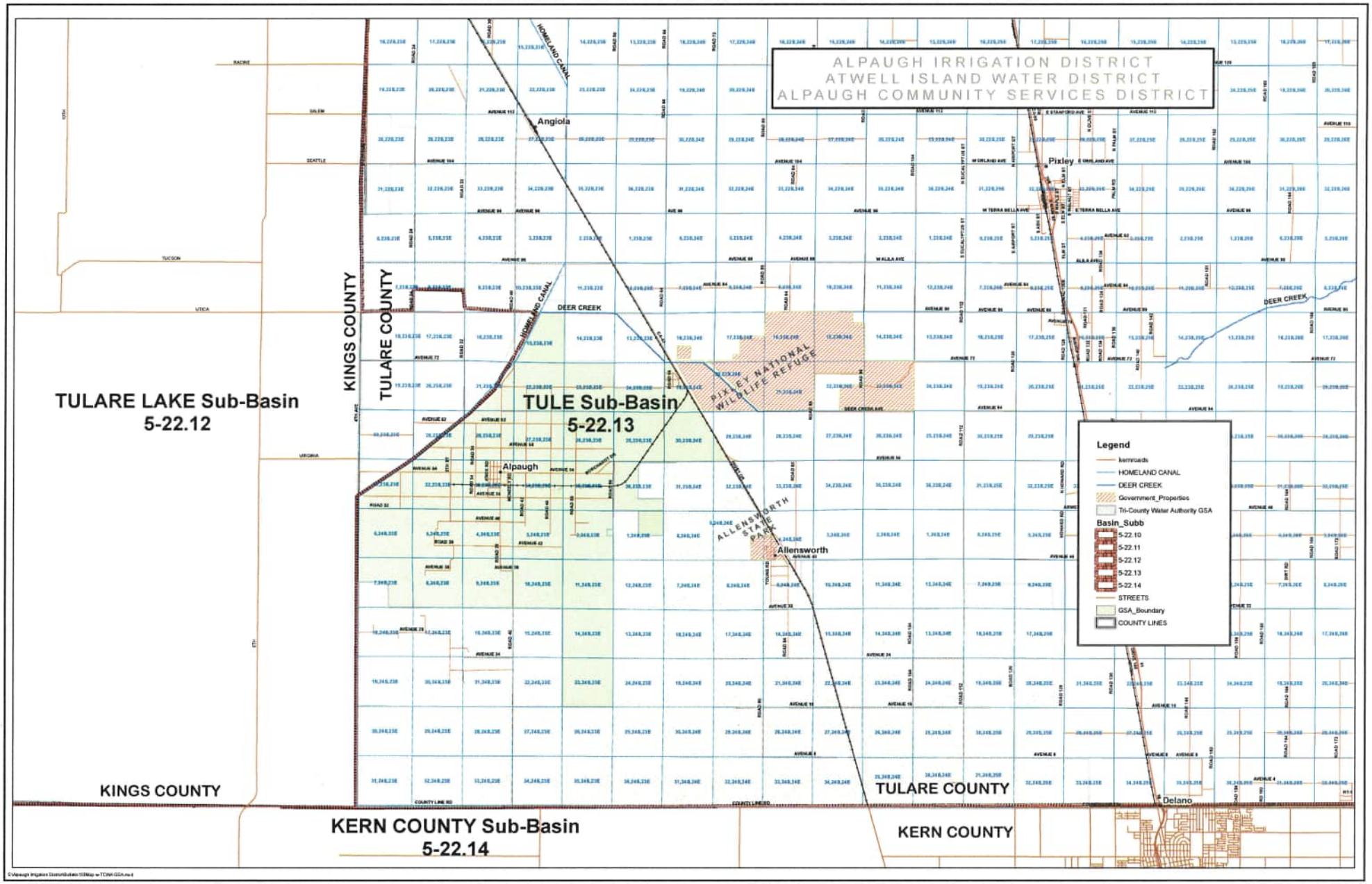
EXHIBIT "2"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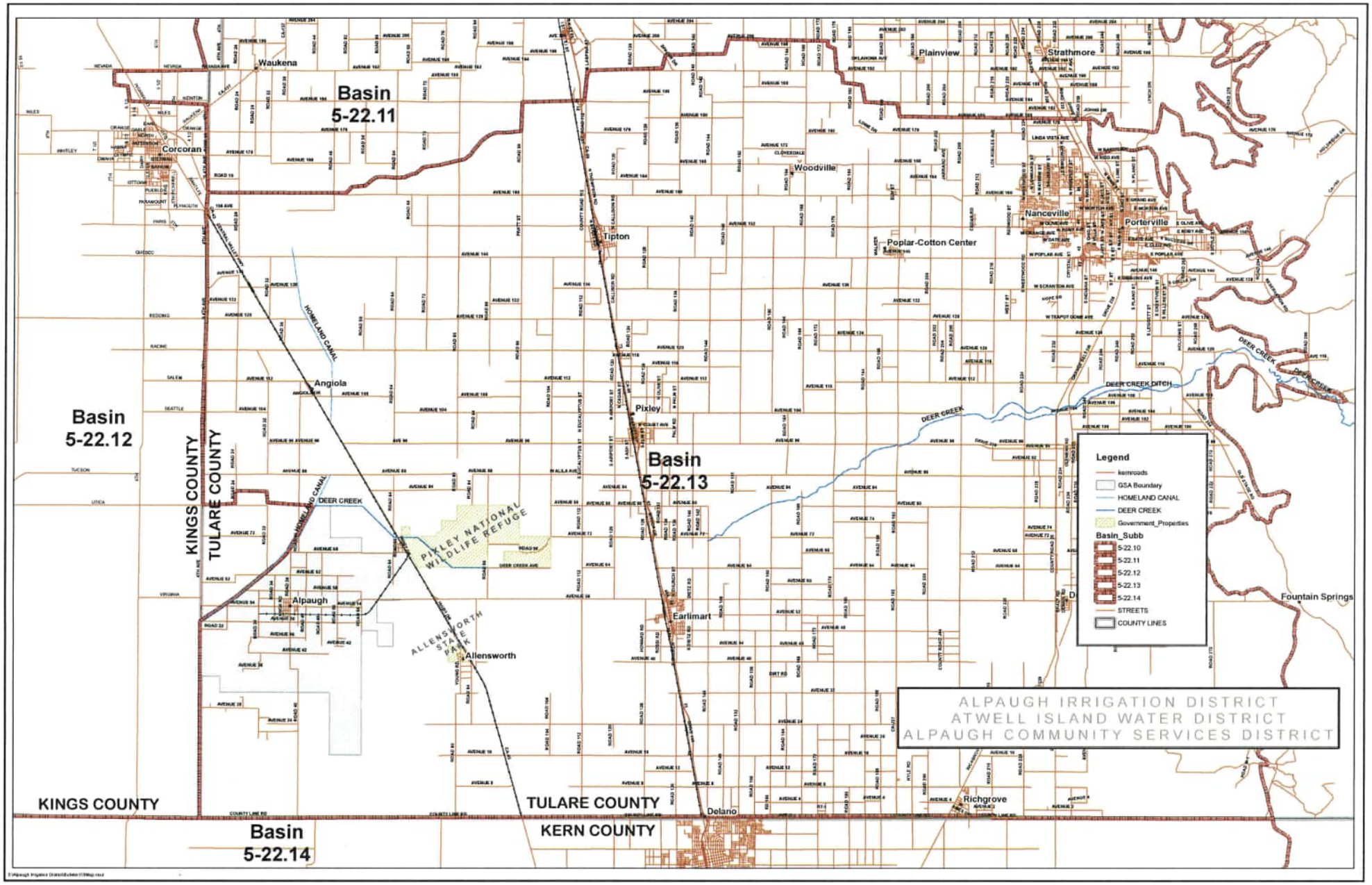
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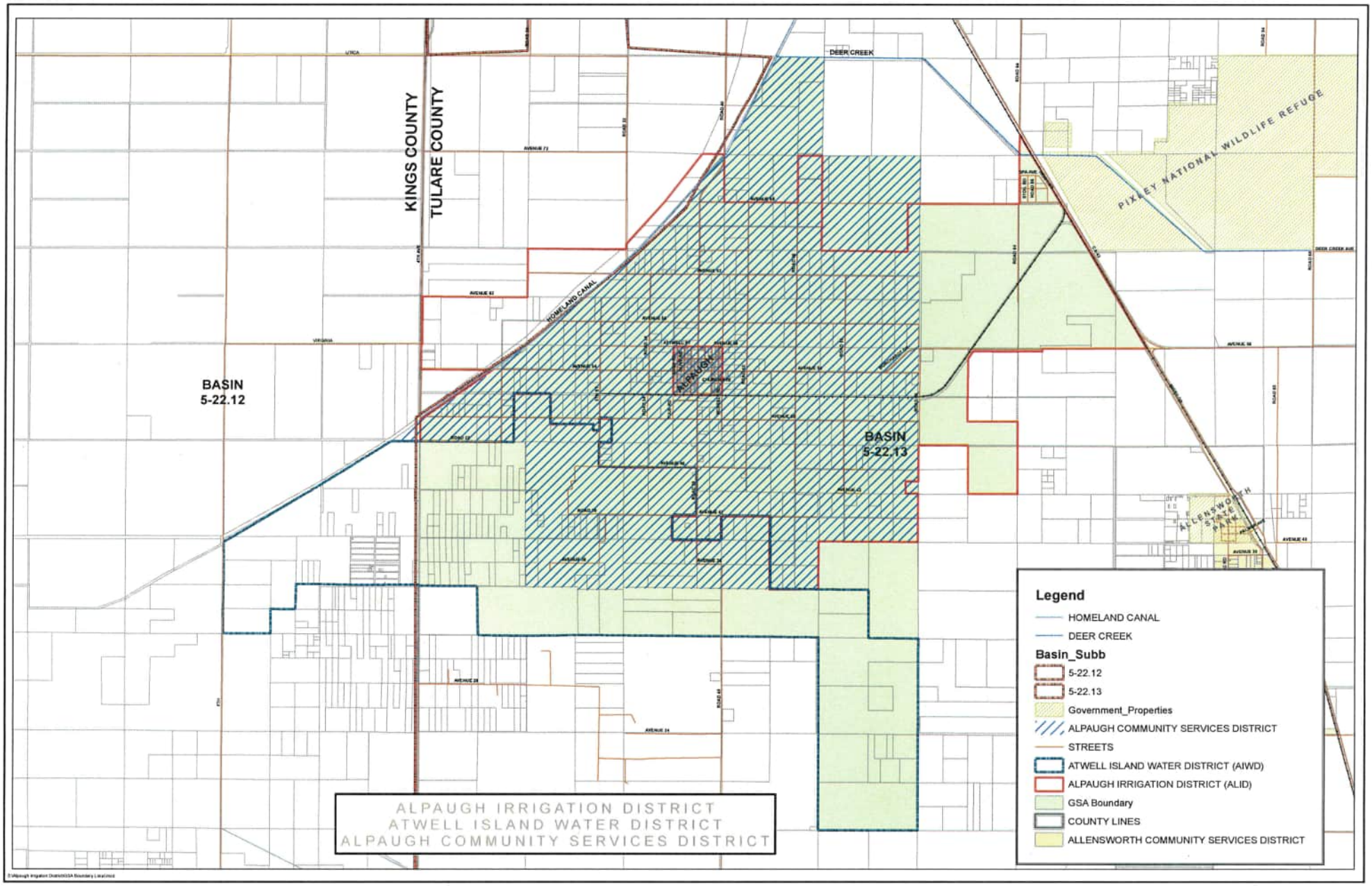
ALPAUGH COMMUNITY SERVICES DISTRICT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STREETS
ATWELL ISLAND WATER DISTRICT (AIWD)
ALPAUGH IRRIGATION DISTRICT (ALID)
GSA Boundary
COUNTY LINES
ALLENSWORTH COMMUNITY SERVICES DISTRICT

EXHIBIT "3"

Visalia Newspapers, Inc.
P.O. Box 31, Visalia, CA 93279
559-735-3200 / Fax 559-735-3210

Certificate of Publication

State Of California ss:
County of Tulare

Advertiser: KAHN SOARES & CONWAY, LLP
219 N DOUTY ST
HANFORD , CA 93230

Order # 0001277998

RE: ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY Notice of

I, Brent Maxwell,
Accounting Clerk, for the below mentioned newspaper(s), am over the age of 18 years old, a citizen of the United States and not a party to, or have interest in this matter. I hereby certify that the attached advertisement appeared in said newspaper on the following

Newspaper: **Visalia Times Delta**

5/16/2016 5/23/2016

I acknowledge that I am a principal clerk of said paper which is printed and published in the City of Visalia, County of Tulare, State of California. The Visalia Times Delta was adjudicated a newspaper of general circulation on July 25, 2001 by Tulare County Superior Court Order No. 41-20576. The Tulare Advance Register was adjudicated a newspaper of general circulation on July 25, 2001 by Superior Court Order No. 52-43225.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 23 day of May, 2016 in Visalia, California.

Brent Maxwell

Declarant

ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY

Notice of Public Hearing

NOTICE IS HEREBY GIVEN that, pursuant to California Water Code Section 10723(b), the ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY (the "Agency") will hold a public hearing (the "Hearing") on Tuesday, May 31, 2016 at 9:00 a.m., at the Alpaugh Irrigation District office located at 5458 Rd 38, Alpaugh, CA 93201, to consider and decide whether the Agency shall become a groundwater sustainability agency (GSA) for a portion of the Tule Groundwater Sub-Basin (Bulletin 118 Basin No. 5-22.13). Written comments should be submitted to the Agency by mail or hand delivery to the Alpaugh Irrigation District office prior to the Hearing, or at the time of the Hearing. During the hearing, the District will receive oral and written comments before making a decision.

After the public hearing, the Agency Board may choose to adopt a Resolution of Intent to Become a GSA and to submit notification to the California Department of Water Resources which shall be posted pursuant to California Water Code Section 10733.3, and will include a description of the proposed boundaries of the portions of the subbasin the Agency intends to manage pursuant to the Sustainable Groundwater Management Act.

For additional information, please contact the Agency at (559) 949-8323 between 9:00 a.m. and 4:00 p.m. Monday through Friday.

Dated: May 12, 2016
Pub: May 16, 23, 2016 #1277998

EXHIBIT "4"

ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY

RESOLUTION NO. 16-1

RESOLUTION OF THE ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY DECLARING ITS INTENTION TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT FOR THE PORTIONS OF THE TULE SUBBASIN WITHIN ITS BOUNDARIES

WHEREAS, on September 16, 2014, California Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act (SGMA); and

WHEREAS, the SGMA went into effect on January 1, 2015; and

WHEREAS, SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by Groundwater Sustainability Agencies (GSAs), which may be formed through formation of a joint powers authority or other legal agreement; and

WHEREAS, the Tule Subbasin has been designated by DWR as a high priority basin; and

WHEREAS, Water Code Section 10723(a) authorizes a local agency with water supply, water management or local land use responsibilities, or a combination of local agencies, overlying a groundwater basin to elect to become a GSA under SGMA; and

WHEREAS, the Alpaugh Groundwater Sustainability Agency is comprised of three local public agency members, Alpaugh Irrigation District, Atwell Island Water District and Alpaugh Community Services District, which have agreed, through a legal agreement, to serve collectively, through a designated Board of Directors, as a GSA within the Tule Subbasin; and

WHEREAS, Water Code Section 10723.2 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans (GSPs); and

WHEREAS, Water Code Section 10723.8 requires that a local agency or agencies electing to be a GSA notify DWR of its election and intention to undertake sustainable groundwater management within a basin; and

WHEREAS, Alpaugh Groundwater Sustainability Agency held a public hearing on May 31, 2016, after publication of notice pursuant to Government Code Section 6066 to consider the adoption of this Resolution and its election to be a GSA in the Tule Subbasin; and

WHEREAS, Alpaugh Groundwater Sustainability Agency, through its Board of Directors, wishes to exercise the powers and authorities of a GSA granted by SGMA through the Water Code.

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE ALPAUGH GROUNDWATER SUSTAINABILITY AGENCY does hereby resolve, declare and order as follows:

1. Alpaugh Groundwater Sustainability Agency hereby elects to become a groundwater sustainability agency and undertake sustainable groundwater management in the portion of the Tule Subbasin (DWR Subbasin 5-22.12) underlying Alpaugh Groundwater Sustainability Agency's boundary.

2. Alpaugh Groundwater Sustainability Agency shall develop an outreach program to include all stakeholders to ensure all beneficial uses and users of groundwater are considered.

3. The Alpaugh Groundwater Sustainability Agency Board of Directors intends to negotiate a memorandum of understanding, other necessary cooperative agreements or other forms of agreement with other GSAs duly formed and operating in the Tule Subbasin, for the purpose of implementing a cooperative, coordinated structure for the management of the Tule Subbasin pursuant to SGMA.

4. The Board of Directors of the Alpaugh Groundwater Sustainability Agency are authorized to submit to DWR on behalf of Alpaugh Groundwater Sustainability Agency (and its collective members) a notice of intent to undertake sustainable groundwater management in accordance with SGMA (Part 2.74 of the Water Code).

5. Staff is directed to send to DWR Alpaugh Groundwater Sustainability Agency's notification of its election to be a GSA and such notification shall include: the boundaries of the Subbasins that the Alpaugh Groundwater Sustainability Agency intends to manage, which shall include lands within Alpaugh Groundwater Sustainability Agency boundaries as set forth in the map attached hereto as Exhibit "1," a copy of this Resolution, a list of the interested parties developed pursuant to Section 10723.2 of SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and the development and implementation of the GSA's groundwater sustainability plan.

All the foregoing being on motion of Director Ranveig Magden, seconded by Director, Davon G. Gregory, and authorized by the following vote, to wit:

AYES:	Magden, Morris, Gregory
NOES:	Strickland
ABSTAIN:	Atwell
ABSENT:	None

I HEREBY CERTIFY that the foregoing resolution is the resolution of said District as duly passed and adopted by said Board of Directors on the 31st day of May, 2016.

Davon G. Gregory, Secretary

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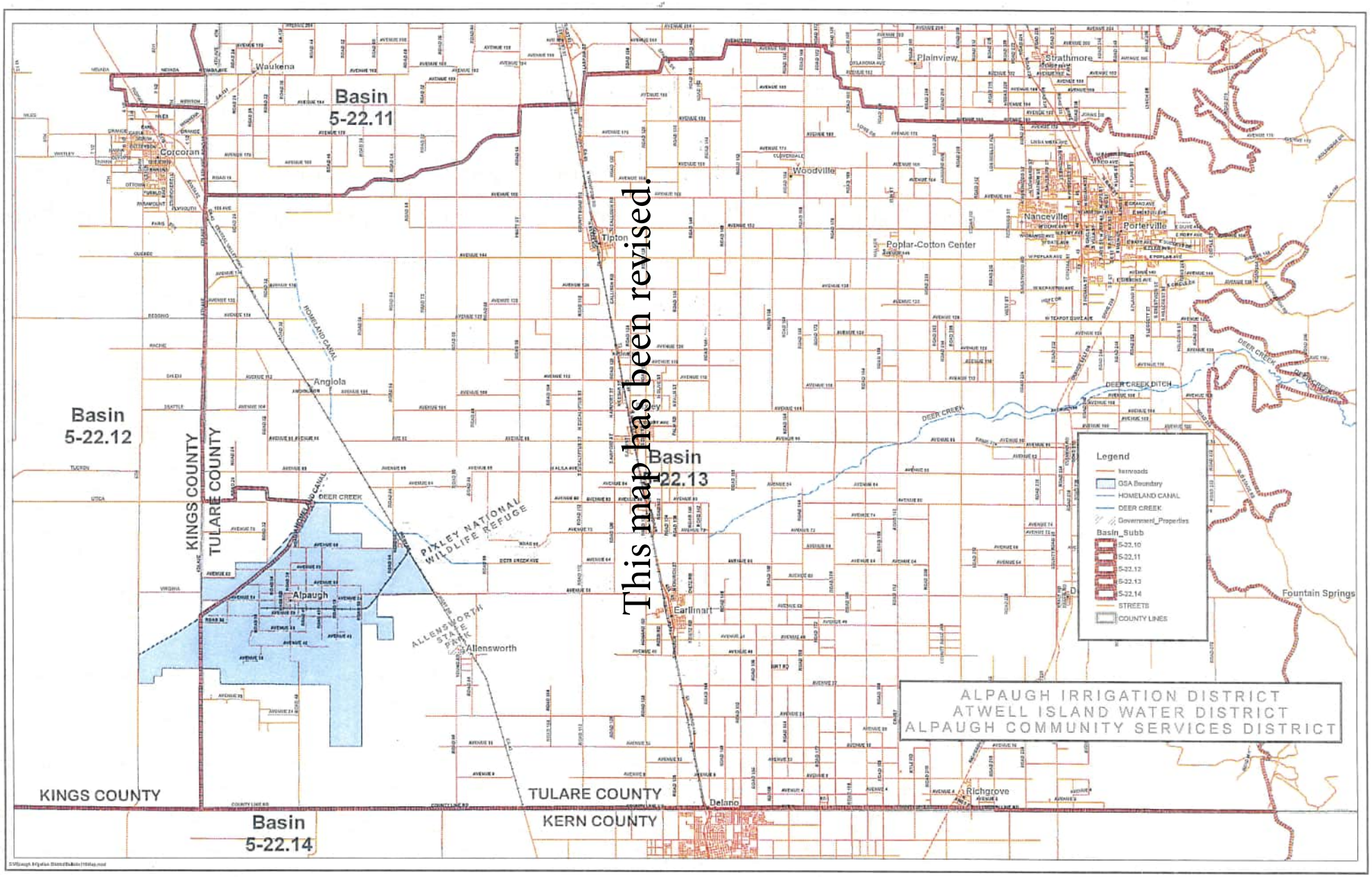
EXHIBIT "1"

(To Resolution No. 16-1)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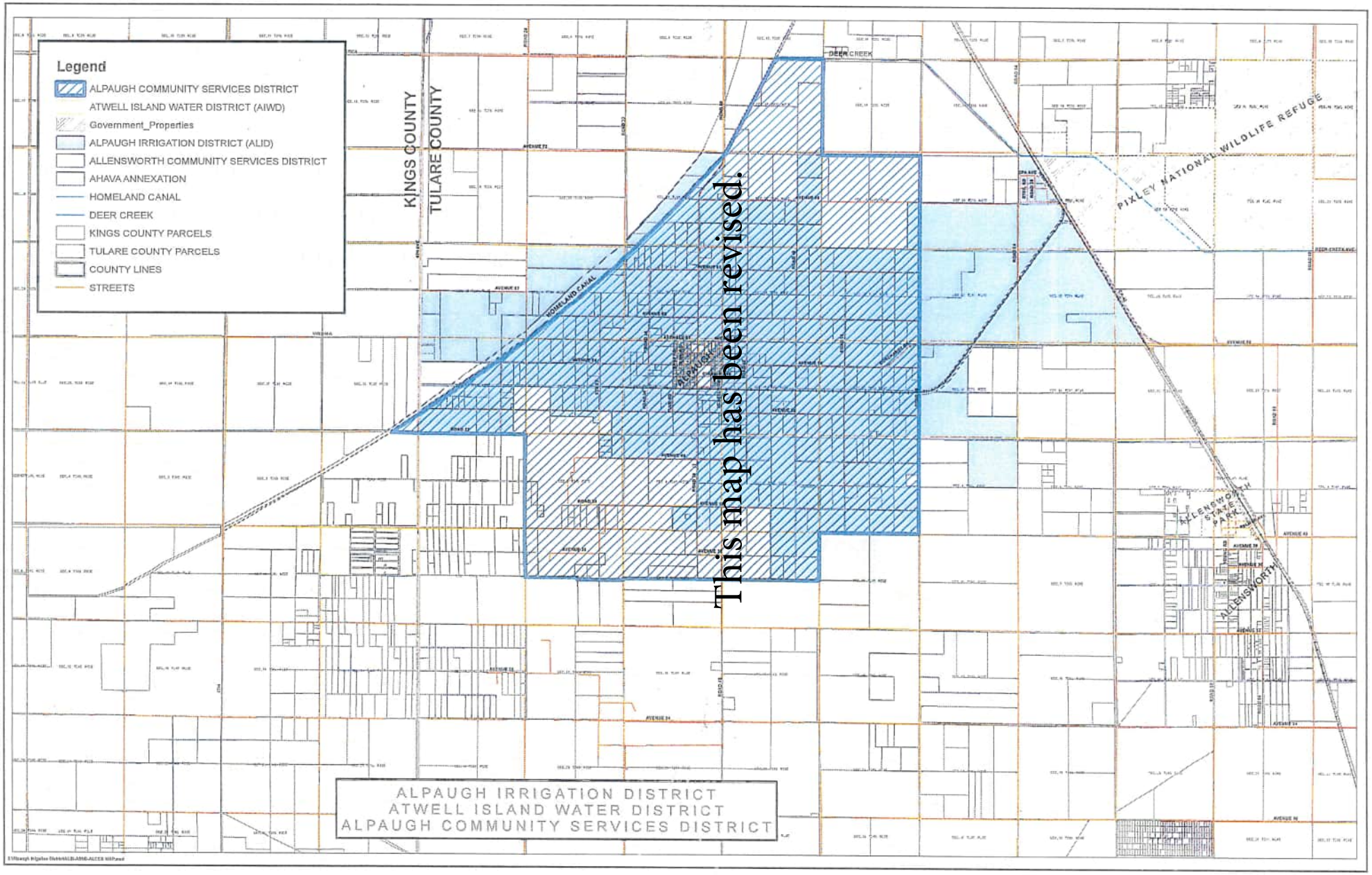
ATWELL ISLAND WATER DISTRICT
ALPAUGH COMMUNITY SERVICES DISTRICT



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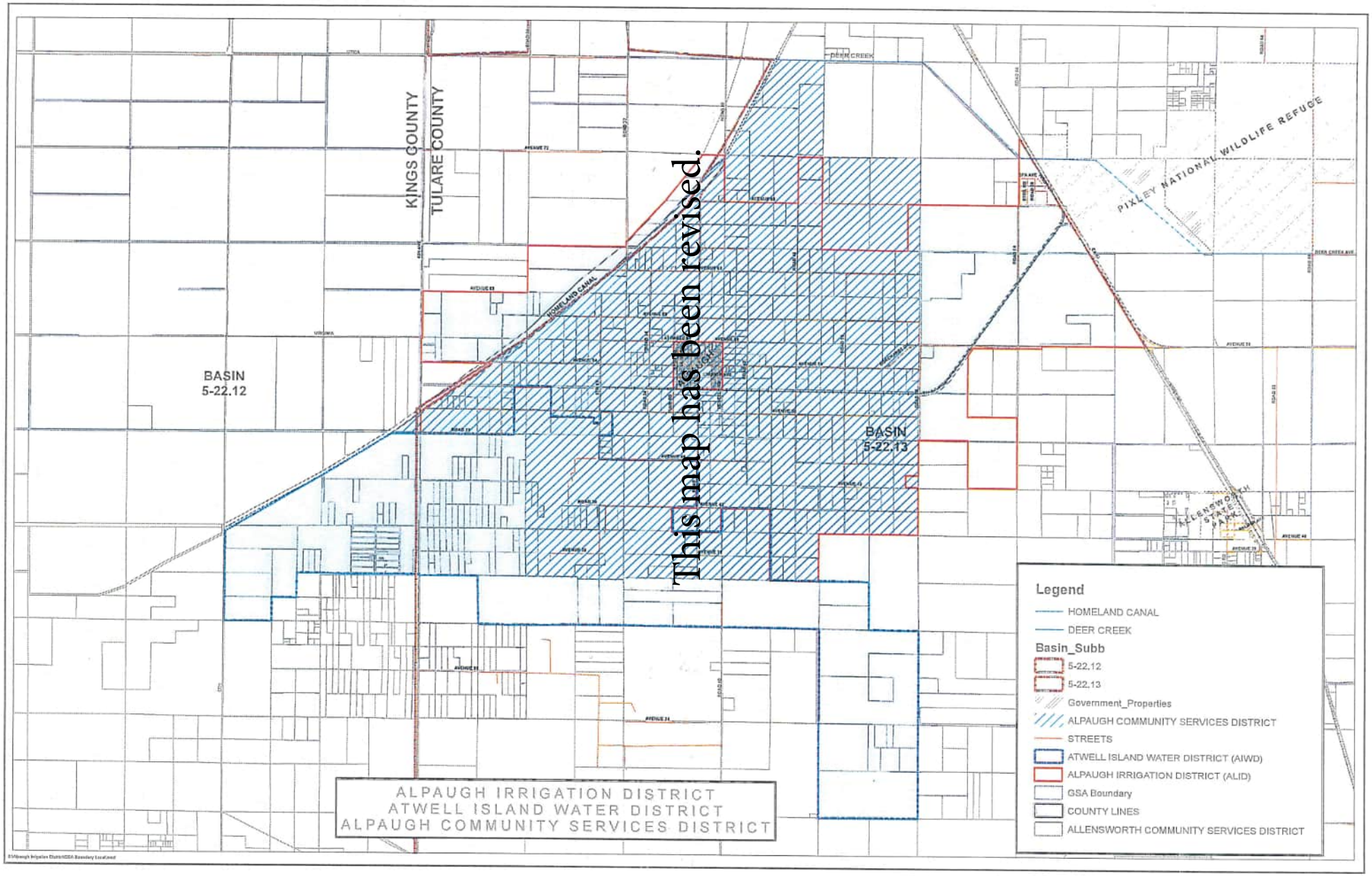
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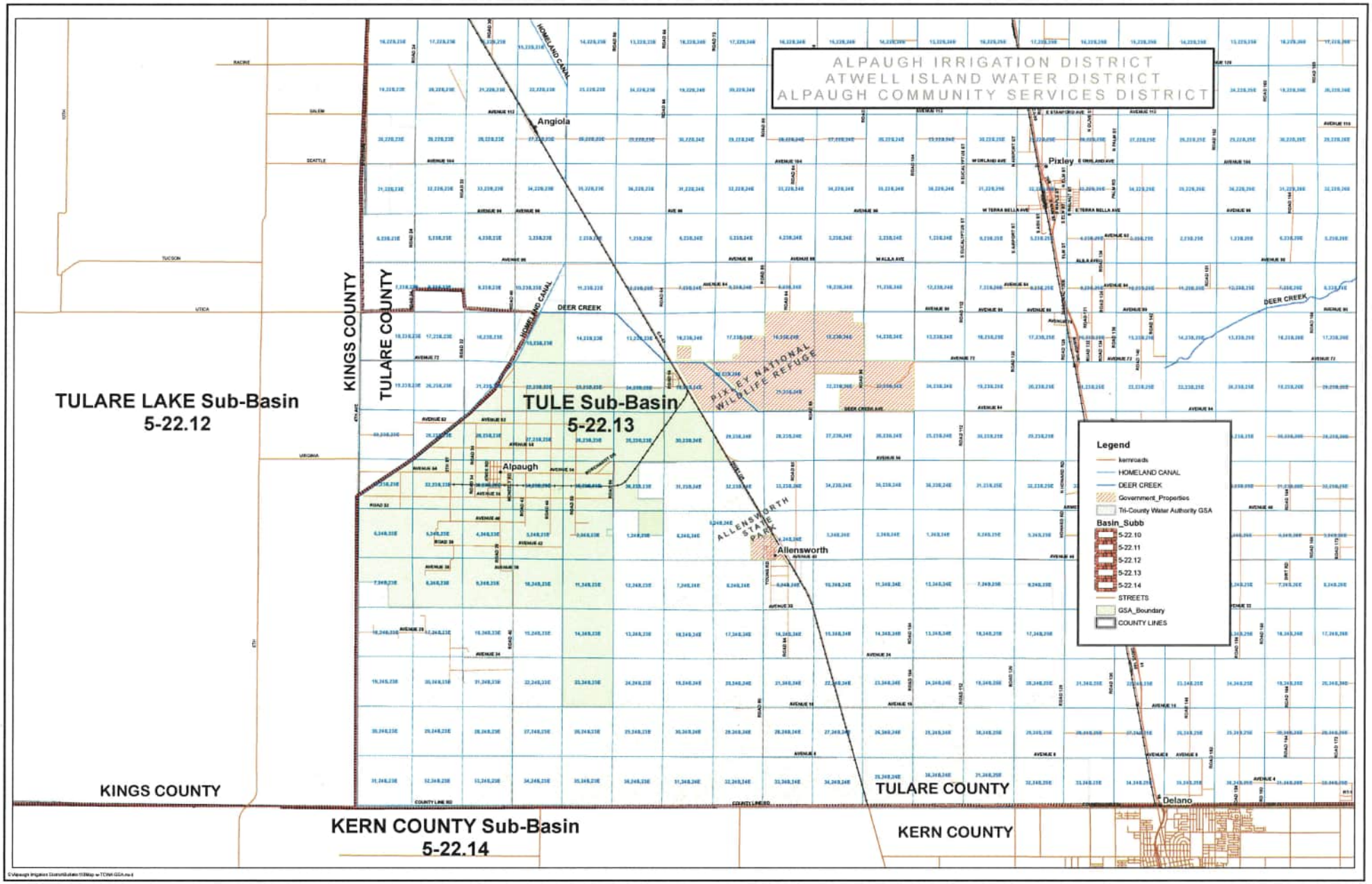
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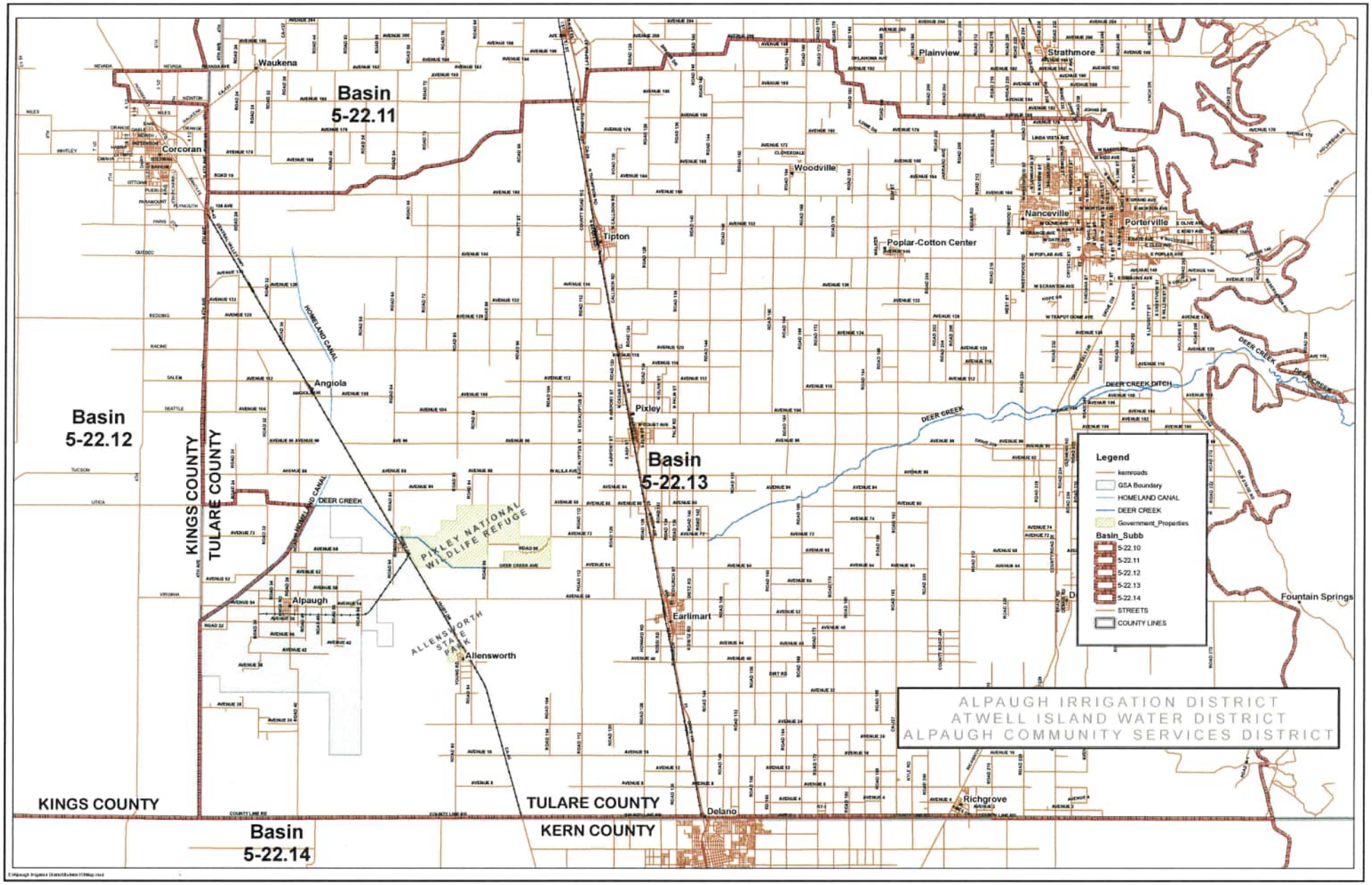
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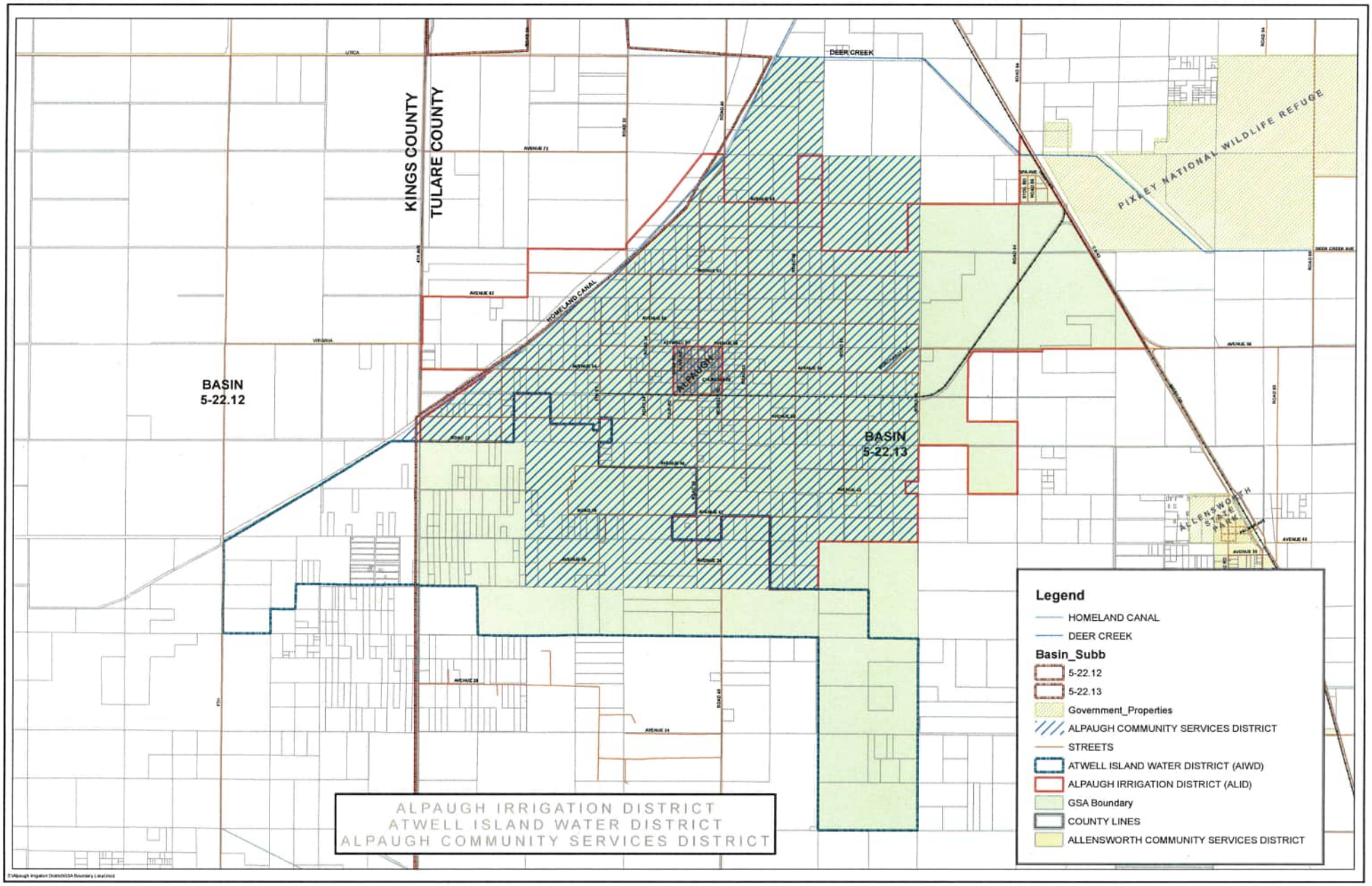
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Appendix B
Tule Subbasin Coordination Agreement

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

7/13/2022

TABLE OF CONTENTS

Table of Contents

Attachments:

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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").

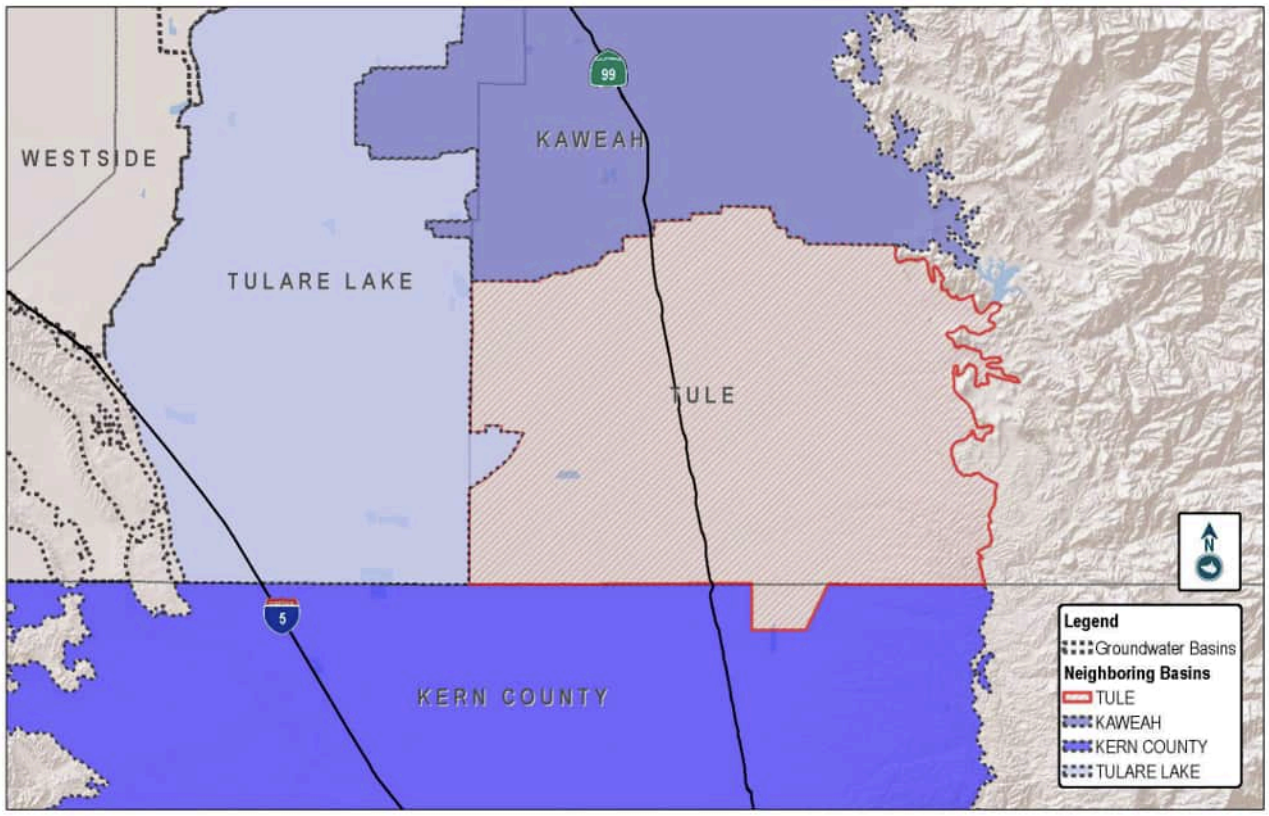

FIGURE 1-1: TULE SUBBASIN

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.

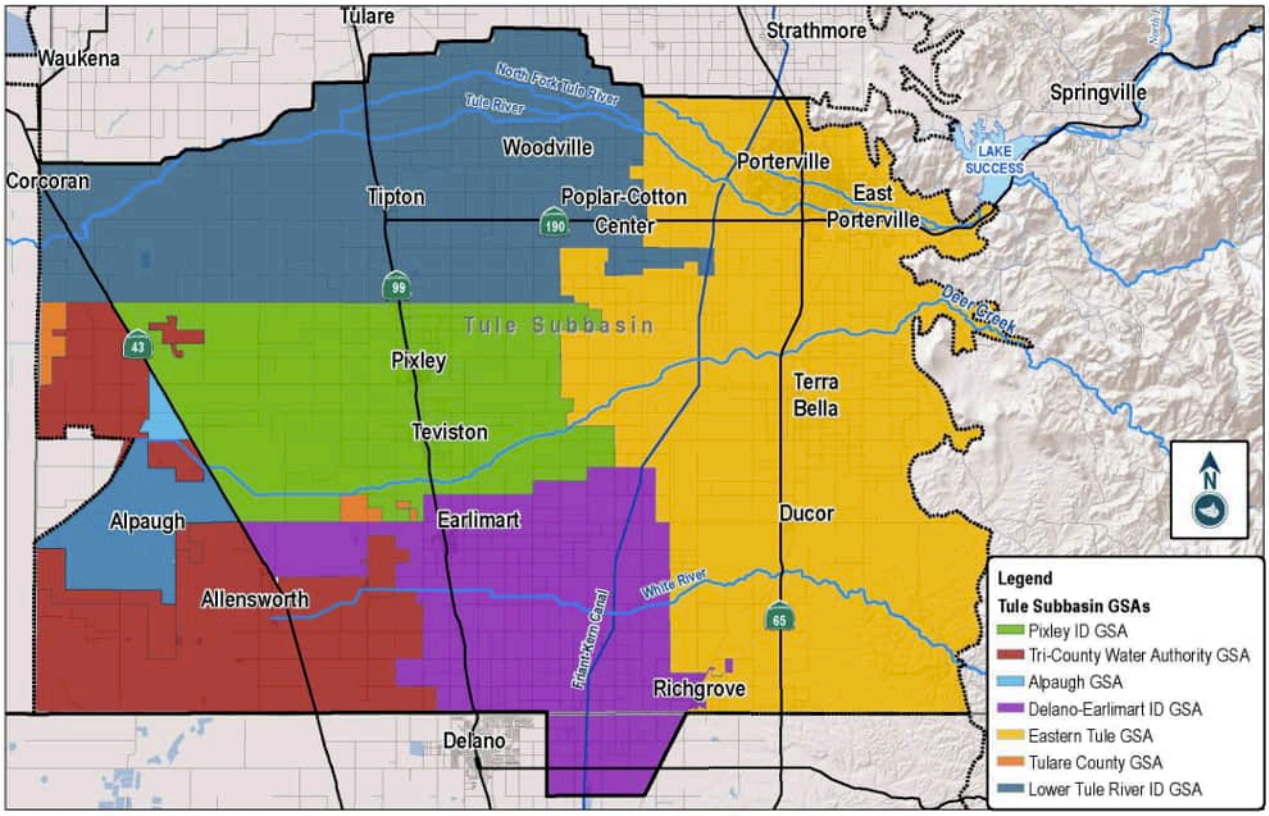

FIGURE 1-2: TULE SUBBASIN GROUNDWATER SUSTAINABILITY AGENCIES

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 Water Budget §354.18.

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:

Surface Water Inflow

- 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).