in the GSP. The EKGSA will try to fill these locations either through agreements with private landowners or by drilling new dedicated monitoring wells.

Other data gaps exist in the fact that most of the proposed monitoring network wells are privately owned production wells that are used for monitoring. Specific well construction information, including depth and perforated interval, are not known for many of the wells. Also, depending on how and when the data was collected, data points in some (or all) years may be skewed. Utilizing a production well as a monitoring well runs the risk of potential influence from recent pumping that may affect the 'static' reading aimed to be captured. It is believed that much of the recorded well data within the EKGSA is credible, however the EKGSA will continue to improve this data set going forward.

4.3.3.4 Plans to Fill Data Gaps

Legal Requirements:
§354.38 (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.

The EKGSA will oversee the groundwater level monitoring network, including filling areas with data gaps. This will be especially useful for the regions that are not currently monitored, such as outside irrigation district boundaries. As previously stated, **Figure 4-1** depicts the wells intended to fill spatial data gaps for initial implementation. The EKGSA will need to locate accessible private wells or drill new wells in the seven locations shown. Over time the EKGSA will transition to utilizing dedicated monitoring wells in its monitoring network.

To address data quality gaps related to unknown construction information, the EKGSA will utilize the following options:

- ***Collect well completion reports.*** *Accurate well Completion Reports (WCRs) can potentially provide missing well construction and completion information. These records could be collected from landowners or DWR. Due to the way that data is collected and dispersed, it is often difficult to correlate WCRs with actual wells. Locations of wells as reported on WCRs are often subjective, as they are based on the drillers' ability to convey spatial location. Multiple wells may exist within the area a well's log leads to. In some cases, wells have been destroyed or lost without documentation. Obtaining well logs directly from owners bypasses this confusion, though this is not a perfect solution. Private well owners may be unable or unwilling to provide logs for their wells.*
- ***Perform a video inspection of each well to obtain construction information.*** *In the absence of verified well logs a video inspection can be performed on wells to determine the total completed depth and perforated interval(s). Each video inspection currently ranges in costs between $2,500 and as much as $15,000 if required to lift and reinstall a pump to obtain access in production wells. There would also be additional costs for administration and outreach to landowners. The EKGSA would need to enter into private agreements with individual well owners for the use of these wells; as an incentive for participation the EKGSA would cover the cost of the well video assessment.*
- ***Abandoned Wells.*** *The EKGSA will assess the likelihood of monitoring former wells that have been abandoned. Use of these wells will potentially bolster the density of the monitoring network in areas with minimal coverage, likely involve less stringent access requirements, and are cheaper than drilling new wells. Additionally, since these wells are no longer in production, the monitoring of abandoned wells allows for better potential in gaining a static water level reading and better fulfill the requirements of Sub-Article 4.*
- ***Replace monitoring point with a dedicated monitoring well.*** *Dedicated monitoring wells could be installed and used in place of private wells. The construction information would be known and since the EKGSA would locate these wells, access issues would not be an issue. Dedicated monitoring wells are expensive to construct, and their installation will depend on available funding.*
- ***Replace monitoring point with another private well.*** *Private wells without documented construction information may potentially be replaced with other private wells that have verified well completion information. This option may be simpler and less costly than using video inspection and would be substantially less expensive than drilling new*

dedicated monitoring wells. This method of network repair would side-step the expense of drilling new wells but would still be subject to availability and limitations arising from the missing historical record.

4.4 Groundwater Storage

Legal Requirements:
§354.34(c)(2) Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.

4.4.1 Monitoring Network Description

The EKGSA is proposing to monitor changes in groundwater storage by utilizing groundwater levels as a proxy. Put simply, if groundwater levels decline to unacceptable levels it indicates an unacceptable volume of water was lost from groundwater storage or, given the shallow aquifer on the east side, an unacceptable amount of groundwater remains in storage. By utilizing the groundwater level monitoring as a proxy, the monitoring network for groundwater storage is the same as depicted in **Figure 4-1**. More background on groundwater aquifer characteristics and formation cross-sections is needed to evaluate groundwater storage is detailed in the Current and Historical Groundwater Conditions of the Basin Setting (**Chapter 2**). With groundwater level monitoring from year to year, calculations can be performed to estimate change in storage. This method uses average specific yield, basin area, and change in groundwater levels to determine the change in storage from year to year. Additionally, the calibrated Kaweah Sub-basin Groundwater Model can be used to estimate change in storage.

4.4.2 Quantitative Values

Groundwater storage values will be determined by comparing groundwater level changes from year to year through the groundwater level monitoring network. Threshold values are presented in **Chapter 3** and include minimum threshold, measurable objective, and interim milestones.

4.4.3 Review and Evaluation of Monitoring Network

4.4.3.1 Site Selection

Groundwater storage capacity has historically been calculated using local groundwater levels in conjunction with estimated specific yield values. The inadequacies in past groundwater level monitoring networks impacts these calculations since evaluating the change in groundwater storage is largely based on the spatial and temporal coverage of the groundwater level monitoring network. As such, site selection will correspond with the parameters set forth for the groundwater level monitoring sites.

4.4.3.2 Monitoring Frequency and Density

Change in groundwater storage will be estimated annually by comparing Spring groundwater level readings. Groundwater storage change will be estimated on a regional scale encompassing the entirety of the EKGSA through the development of groundwater contours from the Spring data.

4.4.3.3 Identification of Data Gaps

Gaps in current groundwater level monitoring networks have created corresponding inadequacies in the ability to calculate change in storage. Data gaps associated with aquifer characteristics, such as specific yield values used for storage estimates, are anticipated to be improved through the completion of different projects and studies undertaken by the Kaweah Sub-basin and the EKGSA (i.e. SkyTEM).

4.4.3.4 Plans to Fill Data Gaps

Significant data gaps will be filled using the same methods used to address data gaps in the groundwater level network, as spatial data coverage is a critical component in the change in storage calculations. Aquifer evaluation at a Sub-basin scale was performed through a SkyTEM electromagnetic analysis. The results from this analysis were not ready in time for this initial GSP but will be available for future updates and modeling to improve the general knowledge of the aquifer characteristics moving forward.

4.5 Water Quality

Legal Requirements:
§354.34(c)(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.

4.5.1 Monitoring Network Description

Water quality monitoring is an important aspect of groundwater management. It serves the following purposes:

1. Spatially characterize water quality according to soil types, soil salinity, geology, surface water quality, and land use;
2. Compare constituent levels at a specific well through time;
3. Determine the extent of groundwater quality problems in specific areas;
4. Identify groundwater quality protection and enhancement needs;
5. Identify impacts of recharge and surface water use on water quality;
6. Identify suitable crop types that are compatible with the water characteristics; and
7. Monitor the migration of contaminant plumes (such as nitrate).

Baseline groundwater quality conditions for the EKGSA are discussed in the Basin Setting (**Chapter 2**). Several agencies are involved in the monitoring and mitigation of groundwater quality in the surrounding area, such as:

- ***Groundwater Ambient Monitoring and Assessment Program (GAMA)-*** *California's comprehensive groundwater quality monitoring program was designed to identify the threats to California's groundwater resources as prescribed in the Groundwater Quality Monitoring Act of 2001 (AB 599). The program monitors ambient groundwater quality, provides hydrogeologic technical support to statewide programs, and includes projects that meet the statutory requirements of the Groundwater Quality Monitoring Act. Through collaboration with State and Regional Water Boards, the DWR, Department of Pesticide Regulations (DPR), USGS, Lawrence Livermore National Laboratory, and local well owners and agencies, GAMA aims to improve statewide groundwater quality monitoring and increase the availability of groundwater quality information to the public. More information on the GAMA program can be found at: https://www.waterboards.ca.gov/gama/. The GAMA program reports data for*
  - ***DHS –*** *Department of Health Services (now Department of Public Health, DPH).*
  - ***CA SDWIS –*** *California Safe Drinking Water Information System*
  - ***DWR –*** *Department of Water Resources*
  - ***DPR –*** *Department of Pesticide Regulation*
  - ***USGS –*** *United States Geological Survey*
  - ***EDF –*** *Environmental Defense Fund*
  - ***Geotracker and Envirostor Databases***
- ***Irrigated Lands Regulatory Program-*** *The Irrigated Lands Regulatory Program (ILRP) was initiated in 2003 to address pollutant discharges to surface water and groundwater from commercially irrigated lands. The primary purpose of the ILRP is to address key pollutants of concern including salinity, nitrates, and pesticides introduced through*

runoff or infiltration of irrigation water. Within the EKGSA, the ILRP is administered by the Central Valley Regional Water Quality Control Board (CVRWQCB). The Kaweah Basin Water Quality Coalition (Coalition) was established in 2009 as a Joint Powers Agency to pool resources and combine regional efforts to comply with the regulatory requirements of the ILRP. Historically, the Coalition has only monitored surface water quality, but groundwater quality began being monitored in Fall of 2018. In April 2017, the Coalition released a Groundwater Quality Trend Monitoring Workplan – Phase I and submitted a follow-up Groundwater Quality Trend Monitoring Workplan – Phase II in May 2018. The CVRWQCB will ultimately decide whether the submitted network is representative of the impacts of irrigated agriculture of groundwater quality. Additional details of the monitoring network and specific well selection will follow formal CVRWQCB approval of the workplan. Results from annual monitoring will be documented in an annual report and publicly available via the GAMA Geotracker database. The ILRP groundwater trend monitoring program requires testing annually for nitrate as N, conductivity, pH, dissolved oxygen, and temperature in all network wells. In addition, every five years, network wells must also be tested for total dissolved solids, carbonate, bicarbonate, chloride, sulfate, boron, calcium, sodium, magnesium, and potassium.

- ***CV-SALTS-*** *The Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS) program began in 2006 and is a collaborative stakeholder-driven and managed program to develop sustainable salinity and nitrate management planning for the Central Valley. CV-SALTS developed a Salt and Nitrate Management Plan (SNMP) to meet the requirements set forth in the State Recycled Water Policy adopted in 2009. The SNMP's goals are to provide a safe drinking water supply, achieve balanced salt and nitrate loadings, and implement a managed aquifer restoration program. Combined, the development of the SNMP and the proposed, corresponding Basin Plan amendments will establish a revised regulatory framework and provide the flexibility necessary to make salt and nitrate management decisions at the appropriate temporal, geographic and/or management scales. As a part of the larger SNMP, CV-SALTS also developed a Surveillance and Monitoring Program (SAMP) to monitor groundwater quality and comply with the Recycled Water Policy. The SAMP network developed two monitoring networks – one each for the shallow and deep aquifer zones. It is anticipated that implementation of the surveillance and monitoring program will occur soon after adoption of planned Basin Plan amendments. In March 2017, the CVRWQCB adopted a resolution accepting the SNMP and directing staff to initiate Basin Plan amendments for incorporation into the Basin Plans. On May 31, 2018 the CVRWQCB adopted the suggested Basin Plan amendments. These proposed Basin Plan amendments are currently undergoing the State Water Board adoption process and will be followed with the Office of Administrative Law and US EPA (as appropriate) adoption processes.*
- ***Municipal Water Suppliers-*** *Municipal water suppliers in the EKGSA include the City of Lindsay and the Strathmore Public Utility District. These entities test water quality on a routine basis for state and federally regulated inorganic and organic constituents, as well as coliform bacteria, as required by the Division of Drinking Water (DDW). Testing requirements vary based on the size of the system and constituents of concern with a history in the area. Water quality is tested at all production well sites and some monitor wells. The municipal water suppliers also prepare annual Consumer Confidence Reports to inform the public of water quality issues, as required by the State of California.*
- ***AB 3030 and SB 1938-*** *AB 3030 was established in 1992 to require certain local agencies to compile groundwater management plans (GMP) and SB 1938 was enacted to require agencies to identify a basin management strategy in the GMP to receive funding. AB 3030 introduced several technical considerations that apply to groundwater quality. The plans are to be updated once every five years. Under this program local agencies must successfully manage their groundwater resources and are encouraged to consider twelve voluntary components:*
    1. *The control of saline water intrusion.*
    2. *Identification and management of wellhead protection areas and recharge areas.*
    3. *Regulation of the migration of contaminated groundwater.*
    4. *The administration of a well abandonment and well destruction program.*
    5. *Mitigation of conditions of overdraft.*
    6. *Replenishment of groundwater extracted by water producers.*
    7. *Monitoring of groundwater levels and storage.*
    8. *Facilitating conjunctive use operations.*
    9. *Identification of well construction policies.*

10. *The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.*
11. *The development of relationships with state and federal regulatory agencies.*
12. *The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination (AB 3030).*

Data from these groundwater monitoring sources indicate the common constituents of concern (COCs) in the EKGSA include: 1,2,3-Trichloropropane (1,2,3 TCP), 1,2-Dibromo-3-chloropropane (DBCP), Arsenic, Hexavalent Chromium, Nitrate, Perchlorate, Sodium, Chloride, and Total Dissolved Solids (TDS). Wells supplying drinking water (i.e. public systems) will be monitored for all of these COCs quarterly. Wells supplying irrigation water will be monitored for Chloride, Sodium, and TDS on a semiannual basis. Further information about these COCs, corresponding regulatory requirements, and contaminant plumes can be found in the Basin Setting (**Chapter 2**). These COCs are proposed to be monitored at all wells in the groundwater level monitoring network, based on their use to develop a more robust data set since current coverage of groundwater quality data is lacking for many parts of the EKGSA.

4.5.2 Quantitative Values

Threshold values for COCs are presented in **Chapter 3**. These values use MCL and prevalence data to provide minimum thresholds, measurable objectives, and interim milestones for each COC. **Table 4-3** repeats the monitoring network wells table, but this time shows the baseline 10-year (2008-2017) COC averages for the wells in the network with water quality data available. By comparison, only 15 of the approximately 70 wells to be monitored for water quality have data for establishing a baseline. This represents a significant data gap, however the intent of the EKGSA monitoring will strive to remedy this gap over the first years of implementation. Water quality degradation will be evaluated against the appropriate water quality standard at the time of the sample and on a 10-year rolling average to determine if the actions of the EKGSA degrade the beneficial use of water in the Subbasin.

4.5.3 Review and Evaluation of Monitoring Network

4.5.3.1 Monitoring Frequency and Density

Water quality monitoring will be conducted at the wells proposed in the groundwater level monitoring network, based on the use of the well water (agricultural or municipal), on a semi-annual or quarterly basis. Agricultural wells will be sampled on a semi-annual basis while municipal wells will be sampled quarterly due to more stringent regulatory requirements. Over time if quality results indicate increasing COC concentrations, monitoring frequency may increase. The frequency of the data collection and the coverage gained by utilizing the groundwater level monitoring network should be sufficient to demonstrate seasonal, short-term (1 to 5 years) and long-term (5 to 10 years) trends in groundwater quality and its relationship to surface conditions and groundwater management activities by the EKGSA.

4.5.3.2 Site Selection

The EKGSA is proposing to utilize the wells in the groundwater level monitoring network in order to gain more groundwater quality data throughout the EKGSA to better evaluate the location and concentrations of the COCs. By utilizing the proposed groundwater level network, the sites selected will correspond with the parameters set forth for the groundwater level monitoring sites.

The intent to monitor water quality specific to the well type in the monitoring network is to evaluate potential trends and impacts directly to the beneficial user, with the focus on agricultural and drinking water use. Evaluating agricultural quality goals will allow the EKGSA to evaluate quality trends for some of the largest use. Evaluating specific drinking water wells of communities within or near the EKGSA allows the EKGSA to

evaluate the quality of drinking water for the vast majority of its resident. Sampling wells for the communities of Yettem, Seville, Ivanhoe, Woodlake, Exeter, Tooleville, Tonyville, Lindsay, Plainview, and Strathmore represent 80%-90% of the population within the EKGSA boundaries.

4.5.3.3 Identification of Data Gaps

The absence of groundwater level data across the entirety of the EKGSA is a data gap. Future monitoring will need to address this data gap so the EKGSA can properly evaluate how groundwater management actions are impacting groundwater quality.

4.5.3.4 Plans to Fill Data Gaps

The EKGSA's proposal to monitor COCs across the groundwater level monitoring network intends to fill some of the significant data gaps with respect to groundwater quality data. Monitoring over the first five years of implementation should provide more insight on groundwater quality (location, trends, etc.) in the EKGSA. The EKGSA will also collaborate, where appropriate and feasible, with other agencies tasked with tracking and/or improving groundwater quality for additional assistance with data gaps.

Table 4-3 COC Baseline 10-Year Average Concentration (2008-2017)

TR	Latitude	Longitude	Site Type	Arsenic (ppb)	Chloride (ppm)	Chromium VI (ppb)	DBCP (ppb)	Nitrate (as N) (ppm)	Perchlorate (ppb)	Sodium (ppm)	TCP (ppt)	TDS (ppm)
1 - EK NW	36.4281	-119.2092	Irrigation Monitoring Well									
1 - EK NW	36.4086	-119.2381	Irrigation Monitoring Well									
1 - EK NW	36.3992	-119.2051	Irrigation Monitoring Well									
1 - EK NW	36.385905	-119.219633	Drinking Water Monitoring Well	2.40	22.00	1.10	0.01	9.25		43.75	0.02	390.00
1 - EK NW	36.389279	-119.224619	Drinking Water Monitoring Well	2.20	26.33	1.30	0.02	8.02		38.67	0.05	416.67
1 - EK NW	36.387249	-119.215311	Drinking Water Monitoring Well		43.00	1.40	0.05	11.47		42.00		460.00
2 - IID-SCID	36.493	-119.2142	Irrigation Monitoring Well									
2 - IID-SCID	36.5005	-119.187	Irrigation Monitoring Well									
2 - IID-SCID	36.4788	-119.1653	Irrigation Monitoring Well									
2 - IID-SCID	36.4682	-119.2001	Irrigation Monitoring Well									
2 - IID-SCID	36.4388	-119.1703	Irrigation Monitoring Well									
2 - IID-SCID	36.4146	-119.1728	Irrigation Monitoring Well									
2 - IID-SCID	36.399028	-119.135194	Irrigation Monitoring Well									
2 - IID-SCID	36.504083	-119.181382	Subsidence Survey Site	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - IID-SCID	36.414025	-119.139866	Subsidence Monument	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - IID-SCID	36.483936	-119.156678	Subsidence Survey Site	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - IID-SCID	36.453177	-119.223455	Proposed Monitoring Well									
2 - IID-SCID	36.472965	-119.18822	Irrigation Monitoring Well									
3 - EK NE	36.449941	-119.120187	Proposed Monitoring Well									
4 - RIVER	36.3438	-119.1012	Irrigation Monitoring Well									
4 - RIVER	36.3649	-119.0628	Irrigation Monitoring Well									
4 - RIVER	36.333	-119.0784	Irrigation Monitoring Well									
4 - RIVER	36.3338	-119.0817	Irrigation Monitoring Well									
4 - RIVER	36.403201	-119.097777	Drinking Water Monitoring Well									
4 - RIVER	36.4038	-119.098318	Drinking Water Monitoring Well									
4 - RIVER	36.399822	-119.097991	Drinking Water Monitoring Well									
4 - RIVER	36.400218	-119.096258	Drinking Water Monitoring Well									
4 - RIVER	36.397603	-119.101521	Drinking Water Monitoring Well									
4 - RIVER	36.325077	-119.085966	Drinking Water Monitoring Well									
4 - RIVER	36.324287	-119.086025	Drinking Water Monitoring Well									
5 - EID	36.3115	-119.135806	Irrigation Monitoring Well									
5 - EID	36.2853	-119.1209	Irrigation Monitoring Well									
5 - EID	36.325278	-119.106389	Subsidence Monument	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5 - EID	36.311321	-119.135088	Subsidence Monument	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5 - EID	36.296749	-119.144649	Drinking Water Monitoring Well		34.33	2.30	0.07	6.24	4.30	47.00		390.00
5 - EID	36.298267	-119.151426	Drinking Water Monitoring Well		18.67	2.10	0.06	5.19		45.33		390.00
5 - EID	36.306361	-119.144192	Drinking Water Monitoring Well	2.43	68.25	2.50	0.03	3.31		56.25		315.00
5 - EID	36.286649	-119.113386	Drinking Water Monitoring Well		185.00	12.15		8.59		84.50		550.00
5 - EID	36.288174	-119.115877	Drinking Water Monitoring Well	3.50	615.00			8.11		200.00		1350.00
6 - EK SE	36.1833	-119.0278	Irrigation Monitoring Well									

TR	Latitude	Longitude	Site Type	Arsenic (ppb)	Chloride (ppm)	Chromium VI (ppb)	DBCP (ppb)	Nitrate (as N) (ppm)	Perchlorate (ppb)	Sodium (ppm)	TCP (ppt)	TDS (ppm)
6 - EK SE	36.1564	-119.0048	Irrigation Monitoring Well									
7 - LSID	36.2506	-119.0795	Irrigation Monitoring Well									
7 - LSID	36.2094	-119.0645	Irrigation Monitoring Well									
7 - LSID	36.1181	-119.0148	Irrigation Monitoring Well									
8 - LID E	36.1822	-119.0831	Irrigation Monitoring Well									
8 - LID E	36.1353	-119.0412	Irrigation Monitoring Well									
8 - LID E	36.1175	-119.0812	Irrigation Monitoring Well									
8 - LID E	36.1666	-119.058459	Subsidence Survey Site	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8 - LID E	36.130819	-119.05574	Subsidence Survey Site	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8 - LID E	36.165789	-119.059314	Irrigation Monitoring Well									
8 - LID E	36.147461	-119.055979	Drinking Water Monitoring Well	2.40	36.00	2.10		13.81		60.25		365.00
9 - LID W	36.2681	-119.1009	Irrigation Monitoring Well									
9 - LID W	36.2389	-119.1009	Irrigation Monitoring Well									
9 - LID W	36.2356	-119.1278	Irrigation Monitoring Well									
9 - LID W	36.1967	-119.1201	Irrigation Monitoring Well									
9 - LID W	36.2068	-119.1038	Irrigation Monitoring Well									
9 - LID W	36.1461	-119.1165	Irrigation Monitoring Well									
9 - LID W	36.12	-119.1253	Irrigation Monitoring Well									
9 - LID W	36.1328	-119.099	Irrigation Monitoring Well									
9 - LID W	36.2625	-119.1356	Irrigation Monitoring Well									
9 - LID W	36.1703	-119.1173	Irrigation Monitoring Well									
9 - LID W	36.142014	-119.130089	Drinking Water Monitoring Well	2.90	17.00	3.20	0.09	7.29		51.50		260.00
9 - LID W	36.143557	-119.134656	Drinking Water Monitoring Well	3.05	24.00	3.10		10.36		44.00		250.00
9 - LID W	36.142964	-119.130025	Drinking Water Monitoring Well, Subsidence Survey Site	2.90	11.00	3.20	0.02	2.73		54.00		210.00
9 - LID W	36.274669	-119.103826	Subsidence Survey Site	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10 - EK SW	36.2273	-119.1386	Irrigation Monitoring Well									
10 - EK SW	36.2069	-119.1723	Irrigation Monitoring Well									
10 - EK SW	36.1853	-119.1551	Irrigation Monitoring Well									
10 - EK SW	36.1522	-119.1706	Irrigation Monitoring Well									
10 - EK SW	36.1714	-119.1709	Irrigation Monitoring Well									
10 - EK SW	36.227331	-119.138548	Drinking Water Monitoring Well	3.80	182.50	4.20	0.26	6.74	2.30	119.25		577.50
Outside EK	36.298705	-119.154153	Drinking Water Monitoring Well		13.67	1.70	0.08	5.16		41.33		316.67
Outside EK	36.225396	-119.154484	Drinking Water Monitoring Well	2.40	741.43	4.20		4.69		236.00		1721.74
Outside EK	36.377371	-119.220542	Drinking Water Monitoring Well									
Outside EK	36.37186	-119.100079	Subsidence Survey Site	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Outside EK	36.482602	-119.223352	Drinking Water Monitoring Well									
Outside EK	36.482413	-119.223388	Drinking Water Monitoring Well									
Outside EK	36.483424	-119.259406	Drinking Water Monitoring Well									
Outside EK	36.485176	-119.25665	Drinking Water Monitoring Well									

4.6 Land Subsidence

Legal Requirements:
§354.34(c)(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.

4.6.1 Monitoring Network Description

The EKGSA monitoring network plans to rely on multiple data sources including satellite analysis monitored by NASA, monitoring points overseen by the Kaweah Delta Water Conservation District (KDWCD) and CalTrans, and newly selected Friant-Kern Canal monitoring points the EKGSA will survey. The focus will be on how land subsidence is impacting critical infrastructure, namely the Friant-Kern Canal (FKC). Data and local experience suggest subsidence has historically not been an issue within the EKGSA; however, due to the heavy reliance on the FKC by member agencies of the EKGSA, subsidence will be closely monitored. The proposed network monitoring locations are shown in **Figure 4-2**. These points, in addition to data available through NASA and DWR (InSAR) will be used to evaluate subsidence in the EKGSA.

4.6.2 Quantitative Values

The quantitative values for measuring subsidence are presented in **Chapter 3**. Minimum thresholds, measurable objectives, and interim milestones have been established based on maximum allowable subsidence rates for maintaining the integrity of key infrastructure in the EKGSA.

4.6.3 Review and Evaluation of Monitoring Network

Land subsidence monitoring has been performed by multiple agencies in the past. The coverage over the EKGSA region was sparse until Interferometric Synthetic Aperture Radar (InSAR) was introduced in 2015 to monitor subsidence in the region through satellite imagery analysis. Agencies currently monitoring subsidence in the area include:

USGS Monitoring Network. A subsidence monitoring network consisting of 31 extensometers was installed in the 1950s to quantify the subsidence occurring in the San Joaquin Valley. By the 1980's, the land subsidence monitoring efforts decreased. Since then, a new monitoring network was developed. The new network includes refurbished extensometers from the old network, continuous Global Positioning System (CGPS) stations, and use of InSAR. More information can be found on the USGS website:
https://ca.water.usgs.gov/land_subsidence/california-subsidence-measuring.html.

NASA Monitoring Network. NASA obtains subsidence data by comparing satellite images of Earth's surface over time. For the last few years, subsidence maps have been produced using InSAR observations from satellite and aircraft imaging. More information can be found on their website: https://www.nasa.gov/jpl/nasa-california-drought-causing-valley-land-to-sink.

Kaweah Delta Water Conservation District: KDWCD started a new monitoring network in 2016 and placed extensometers throughout the Kaweah Sub-basin to expand upon the long-standing USGS network of extensometers and establish an adequate number of subsidence monitoring stations to adequately monitor land elevation changes at areas most effected by subsidence in the Sub-basin. The goal is to monitor the inelastic land subsidence resulting from groundwater pumping.

4.6.3.1 Site Selection

FKC monitoring points are being proposed to be added for the EKGSA's subsidence monitoring, given the focus on critical infrastructure. Six locations have been proposed along the FKC. These monitoring points are strategically situated near infrastructure along the FKC that is vital to maintain the long-term delivery capacity of the gravity-driven canal. This infrastructure includes existing check structures and bridges spaced north to south through the EKGSA. These points are depicted in **Figure 4-2**. Presently the FKC is not impacted by subsidence within the EKGSA, but it is a critical issue downstream, just south of the EKGSA. Including these specific monitoring points is considered adequate for evaluating the FKC and its capacity within the EKGSA.

A subsidence monitoring point is also being established at a well in the community of Plainview. Infrastructure such as roads, pipelines, and well casings are also susceptible to subsidence impacts. The EKGSA intends to monitor potential impacts to subsidence in an area of the EKGSA that may be more vulnerable to subsidence.

4.6.3.2 Monitoring Frequency and Density

The proposed FKC and Plainview monitoring points will be monitored annually in March to evaluate subsidence impacts. The combination of monitoring points and additional spatial coverage from InSAR provides the appropriate density for monitoring. The InSAR data set is also available annually. The specific points surveyed by the EKGSA can be compared to the InSAR data.

4.6.3.3 Identification of Data Gaps

Beyond the specific proposed monitoring points, no other data gaps were identified for the land subsidence monitoring network for the EKGSA. Subsidence has been an ongoing issue in portions of the Central Valley, thus monitoring systems have been put in place to evaluate the impacts. Over time these tools and data have improved and become more widespread.

4.6.3.4 Plans to Fill Data Gaps

With the addition of survey points to critical infrastructure, and utilizing the InSAR data set as a backstop, the current subsidence monitoring network is believed to sufficiently cover the EKGSA.

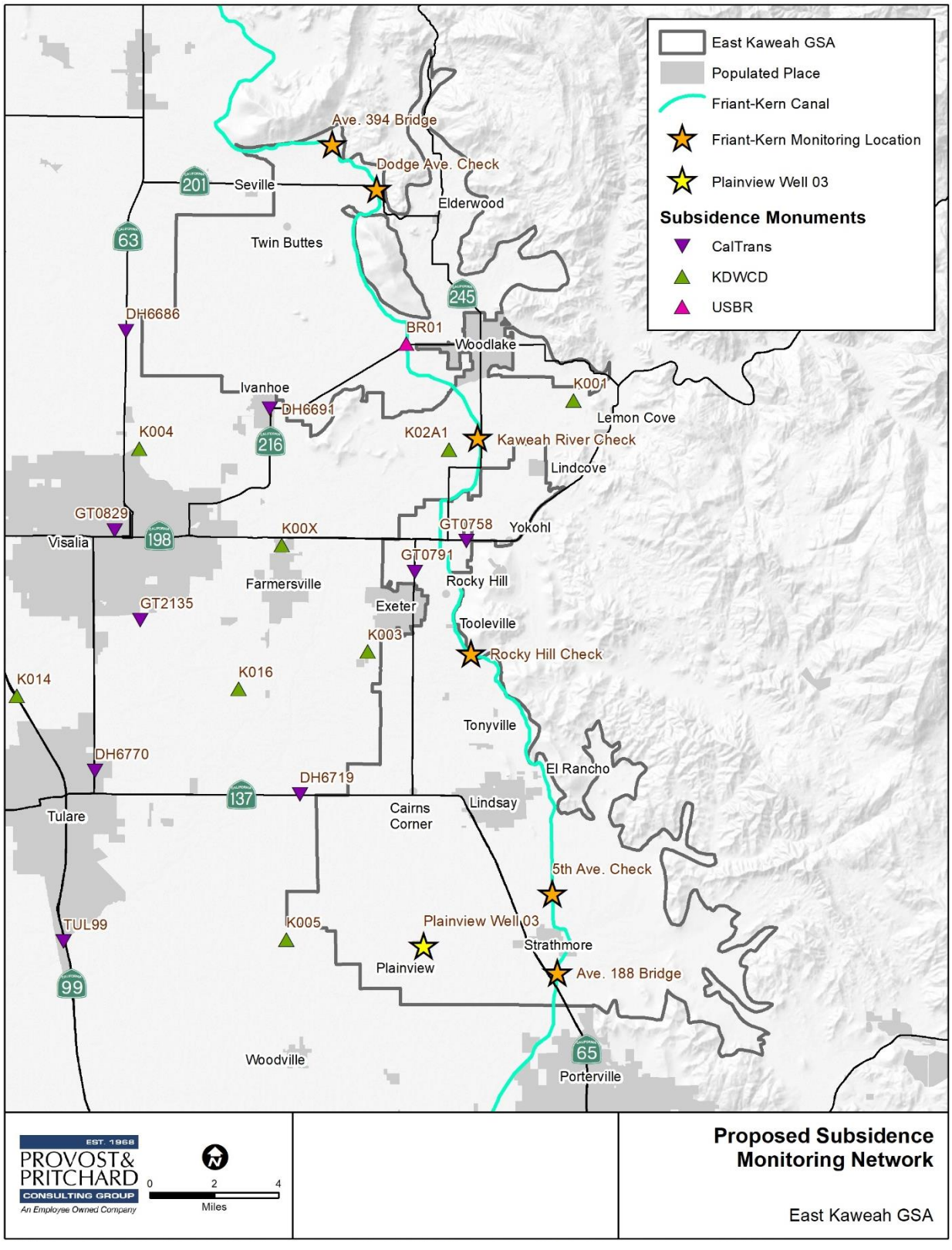

Figure 4-2: Subsidence Monitoring Network

4.7 Depletion of Interconnected Surface Water

Legal Requirements:
§354.34(c)(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.*

4.7.1 Monitoring Network Description

The EKGSA has identified interconnected surface water as a data gap and therefore does not have enough data to establish a comprehensive monitoring network. Rather, the EKGSA proposes to fill these data gaps via implementation of an Interconnected Surface Water Data Gap Work Plan (**Section 5.3.7**).

4.7.2 Quantitative Values

The quantitative measures for the depletion of interconnected surface water are explained in further detail in Chapter 3. This includes description of minimum thresholds, measurable objectives, and interim milestones for the measurement of the impact on surface water with potential groundwater connection.

4.7.3 Review and Evaluation of Monitoring Network

Due to lack of available data, there is not a network in place to monitor groundwater-surface water interconnections. Present knowledge is obtained from the groundwater contours created from groundwater level monitoring data and local knowledge. Those familiar with the geology in the GSA indicate the Kaweah River is a gaining stream East of McKay's point. This is further substantiated by the fact that two of the Kaweah River's USGS stream gauges have not been dry during droughts throughout the history of the stream monitoring stations. Additionally, local residents do not recall a time, other than 2015, when the Kaweah River east of McKays Point has been dry. In 2015, amongst a critical drought, portions of the Kaweah River began to dry and standing water began to recede upstream. However, there was still some water remaining in the channel. Well records show that wells in this area have a depth to water less than 30 feet, possibly substantiating the claims that there is interconnected surface water. In addition to the Kaweah River, Lewis Creek is also suspected to have potential groundwater connection within LSID. There is a well approximately a half mile from Lewis Creek that consistently reads depth to groundwater less than 10 feet, due to a small, perched aquifer. **Figure 4-3** depicts Spring 2015 depth to water (DTW) contours in the EKGSA. Areas with depths less than 30 feet are considered potential areas for groundwater-surface water connection. Some of these areas are actively farmed, which would reduce the potential footprint. The contours in **Figure 4-3** also show that moving further west, away from the foothills, there is no interconnection due to the large depths to water.

4.7.3.1 Site Selection

The interconnected surface water monitoring sites will be selected as more data becomes available via the implementation of the Interconnected Surface Water Data Gap Work Plan (**Section 5.3.7**).

4.7.3.2 Monitoring Frequency and Density

Monitoring frequency and density of interconnected surface water will be determined during the implementation of the Interconnected Surface Water Data Gap Work Plan (**Section 5.3.7**).

4.7.3.3 Identification of Data Gaps

The EKGSA acknowledges that interconnected surface water is a data gap. This data gap will be addressed via implementation of the Interconnected Surface Water Data Gap Work Plan (**Section 5.3.7**).

4.7.3.4 Plans to Fill Data Gaps

Section 5.3.7 describes the EKGSA's plan to fill the interconnected surface water data gap.

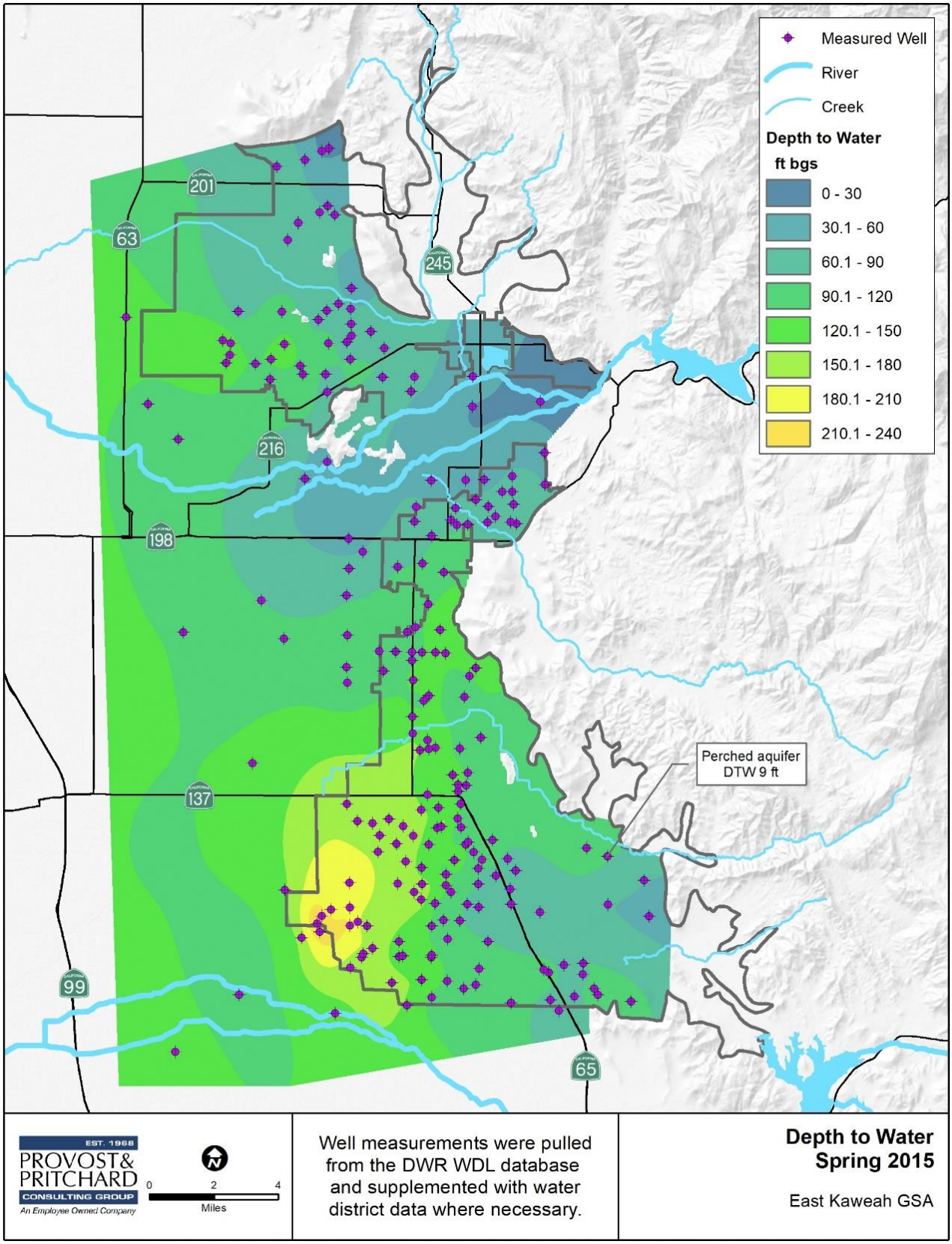

Figure 4-3: Spring 2015 Depth to Water Contours

4.8 Consistency with Standards

Legal Requirements:
§354.34(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.

The data gathered through the monitoring networks is and will continue to be consistent with the standards identified in Section 352.4 of the California Code of Regulations related to Groundwater Sustainability Plans. The main topics of Section 352.4 are outlined below.

- *Data reporting units and accuracy;*
- *Monitoring site information;*
- *Well attribute reporting;*
- *Map standards;*
- *Hydrograph requirements;*
- *Groundwater and surface water models;*
- *Availability of input and output files to DWR.*

4.9 Monitoring Protocols

Legal Requirements:
§354.34(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.

Groundwater level, groundwater quality, and land subsidence monitoring will generally follow the protocols identified in the *Monitoring Protocols, Standards, and Sites BMP* (DWR, December 2016b). This BMP largely leans on the U.S. EPA's DQO process. Refer to **Appendix 4-A** for a copy of the BMP. The EKGSA may develop standard monitoring forms in the future.

The following comments and exceptions to the BMP should be noted:

1. SGMA regulations require groundwater levels are measured to the nearest 0.1 feet. The BMP suggests measurements to the nearest 0.01 feet; however, this is not practical for many measurement methods. In addition, this level of accuracy would have little value since groundwater contours maps typically have 10 or 20-foot intervals, and storage calculations are based on groundwater levels rounded to the nearest foot. The accuracy of groundwater level measurements will vary based on the well type and condition. For instance, if significant oil is found in an agricultural well then readings to the nearest foot are the best one can achieve.
2. If used in a well suspected of contamination or if there are obvious signs of contamination (such as oil), well sounding equipment will be decontaminated after use.
3. Wells will be surveyed to a horizontal accuracy of 0.5 feet.
4. Unique well identifiers will be labeled on all public wells, and on private wells if permission is granted.
5. The BMP states that measurements each Spring and Fall should be taken 'preferably within a 1 to 2-week period'. This is likely not feasible due to the large number of wells in the GSA, and a 4-week period is requested for bi-annual monitoring and potentially be suggested to be taken in the Spring to capture peak groundwater levels.

6. If a vacuum or pressure release is observed, then water level measurements will be remeasured every 5 minutes until they stabilize.
7. In the field, water level measurements will be compared to previous records; if there is a significant difference then the measurement will be verified.
8. For water quality monitoring, field parameters for pH, electrical conductivity, and temperature will only be collected when required for the parameter being monitored. Determining if a well has been purged adequately may be ascertained by calculating a run time before sampling.

4.10 Representative Monitoring

Legal Requirements:
§354.36 Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:
§354.36(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.
§354.36(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.*

The EKGSA plans to use groundwater elevations as a proxy for monitoring the sustainability indicators for aquifer storage. As mentioned, groundwater elevations will be a critical component of groundwater storage estimation.

Subsidence monitoring is not as straightforward since it cannot be directly attributed to groundwater levels. Therefore, it will be based on vital infrastructure within the EKGSA, namely the conveyance capacity of the Friant-Kern Canal. Reduced conveyance capacity of the Friant-Kern Canal has been recognized as an undesirable result explained in further detail in Section 4: Sustainable Management Criteria.

Groundwater quality is proposed to be tested in the monitoring wells within the EKGSA and compared to the current recognized standard the COCs assigned to a well based on the consumptive use of the groundwater pumped (agricultural or municipal). The intent for monitoring all wells is to develop a more robust data set for the COCs so that better understanding can be gained on the spatial distribution of these contaminants and potential correlation to activities within EKGSA control.

Depletions of interconnected surface water has been identified as a data gap. Monitoring sites and methodology will be determined as EKGSA implements the Interconnected Surface Water Data Gap Work Plan (**Section 5.3.7**).

4.11 Data Storage and Reporting

Legal Requirements:
§354.40 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.

The Kaweah Subbasin is developing and will maintain a Data Management System (DMS) for storing and reporting information for the implementation of this GSP. Specifically, the monitoring network data will be collected and compiled into one central data system that can be easily referenced and displayed when needed. More information on the development and user guide is provided in **Appendix 4-B**.

5 Projects and Management Actions to Achieve Sustainability

Legal Requirements:

§ 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 timetable 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.

5.1 Introduction

Two primary tools for sustainable groundwater management are project development for water supply augmentation and management actions for data collection and demand reduction. The goal of the EKGSA is to first develop projects to augment and/or better use the surface water supply to overcome groundwater overdraft, however if project development alone is unable to achieve the desired goals (i.e. avoiding Undesirable Results and achieving Measurable Objectives), then management actions or programs will need to be employed. The projects described herein primarily focus on the capture, use, and recharge of available surface water supplies within the EKGSA to augment the water supply and reduce the impacts of groundwater pumping. The EKGSA considered many potential projects that could mitigate the groundwater overdraft within the EKGSA area and help achieve sustainability, but ultimately determined that not all of these potential projects are currently feasible for implementation. The EKGSA will continue to evaluate potential projects during implementation. Projects that are currently envisioned for implementation are discussed in **Section 5.2**. The EKGSA, when necessary, will consider management actions that focus on several factors including, but not limited to, reducing water demand and associated reduction of groundwater pumping, increasing data collection, education and outreach, regulatory policies, incentive-based programs, and enforcement actions. The potential management actions that may be implemented following further investigation and analysis are discussed in **Section 5.3**.

Projects and management actions may be implemented on different timelines. The EKGSA understands there are various levels of uncertainty with project and program implementation, and it is not unusual for it to take longer than originally estimated. In addition, some projects and management actions build upon others, and the accrual of expected benefits may take multiple years to be individually realized and vary substantially from year to year. Depending upon the success or failure of the initial GSP project and management action efforts to increase water supplies, reduce groundwater demands, and improve data collection, the proposed implementation timelines may vary over time and will be reevaluated each time this GSP is updated.

5.1.1 Public Notification

Successful implementation of this GSP over the planning horizon will require ongoing efforts to engage stakeholders and the general public in the sustainability process. This includes communicating the statutory requirement, the objectives of the GSP, and progress toward each identified measurable objective. In the context of this ongoing public communication, announcements of upcoming environmental hearings, project presentations, bid openings and project construction schedules will be made on a regular basis. Public forums will include opportunities for public comment and feedback, to be addressed in an appropriate manner by EKGSA staff and/or consultants. The EKGSA will provide notice to the public and other agencies through public meetings, newsletters, and the EKGSA website www.ekgsa.org as each project or management action is being considered, evaluated, and implemented.

5.1.2 Water Supply

The existing or new water supply most likely to be used for each surface water-dependent project is identified in the description of each of the projects. Due to the location of the projects, only certain surface water supplies might be available.

In California, permits, licenses, and registrations give the right to beneficially use reasonable amounts of water within a specific area or Place of Use. The EKGSA area is located within the Place of Use for the USBR Central Valley Project (CVP) and portions of the EKGSA are located within the Place of Use for the Kaweah River, called the Kaweah River Service Area. Therefore, entities could purchase surface water supplies from the Kaweah River and/or CVP and use them for beneficial uses within the EKGSA after going through the various regulatory and environmental processes for a water transfer if there was a willing seller.

The most likely CVP water that could be available in the future is Section 215 water, a federal designation for floodwater. Section 215 water is available when conditions cause Millerton Lake (on the San Joaquin River) to rise to the point that flood control releases are necessary, as mandated by the U.S. Army Corps of Engineers flood control criteria. Priority allocation for Section 215 water is made available to the Friant Division Long-Term and Cross Valley Canal Contractors. Section 215 water can then also be made available to other parties (Non-Long-Term Contractors) in accordance with Reclamation law and contractual requirements. Section 215 water has typically occurred between December and July, with historical data showing the most prolific months for water availability being March through July. Section 215 water is usually available approximately 2 years out of every 5 years. Some Section 215 has been purchased in the past by EKGSA members when available.

It should be noted that the San Joaquin River Restoration Program (SJRRP) can be expected to utilize flood releases when available prior to water being designated as Section 215 water. This program will have the effect of decreasing the amount of water available for use or recharge when Section 215 water does become available. Another option, albeit costlier, would be to purchase Class 1 or Class 2 supplies from Friant contractors, which is far more reliable than Section 215 water.

5.2 Projects

The EKGSA has identified potential projects for initial implementation to help achieve groundwater sustainability, and it is likely additional projects will be developed as GSP implementation proceeds. Agencies within the EKGSA have been doing some recharge for years, but additional projects are required to augment the water supply to help overcome the groundwater overdraft.

The EKGSA will maintain a list of proposed projects and their characteristics, along with their development status, and will use this list to prioritize and secure funding as opportunities become available. Projects discussed in this GSP will remain a part of the potential projects that the EKGSA may choose to implement; however, the projects list will be dynamic based on routine cost-benefit analyses. When multiple projects are considered for competing funds, they will be prioritized based on a weighted decision matrix and those deemed most beneficial considering a broad range of categories will be selected for execution. All projects will be supported by the best available information and the best available science.

Implementation through this first GSP will focus on bolstering data sets to fill data gaps, and then projects fully developed based on current and projected conditions. As a result, projects are presently developed to a conceptual level for general evaluation and comparison. Remaining details of projects, such as specific location, will be finalized later. The projects that are currently being considered would yield an estimated average annual volume of approximately 18,200 AF/year if fully implemented as envisioned, which is over 60% of the currently identified overdraft (28,000 AF/year) in the EKGSA. The remainder will be saved through projects yet to be developed and/or management actions, if necessary. The current projects are generally prioritized and summarized in **Table 5-1** and location within the EKGSA is shown in **Figure 5-1**. Detailed discussion is provided further in this section.

Table 5-1 EKGSA Currently Identified Projects

Project ID	Project Title	Project Type	Estimated Annual Benefits AF/yr.	Generalized Priority
EK1	Lewis Creek Recharge	Recharge	3,000	High
EK2	Cottonwood Creek Recharge	Recharge	1,800	High
EK3	Yokohl Creek Recharge	Recharge	1,800	High
EK4	Rancho de Kaweah Water Management & Banking Project	Recharge, Storage, Re-regulation, Banking	9,000	High
EK5	Lindmore/Exeter Dry Wells	Recharge	2,010	Medium
EK6	Lindsay Recharge Basin	Recharge	150	Medium
EK7	Wutchumna Ditch Recharge	Recharge	480	Medium
	Subtotal		18,240	AF/yr.

Ultimately, each of these projects and those to be developed will fall into at least one of three categories. There may be multiple projects of each type. Project types include:

1. *Recharge*
    - *Basin*
    - *Dry well*
    - *On-farm recharge*
    - *Flood delivery to existing channel*
2. *Existing conveyance facilities rehabilitation or expansion*
3. *Efficiency improvements*

The anticipated process for project implementation follows:

1. *Identify potential projects*
2. *Prepare conceptual level feasibility study and cost estimate*
3. *Prioritize potential projects based on EKGSA and Stakeholder goals*
4. *Obtain agreement with project partner(s)*
5. *Secure funding*
6. *Prepare environmental documents and obtain permit and regulatory approvals, as necessary*
7. *Design and prepare construction documents*
8. *Implement project construction*
9. *Operate and maintain project for sustainability*
10. *Evaluate actual project benefits compared to expected benefits*

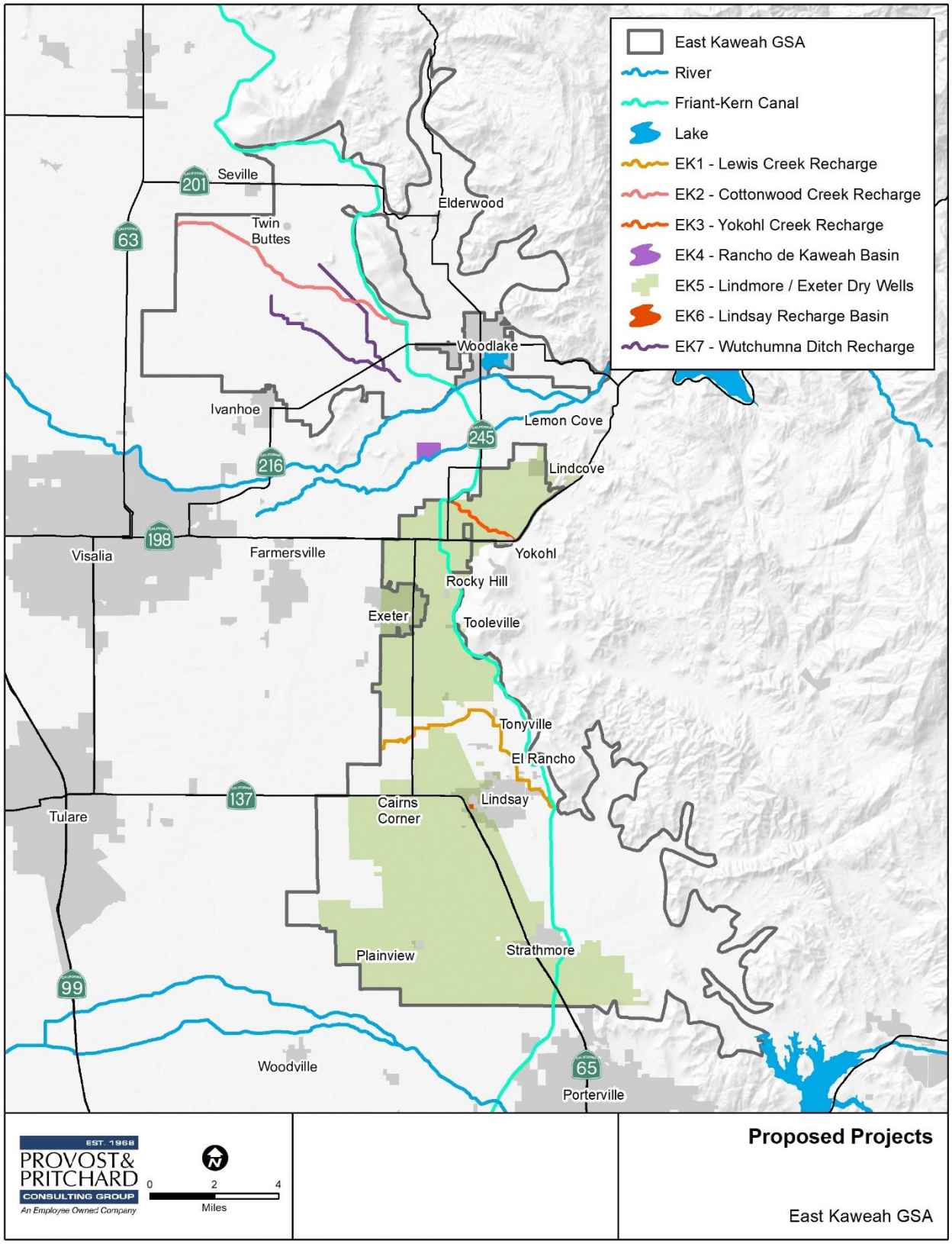

Figure 5-1 EKGSA Proposed Projects Location Map

5.2.1 Lewis Creek Recharge

The following describes the Lewis Creek Recharge Project, which will capture available surface water and recharge the aquifer through the creek bed. Eventually it may also facilitate in-lieu recharge through decreased use of groundwater wells by using the surface water for irrigation. The length of Lewis Creek expected to be used for recharge is shown in **Figure 5-2**.

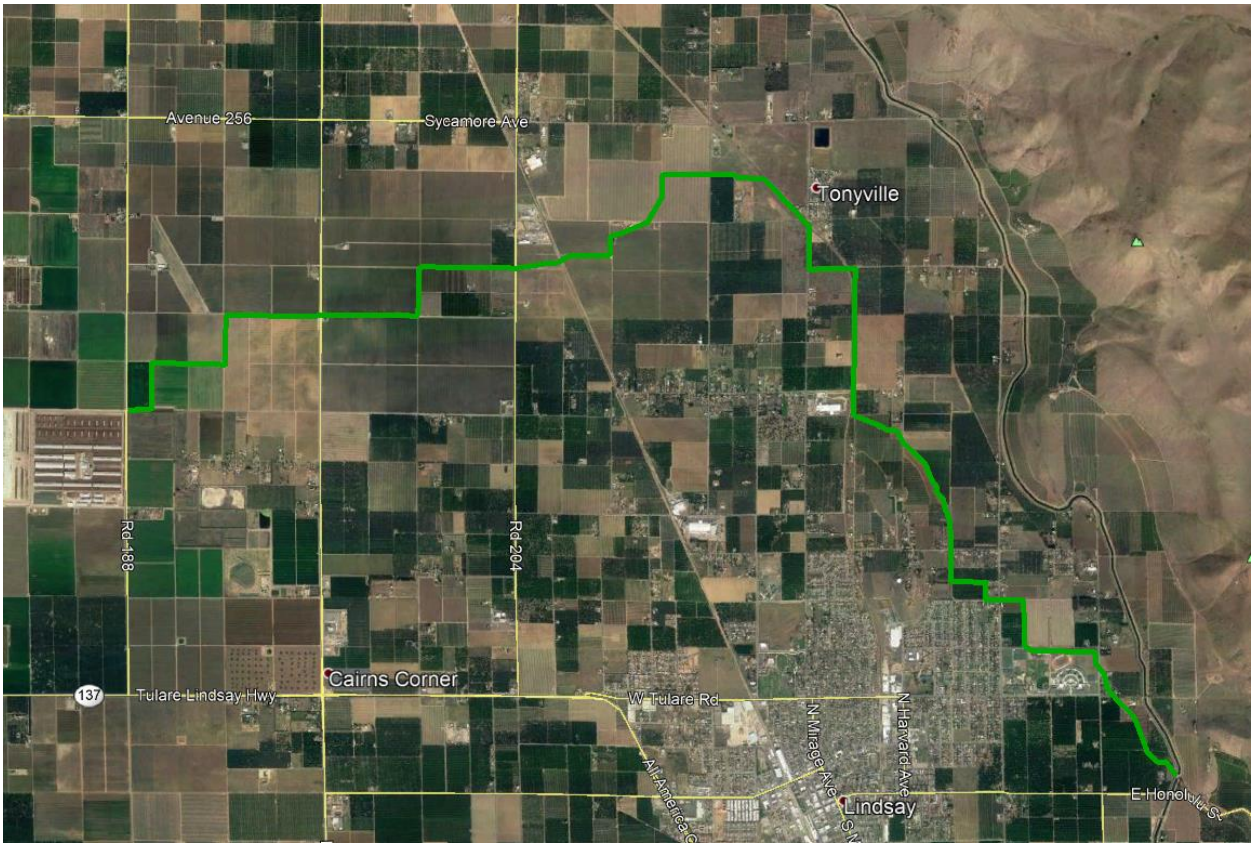

Figure 5-2 Lewis Creek Alignment within EKGSA

Project Title: Lewis Creek Recharge	Project ID: EK1
Project Type	
Recharge (delivery to existing channel)	
Project Location	
Lewis Creek from intersection at Friant-Kern Canal east of City of Lindsay and heading west along the channel to the western EKGSA boundary in Tulare County – T20S R27E, T19S R27E, and T19S R26E.	
Implementing Agency	
Lindmore Irrigation District (LID).	
Project Description - 354.44(a)	
The Lewis Creek Recharge Project will entail construction of a turnout from Friant-Kern Canal into Lewis Creek to capture CVP water supplies, when available, and recharge the underlying aquifer. The total length of the portion of the creek acting as a recharge facility is nearly 9 miles.	

Project Title: Lewis Creek Recharge	Project ID: EK1

Measurable Objective(s) Addressed - 354.44(b)(1)

The project will primarily help stabilize groundwater levels and increase the amount of groundwater in storage. Indirectly there could be secondary benefits of some groundwater quality improvement from high quality surface water, and reduction in land subsidence.

- ☒ Chronic Lowering of Groundwater Levels
- ☐ Seawater Intrusion – *not applicable*
- ☒ Land Subsidence
- ☒ Reduction of Groundwater Storage
- ☒ Degraded Water Quality
- ☒ Depletion of Interconnected Surface Water

Circumstances and Criteria for Implementation - 354.44(b)(1)(A)

The Project is in the conceptual stage and no feasibility study work has begun. Infiltration is expected based on general knowledge of the soil characteristics in the immediate project area. Construction of the project would depend upon successful outcome of a feasibility study including geotechnical work to validate the capacity for percolation. Environmental clearance would be necessary under CEQA and NEPA. This is a high priority project because it utilizes a readily available recharge area to address several of the measurable objectives. It is viewed as an integral piece of the EKGSA's overall effort to reach sustainability.

Process to Provide Notice of Implementation - 354.44(b)(1)(B)

The EKGSA will have ongoing efforts to engage stakeholders and the general public in the sustainability process, communicating the statutory requirements, the objectives of the GSP, and progress toward each identified measurable objective. Neighboring landowners will be notified about the project prior to implementation and environmental documents will be available for public review.

Estimated Annual Project Benefits (AF/yr.) - 354.44(b)(2)

The actual recharge rate of the proposed project will be determined by the on-site soils. The project is expected to recharge approximately 3,000 acre-feet per year, on average. This is based on an anticipated delivery capacity of 100 AF/day and 30 days of CVP water available per year on average.

Permitting and Regulatory Requirements - 354.44(b)(3)

The project will complete all necessary permitting and regulatory requirements. It will require CEQA and NEPA documentation, and potentially a Dust Control Plan (DCP) and a Storm Water Pollution Prevention Plan (SWPPP). The project will utilize CVP water for groundwater recharge.

Project Schedule - 354.44(b)(4) Anticipated Start & Completion, Timeframe to accrue benefits

No set project schedule has been determined; however, it is the goal of the EKGSA to have this Project operating by 2022. The key steps that will dictate schedule will be funding, CEQA/NEPA compliance, and construction of a turnout from the FKC into Lewis Creek.

Evaluation of Benefits - 354.44(b)(5)

The volume of water delivered for recharge will be measured daily and summarized monthly by LID. The rate of accrual of benefits will depend on the frequency of water availability and the infiltration capacity of the soil. The water level of groundwater wells in the area will be measured and water quality in the vicinity of the project will be monitored. This data will be used to determine project impacts and benefits.

How will project be accomplished, and what is the water source? - 354.44(b)(6)

The project will be accomplished by LID with the support of EKGSA. The water source will be CVP supplies when available.

Project Title: Lewis Creek Recharge	Project ID: EK1

Legal Authority - 354.44(b)(7)

LID has the legal authority to deliver CVP water to Lewis Creek for recharge since portions of the creek are within the District boundaries and is within the CVP Place of Use.

Project Cost - 354.44(b)(8) Estimated Capital Cost Estimated annual cost/AF

The estimated project capital cost is approximately $350,000 and the annual cost over a 20-year return period is estimated to be $12 to $15/AF, including operational and capital costs.

Funding Source - 354.44(b)(8)

The funding source will likely be a combination of grant funding, EKGSA funds, and possibly LID funds.

Management of Groundwater Extractions and Recharge - 354.44(b)(9)

The project would be managed by LID with the oversight by the EKGSA. Recharge volumes will be measured and reported by LID. Groundwater extraction will be by landowners in the area within LID and to the western EKGSA area. Performance of the project would be a necessary part of the EKGSA's reporting requirements as well as evaluations of measurable objectives.

Level of Uncertainty - 354.44(d)

The level of uncertainty primarily involves funding availability, permeability of the intended recharge area, and frequency of high flow water. The overall level of uncertainty is moderate for the volume of recharge water indicated.

5.2.3 Cottonwood Creek Recharge

The following describes the Cottonwood Creek Recharge Project, which will capture available surface water and recharge the aquifer through the creek bed. Eventually it may also facilitate in-lieu recharge through decreased use of groundwater wells by using the floodwater for irrigation. The length of Cottonwood Creek expected to be used for recharge is shown in **Figure 5-3**.

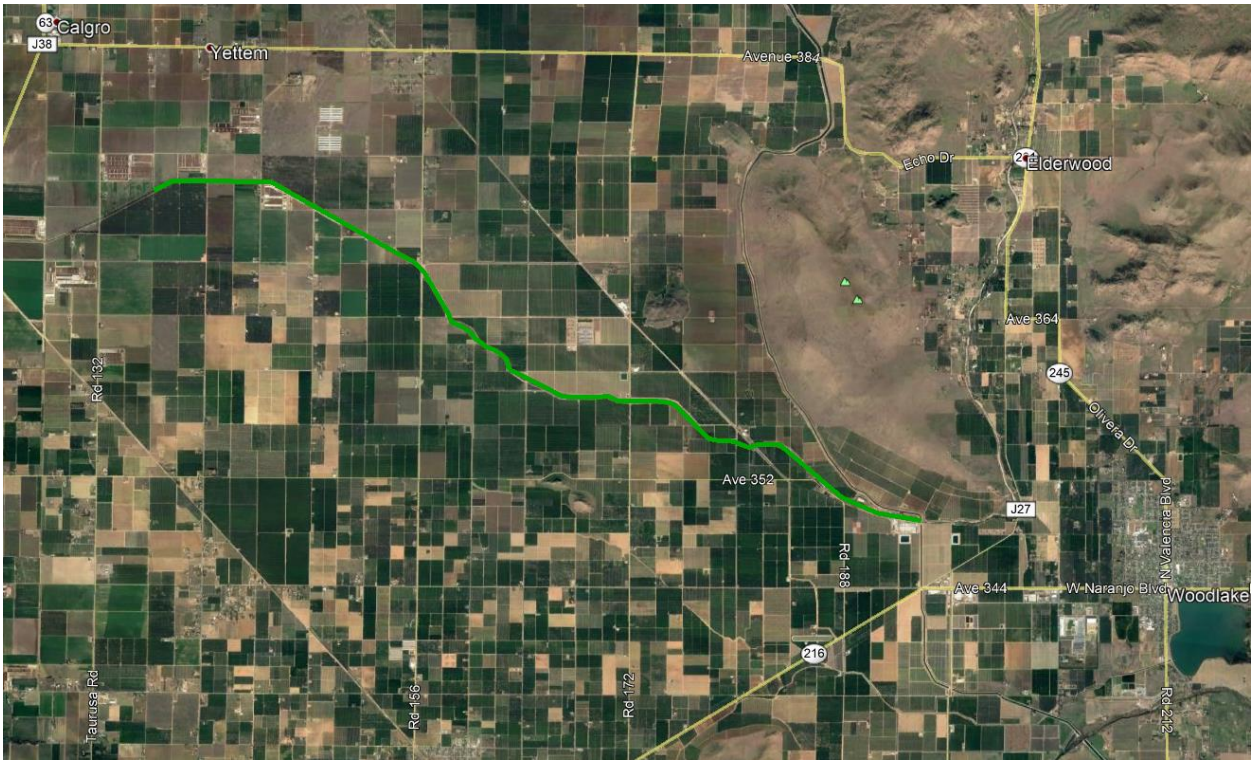

Figure 5-3 Cottonwood Creek Alignment within EKGSA

Project Title: Cottonwood Creek Recharge	Project ID: EK2
Project Type	
Recharge (delivery to existing channel)	
Project Location	
Intersection of Friant-Kern Canal and Cottonwood Creek west to the GSA boundary. West of Woodlake and Northeast of Ivanhoe in Tulare County – T17S R26E and T17S R25E.	
Implementing Agency	
Stone Corral Irrigation District (SCID) & Ivanhoe Irrigation District (IID)	
Project Description - 354.44(a)	
The Cottonwood Creek Recharge Project will entail construction of a turnout from Friant-Kern Canal into Cottonwood Creek to capture CVP water supplies when available and recharge the underlying aquifer. The total length of the portion of the creek acting as a recharge facility is just over 8 miles.	

Project Title: Cottonwood Creek Recharge	Project ID: EK2

Measurable Objective(s) Addressed - 354.44(b)(1)

The project will primarily help stabilize groundwater levels and increase the amount of groundwater in storage. Indirectly there could be secondary benefits of some groundwater quality improvement from high quality surface water, and reduction in land subsidence.

- ☒ Chronic Lowering of Groundwater Levels
- ☐ Seawater Intrusion – *not applicable*
- ☒ Land Subsidence
- ☒ Reduction of Groundwater Storage
- ☒ Degraded Water Quality
- ☒ Depletion of Interconnected Surface Water

Circumstances and Criteria for Implementation - 354.44(b)(1)(A)

The project is in the conceptual stage and no feasibility study work has begun. Infiltration is expected based on general knowledge of the soil characteristics in the immediate project area. Construction of the project would depend upon successful outcome of a feasibility study including geotechnical work to validate the capacity for percolation. Environmental clearance would be necessary under CEQA and NEPA. This is a high priority project because it utilizes a readily available recharge area to address several of the measurable objectives. It is an integral piece of the EKGSA's overall effort to reach sustainability and will be implemented after a feasibility study is completed and funding becomes available.

Process to Provide Notice of Implementation - 354.44(b)(1)(B)

The EKGSA will have ongoing efforts to engage stakeholders and the general public in the sustainability process, communicating the statutory requirement, the objectives of the GSP, and progress toward each identified measurable objective. Neighboring landowners will be notified about the project prior to implementation and environmental documents will be available for public review.

Estimated Annual Project Benefits (AF/yr) - 354.44(b)(2)

The actual recharge rate of the proposed project will be determined by the on-site soils. The project is expected to recharge approximately 1,800 acre-feet per year, on average. This is based on an anticipated delivery capacity of 60 AF/day and 30 days of CVP water available per year.

Permitting and Regulatory Requirements - 354.44(b)(3)

The project shall complete all necessary permitting and regulatory requirements. It will require CEQA and NEPA documentation, a DCP, and a SWPPP. The project will utilize CVP water, when available, for groundwater recharge.

Project Schedule - 354.44(b)(4) Anticipated Start & Completion, Timeframe to accrue benefits

No project schedule has been determined, and a project feasibility study and analysis need to be completed, including a geotechnical study. Once a source of project funding is secured, a comprehensive schedule including environmental review, design, permitting and construction will be developed. Project construction and implementation is anticipated to occur within 5 to 10 years of GSP submittal.

Evaluation of Benefits - 354.44(b)(5)

The volume of water delivered for recharge will be measured daily and summarized monthly by Stone Corral and/or Ivanhoe IDs. The rate of accrual of benefits will depend on the frequency of water availability and the percolation capacity of the soil. The water level of groundwater wells in the area will be measured and water quality in the vicinity of the project will be monitored. This data will be used to determine project impacts and benefits.

How will project be accomplished, and what is the water source? - 354.44(b)(6)

The project will be accomplished by Stone Corral & Ivanhoe IDs with the support of EKGSA. The water source will be CVP water.

Project Title: Cottonwood Creek Recharge	Project ID: EK2

Legal Authority - 354.44(b)(7)

Stone Corral & Ivanhoe IDs have the legal authority to deliver CVP water to the creek for recharge since the EKGSA area is within the Place of Use.

Project Cost - 354.44(b)(8) Estimated Capital Cost Estimated annual cost/AF

The estimated project capital cost is approximately $200,000 and the annual cost over a 20-year return period is estimated to be $11 to $14/AF, including operational and capital costs.

Funding Source - 354.44(b)(8)

The funding source will likely be a combination of grant funding, Stone Corral ID, Ivanhoe ID, and/or EKGSA.

Management of Groundwater Extractions and Recharge - 354.44(b)(9)

The project would be managed by Stone Corral & Ivanhoe IDs under the oversight of the EKGSA. Recharge volumes will be measured and reported by Stone Corral & Ivanhoe IDs. Groundwater extraction will be by landowners in the area within Stone Corral ID, Ivanhoe ID, and the EKGSA area. Performance of the project would be a necessary part of the EKGSA's reporting requirements as well as evaluations of measurable objectives.

Level of Uncertainty - 354.44(d)

The level of uncertainty primarily involves funding availability, permeability of the intended recharge area, and frequency of available water. The overall level of uncertainty is moderate for the volume of recharge water indicated.

5.2.4 Yokohl Creek Recharge

The following describes the Yokohl Creek Recharge Project, which will capture available surface water and recharge the aquifer through the creek bed. Eventually it may also facilitate in-lieu recharge through decreased use of groundwater wells by using the floodwater for irrigation. The length of Yokohl Creek expected to be used for recharge is shown in **Figure 5-4**.

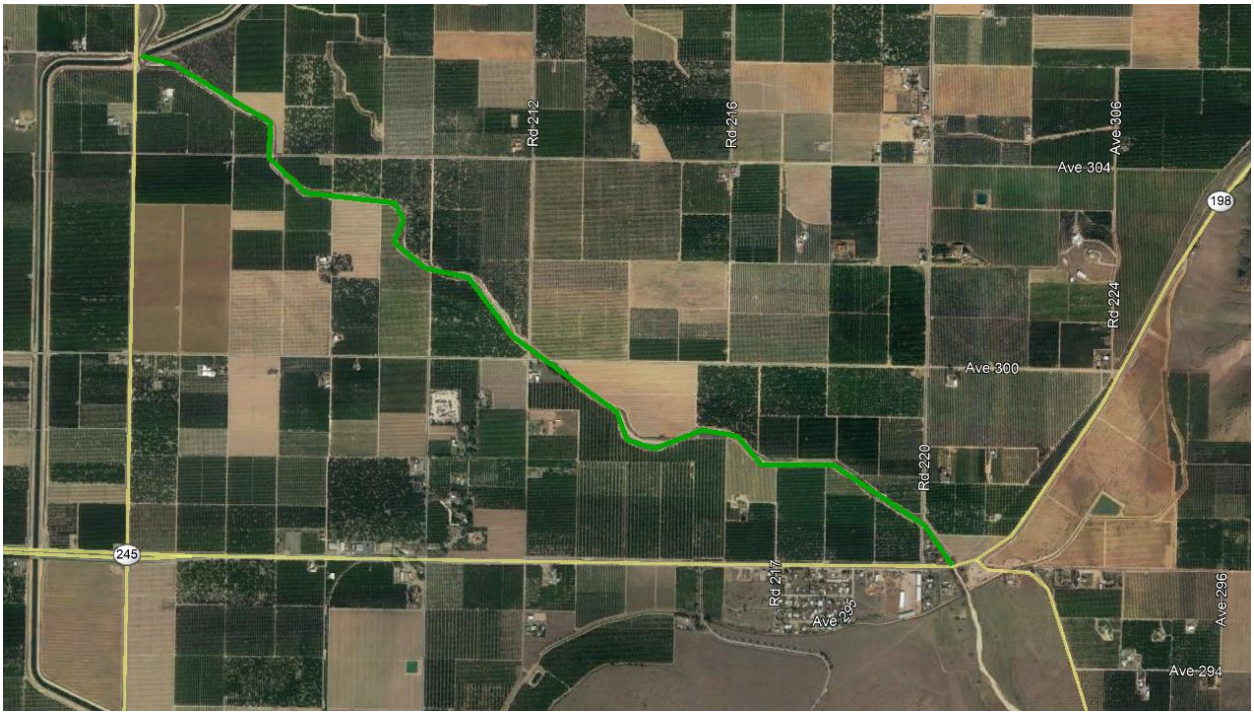

Figure 5-4 Yokohl Creek Alignment within EKGSA

Project Title: Yokohl Creek Recharge	Project ID: EK3
Project Type	
Recharge (delivery to existing channel)	
Project Location	
Intersection of Yokohl Creek and Friant-Kern Canal to intersection of Yokohl Creek and HWY 198. North-Northeast of Exeter – T18S R26E and T18S R27E.	
Implementing Agency	
Exeter Irrigation District (EID)	
Project Description - 354.44(a)	
The Yokohl Creek Recharge Project will utilize existing EID turnout(s) to deliver CVP water supplies, when available, and recharge the underlying aquifer via the Yokohl Creek channel. The total length of the portion of the creek acting as a recharge facility will be nearly 3 miles.	

Project Title: Yokohl Creek Recharge	Project ID: EK3

Measurable Objective(s) Addressed - 354.44(b)(1)

The project will primarily help stabilize groundwater levels and increase the amount of groundwater in storage. Indirectly there could be secondary benefits of some groundwater quality improvement from high quality surface water, and reduction in land subsidence.

- ☒ Chronic Lowering of Groundwater Levels
- ☐ Seawater Intrusion – *not applicable*
- ☒ Land Subsidence
- ☒ Reduction of Groundwater Storage
- ☒ Degraded Water Quality
- ☒ Depletion of Interconnected Surface Water

Circumstances and Criteria for Implementation - 354.44(b)(1)(A)

The EID system has existing connections to Yokohl Creek; however, this project is still in the conceptual stage and no feasibility study work has begun. Infiltration is expected based on general knowledge of the soil characteristics in the immediate project area. Initially, the EKGSA and EID would utilize these existing connections and, pending recharge results, construction to expand the delivery capacity can be considered in the future. This is a high priority project because it utilizes a readily available recharge area to address several of the measurable objectives. It is an integral piece of the EKGSA's overall effort to reach sustainability and will potentially be implemented in 2020.

Process to Provide Notice of Implementation - 354.44(b)(1)(B)

The EKGSA will have ongoing efforts to engage stakeholders and the general public in the sustainability process, communicating the statutory requirement, the objectives of the GSP, and progress toward each identified measurable objective. Neighboring landowners will be notified about the project prior to implementation and environmental documents will be available for public review.

Estimated Annual Project Benefits (AF/yr) - 354.44(b)(2)

The actual recharge rate of the proposed project will be determined by the on-site soils. The project is expected to recharge approximately 1,800 acre-feet per year, on average. This is based on an anticipated delivery capacity of 60 AF/day and 30 days of CVP water available per year.

Permitting and Regulatory Requirements - 354.44(b)(3)

The project shall complete all necessary permitting and regulatory requirements. The project will utilize CVP water for groundwater recharge.

Project Schedule - 354.44(b)(4) Anticipated Start & Completion, Timeframe to accrue benefits

No project schedule has been determined, however, given the existing facilities in place, this project could be implemented in 2020.

Evaluation of Benefits - 354.44(b)(5)

The volume of water delivered for recharge will be measured daily and summarized monthly by EID. The rate of accrual of benefits will depend on the frequency of water availability and the percolation capacity of the soil. The water level of groundwater wells in the area will be measured and water quality in the vicinity of the project will be monitored. This data will be used to determine project impacts and benefits.

How will project be accomplished, and what is the water source? - 354.44(b)(6)

The project will be accomplished by EID with the support of EKGSA. The water source will be CVP water.

Project Title: Yokohl Creek Recharge	Project ID: EK3

Legal Authority - 354.44(b)(7)

EID has the legal authority to deliver CVP water to the creek for recharge since Yokohl Creek is within its boundary.

Project Cost - 354.44(b)(8) Estimated Capital Cost Estimated annual cost/AF

The estimated project capital cost, for potential capacity enhancement, is approximately $135,000 and the annual cost over a 20-year return period is estimated to be $5 to $10/AF, including operational and capital costs.

Funding Source - 354.44(b)(8)

The funding source will likely be a combination of grant funding, EID, and/or EKGSA.

Management of Groundwater Extractions and Recharge - 354.44(b)(9)

The project would be managed by EID under the oversight of the EKGSA. Recharge volumes will be measured and reported by EID. Groundwater extraction will be by landowners in the area within EID and the EKGSA area. Performance of the project would be a necessary part of the EKGSA's reporting requirements as well as evaluations of measurable objectives.

Level of Uncertainty - 354.44(d)

The level of uncertainty primarily involves permeability of the intended recharge area, and frequency of CVP water available for recharge. The overall level of uncertainty is moderate for the volume of recharge water indicated.

5.2.5 Rancho de Kaweah Water Management & Banking Project

The following describes the Rancho de Kaweah Water Management & Banking Project, which will manage available CVP and/or Kaweah River supplies from project participants and capture excess water in high flow years to recharge the aquifer, store, bank, or re-regulate supplies to help achieve sustainability in the Kaweah Subbasin and potentially benefit others based on participation. The project area is shown in **Figure 5-5**.

Figure 5-5 Rancho de Kaweah Project Area

Project Title: Rancho de Kaweah Water Management & Banking Project	Project ID: EK4
Project Type	
Recharge (basin), Banking, Recovery, and Re-regulation	
Project Location	
The project site is located near Exeter Blvd. and the Lower Kaweah River in Tulare County – Portion of Sections 11, 14, 15, 22, and 23 T18S, R26E.	
Implementing Agency	
Lindsay-Strathmore Irrigation District (LSID)	

Project Title: Rancho de Kaweah Water Management & Banking Project Project ID: EK4

Project Description - 354.44(a)

The Rancho de Kaweah Water Management & Banking Project will entail constructing recharge and recovery facilities on approximately 1,200 acres. It will provide water management including recharge, storage, re-regulation, and recovery of project participant's CVP and/or Kaweah River water supplies. A conveyance system will be constructed to the project site.

Measurable Objective(s) Addressed - 354.44(b)(1)

The project will primarily help stabilize groundwater levels and increase the amount of groundwater in storage. The project may also re-regulate high flow supplies that would have been potentially underutilized and reduce groundwater pumping by delivering captured water during the irrigation season. Indirectly there could be secondary benefits of some groundwater quality improvement and reduction in land subsidence.

- ☒ Chronic Lowering of Groundwater Levels
- ☐ Seawater Intrusion – *not applicable*
- ☒ Land Subsidence
- ☒ Reduction of Groundwater Storage
- ☒ Degraded Water Quality
- ☒ Depletion of Interconnected Surface Water

Circumstances and Criteria for Implementation - 354.44(b)(1)(A)

The project is in the conceptual stage and no feasibility study work has begun. Infiltration is expected based on general knowledge of the soil characteristics in the immediate project area—the sandy soils present have a high capacity for percolation. Construction of the project would depend upon successful outcome of a feasibility study including a geotechnical investigation. Environmental clearance would be necessary under CEQA and/or NEPA depending upon the ultimate funding source. This is a high priority project because of the large potential recharge and will address several of the measurable objectives. It is an integral piece of the EKGSA's overall effort to reach sustainability and provide partnering ability within the Kaweah Subbasin.

Process to Provide Notice of Implementation - 354.44(b)(1)(B)

The EKGSA will have ongoing efforts to engage stakeholders and the general public in the sustainability process, communicating the statutory requirement, the objectives of the GSP, and progress toward each identified measurable objective. Neighboring landowners will be notified about the project prior to implementation and environmental documents will be available for public review.

Estimated Annual Project Benefits (AF/yr) - 354.44(b)(2)

The actual recharge rate of the proposed project will be determined by the on-site soils and size of basin, but it is expected to be approximately 1 ft/day, which would result in approximately 300 AF/day if at least 300 acres of basin area is constructed. This would yield an average annual recharge volume of approximately 9,000 AF/year when Kaweah River water and/or CVP water is available (currently estimated at 30 days per year. Potential storage, recovery, and re-regulation volumes will be determined in the future during further project feasibility and design analysis.

Permitting and Regulatory Requirements - 354.44(b)(3)

The project will require CEQA and/or NEPA documentation, permits through the U.S. Army Corps of Engineers and California Department of Fish & Wildlife (CDFW), and construction permits (DCP and SWPPP). The project will likely utilize CVP and Kaweah River water when available. The project shall complete all necessary permitting and regulatory requirements.

Project Schedule - 354.44(b)(4) Anticipated Start & Completion, Timeframe to accrue benefits

No project schedule has been determined, and a project feasibility study and analysis need to be completed. Once a source of project funding is secured, a comprehensive schedule including environmental review, design, permitting and construction will be developed. Project construction and

Project Title: Rancho de Kaweah Water Management & Banking Project	Project ID: EK4

implementation is anticipated to occur within 5 to 10 years of GSP submittal. Basin recharge can occur after project construction whenever water is available from potential sources.

Evaluation of Benefits - 354.44(b)(5)

The volume of water delivered for recharge will be measured daily and summarized monthly. The rate of accrual of benefits will depend on the frequency of water availability and the percolation capacity of the soil. The water level of groundwater wells in the area is measured and water quality in the vicinity of the project is monitored. This data will be used to determine project impacts and benefits.

How will project be accomplished, and what is the water source? - 354.44(b)(6)

The project will be accomplished by LSID with the support of EKGSA and cooperation of GKGSA. The water source will be Kaweah River water and/or CVP water that may be available.

Legal Authority - 354.44(b)(7)

LSID, as the property owner, has the legal authority to construct the project upon receipt of applicable permits and has the authority to deliver Kaweah River water to the basin as well as CVP water since the area is within the CVP Place of Use.

Project Cost - 354.44(b)(8) Estimated Capital Cost Estimated annual cost/AF

The estimated project capital cost is approximately $12,000,000 and the annual cost over a 20-year return period is estimated to be $100 to $150/AF, including operational and capital costs.

Funding Source - 354.44(b)(8)

The funding source will likely be a combination of grant funding, LSID, and/or EKGSA.

Management of Groundwater Extractions and Recharge - 354.44(b)(9)

The project would be managed by LSID under the oversight of the EKGSA and GKGSA. Recharge volumes will be measured and reported by LSID. Groundwater extraction will be by landowners who partner on the project within the Kaweah Subbasin. Performance of the project would be a necessary part of the EKGSA's reporting requirements as well as evaluations of measurable objectives.

Level of Uncertainty - 354.44(d)

The level of uncertainty primarily involves funding availability as this project is at the higher end of projected project costs.

5.2.7 Lindmore/Exeter Dry Wells

The following describes the Lindmore/Exeter Dry Wells Project, which will capture and recharge water in above average years when surface water is available to help achieve sustainability in the EKGSA. The general project layout is shown in **Figure 5-6**.

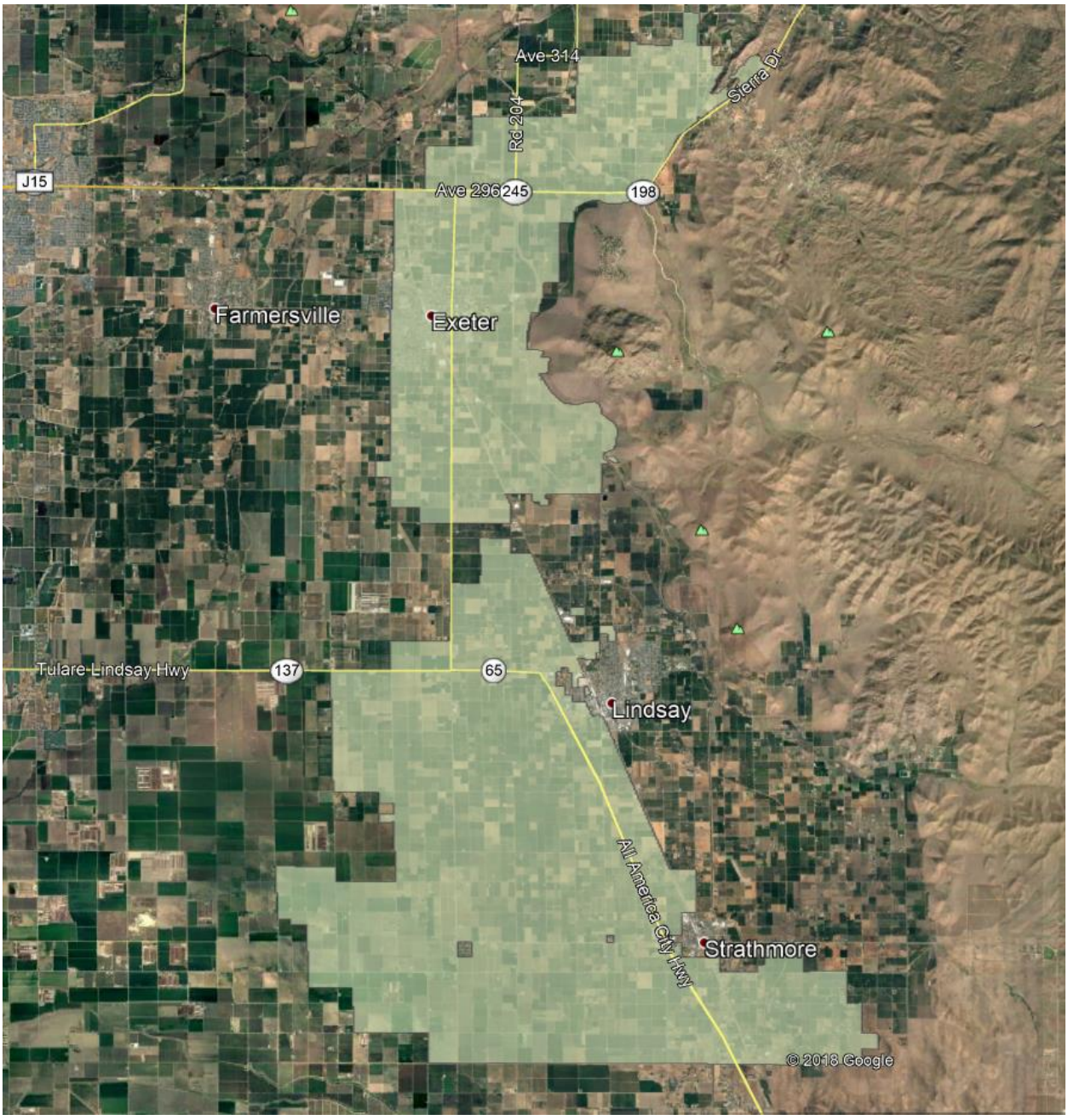

Figure 5-6 Exeter ID and Lindmore ID Boundaries

Project Title: Lindmore/Exeter Dry Wells	Project ID: EK5

Project Type

Recharge (dry well)

Project Location

The intent of the dry well projects is to spread multiple wells throughout the Exeter and Lindmore Irrigation Districts to provide recharge throughout the area with a smaller project footprint. Specific locations have not been selected, as they will require coordination with landowners within the two districts. The intent will be to place them near access to surface water connection (i.e. District distribution system) to develop widespread recharge.

Implementing Agency

Lindmore ID & Exeter ID

Project Description - 354.44(a)

The Lindmore/Exeter Dry Wells Project is still largely conceptual in nature and will entail the Irrigation Districts constructing multiple series of interconnected dry wells that could be used to achieve groundwater recharge when CVP supplies are available to the Districts. The dry well would be a standpipe filled with gravel that would allow water to infiltrate below the soil surface. The size and depth of the dry wells would be site dependent. The dry well recharge system would likely be the recharge method in areas where surface soils are not conducive to recharge and it is necessary to deliver water for recharge below shallow clay layers in the soil, or if recharge in an existing basin would be enhanced by delivering water deeper into the soil profile.

Measurable Objective(s) Addressed - 354.44(b)(1)

The project will primarily help stabilize groundwater levels and increase the amount of groundwater in storage. Indirectly there could be secondary benefits of some groundwater quality improvement and reduction in land subsidence.

- ☒ Chronic Lowering of Groundwater Levels
- ☐ Seawater Intrusion – *not applicable*
- ☒ Land Subsidence
- ☒ Reduction of Groundwater Storage
- ☒ Degraded Water Quality
- ☐ Depletion of Interconnected Surface Water

Circumstances and Criteria for Implementation - 354.44(b)(1)(A)

The project is in the conceptual stage and no feasibility study work has begun. Successful pilot projects must be conducted before significant implementation would occur. If proven feasible, the EKGSA and Districts would develop a program that could be implemented on a larger scale. This is a medium priority project because, while many dry wells are expected to be constructed, there are interim steps to be taken prior to large scale implementation. This project will be implemented after successful pilot projects demonstrate effectiveness and funding options are known.

Process to Provide Notice of Implementation - 354.44(b)(1)(B)

The EKGSA will have ongoing efforts to engage stakeholders and the general public in the sustainability process, communicating the statutory requirement, the objectives of the GSP, and progress toward each identified measurable objective. The EKGSA will provide information about the pilot program as part of SGMA outreach and education and will notify landowners about development of the program. Landowners that can and wish to participate will coordinate water delivery through their local agency.

Estimated Annual Project Benefits (AF/yr) - 354.44(b)(2)

The number of dry wells that will be constructed for this project is unknown at this time, but an estimate of 150 dry wells could be implemented with an average recharge rate of approximately 0.5 AF/day. Based on the typical availability of CVP supplies, this would equate to an estimated average annual recharge

Project Title: Lindmore/Exeter Dry Wells	Project ID: EK5

volume of approximately 2,000 AF/yr. The recharge rate would be highly dependent on the size and depth of the dry wells and the infiltrating soil type.

Permitting and Regulatory Requirements - 354.44(b)(3)

Permits may need to be obtained from the County and/or the Regional Water Quality Control Board (RWQCB) depending on the size and depth of the dry wells. The recharge program still needs to be established by the EKGSA, and the program will likely need to go through CEQA compliance prior to implementation. The recharge program would have oversight by the EKGSA to assure proper water accounting and evaluate on-going impact (positive or negative) on groundwater quality.

Project Schedule - 354.44(b)(4) Anticipated Start & Completion, Timeframe to accrue benefits

No project schedule has been determined. It is anticipated that development of the recharge program would occur early on during the first 5 years of GSP implementation, and significant implementation and use of the wells may occur by the end of the first 5 years.

Evaluation of Benefits - 354.44(b)(5)

The volume of water delivered for recharge will be measured daily and summarized monthly by the local water delivery agency and/or landowner. The rate of accrual of benefits will depend on how many systems are installed, the recharge capacity of each, and the availability and frequency of high flow water.

How will project be accomplished, and what is the water source? - 354.44(b)(6)

The project will be accomplished by individual landowners that have fields that can access District supplies. The water source will be the District's CVP supplies.

Legal Authority - 354.44(b)(7)

The Districts have the legal authority to deliver CVP water to the landowner fields within their boundary. Once any necessary permits are obtained, there would be legal authority to construct a dry well.

Project Cost - 354.44(b)(8) Estimated Capital Cost Estimated annual cost/AF

The estimated project capital cost for constructing 150 wells is approximately $2,500,000 and the annual cost over a 20-year return period is estimated to be $70 to $80/AF, including operation and capital costs.

Funding Source - 354.44(b)(8)

The funding source will likely be a combination of grant funding, LID, EID, and/or EKGSA.

Management of Groundwater Extractions and Recharge - 354.44(b)(9)

The project would be managed by the landowner and overlying district under the oversight of the EKGSA. Recharge volumes will be measured and reported by the District. Groundwater extraction will be by the landowner of the well. Performance of the project would be a necessary part of the EKGSA's reporting requirements as well as evaluations of measurable objectives.

Level of Uncertainty - 354.44(d)

The primary uncertainty involved with small recharge operations is the cost effectiveness. It is slightly decreased in this case due to economy of scale. The other chief uncertainty is the permitting process as this would be a newer recharge methodology in the area. The level of uncertainty for significant implementation is moderate.

5.2.8 Lindsay Recharge Basin

The following describes the Lindsay Recharge Basin Project, which will capture available surface water and recharge the aquifer to help achieve sustainability in the EKGSA area. The general project area is shown in **Figure 5-7**.

Figure 5-7 City of Lindsay Recharge Basin Site

Project Title: Lindsay Recharge Basin	Project ID: EK6
Project Type	
Recharge (basin)	
Project Location	
The project site is located on APN 199-140-038 and -049 east of the intersection of Mariposa St. (Ave. 230) and Highway 65 in Tulare County – Section12, T20S, R26E.	
Implementing Agency	
Lindmore ID & City of Lindsay	

Project Title: Lindsay Recharge Basin	Project ID: EK6

Project Description - 354.44(a)

The Lindsay Recharge Basin Project will entail improving recharge capability of an existing 8-acre basin and constructing conveyance facilities to improve capacity to the basin site. The basin will provide recharge when CVP water is available.

Measurable Objective(s) Addressed - 354.44(b)(1)

The project will primarily help stabilize groundwater levels and increase the amount of groundwater in storage. Indirectly there could be secondary benefits of some groundwater quality improvement and reduction in land subsidence.

- ☒ Chronic Lowering of Groundwater Levels
- ☐ Seawater Intrusion – *not applicable*
- ☒ Land Subsidence
- ☒ Reduction of Groundwater Storage
- ☒ Degraded Water Quality
- ☐ Depletion of Interconnected Surface Water

Circumstances and Criteria for Implementation - 354.44(b)(1)(A)

The project is in the conceptual stage and no feasibility work has begun. Environmental clearance would be necessary under CEQA and/or NEPA depending upon the ultimate funding source. This is a medium priority project because, while there is existing infrastructure in place, the projected benefit is not as great as other proposed projects and the cost-benefit is lower.

Process to Provide Notice of Implementation - 354.44(b)(1)(B)

The EKGSA will have ongoing efforts to engage stakeholders and the general public in the sustainability process, communicating the statutory requirement, the objectives of the GSP, and progress toward each identified measurable objective. Neighboring landowners will be notified about the project prior to implementation and environmental documents will be available for public review.

Estimated Annual Project Benefits (AF/yr) - 354.44(b)(2)

The actual recharge rate of the proposed project will be determined by the on-site soils and size of basin, but the intent is to improve the recharge capability of the existing basin to obtain an extra 5 AF/day and therefore yield an average annual recharge volume of 150 AF/year when CVP water is available.

Permitting and Regulatory Requirements - 354.44(b)(3)

The project will complete all necessary permitting and regulatory requirements such as CEQA documentation regarding potential impacts and construction permits (DCP and SWPPP). The program would utilize surplus CVP water when available.

Project Schedule - 354.44(b)(4) Anticipated Start & Completion, Timeframe to accrue benefits

No project schedule has been determined. Once a source of funding is identified, a comprehensive schedule including environmental review, design, and construction will be developed. Given there is an existing basin, Project implementation is anticipated to occur within the first 5 years of GSP Implementation. Basin recharge can occur after construction, whenever surplus CVP water is available.

Evaluation of Benefits - 354.44(b)(5)

The volume of water delivered for recharge will be measured daily and summarized monthly. The rate of accrual of benefits will depend on the frequency of water availability and the percolation capacity of the soil. The water level of groundwater wells in the area is measured and water quality in the vicinity of the project is monitored. This data will be used to determine project impacts and benefits.

Project Title: Lindsay Recharge Basin	Project ID: EK6

How will project be accomplished, and what is the water source? - 354.44(b)(6)

The project will be accomplished by LID and the City of Lindsay and with support by the EKGSA. The water source will be CVP water.

Legal Authority - 354.44(b)(7)

LID and the City of Lindsay are both Friant CVP contractors and have the authority to deliver CVP water within their boundary. Both entities also have the legal authority to construct the project components upon receipt of applicable permits and easements.

Project Cost - 354.44(b)(8) Estimated Capital Cost Estimated annual cost/AF

The estimated project capital cost is approximately $250,000 and the annual cost over a 20-year return period is estimated to be $100 to $125/AF, including operational and capital costs.

Funding Source - 354.44(b)(8)

The funding source will likely be a combination of grant funding, LID, City of Lindsay, and/or EKGSA.

Management of Groundwater Extractions and Recharge - 354.44(b)(9)

The project would be managed by LID and/or the City of Lindsay under the oversight of the EKGSA. Recharge volumes will be measured and reported by LID. Groundwater extraction will be by landowners in the area. Performance of the project would be a necessary part of the EKGSA's reporting requirements as well as evaluations of measurable objectives.

Level of Uncertainty - 354.44(d)

The level of uncertainty primarily involves funding availability and improvement to the permeability of the intended recharge area. The overall level of uncertainty is low for the volume of recharge water indicated.

5.2.10 Wutchumna Ditch Delivery

The following describes the Wutchumna Ditch Delivery project, which will capture available excess water in high flow years and recharge the aquifer through the ditch bed. Eventually it may also facilitate in-lieu recharge through decreased use of groundwater wells by using the surplus surface water for irrigation. The length of Wutchumna Ditch expected to be used for recharge is shown in **Figure 5-8**.

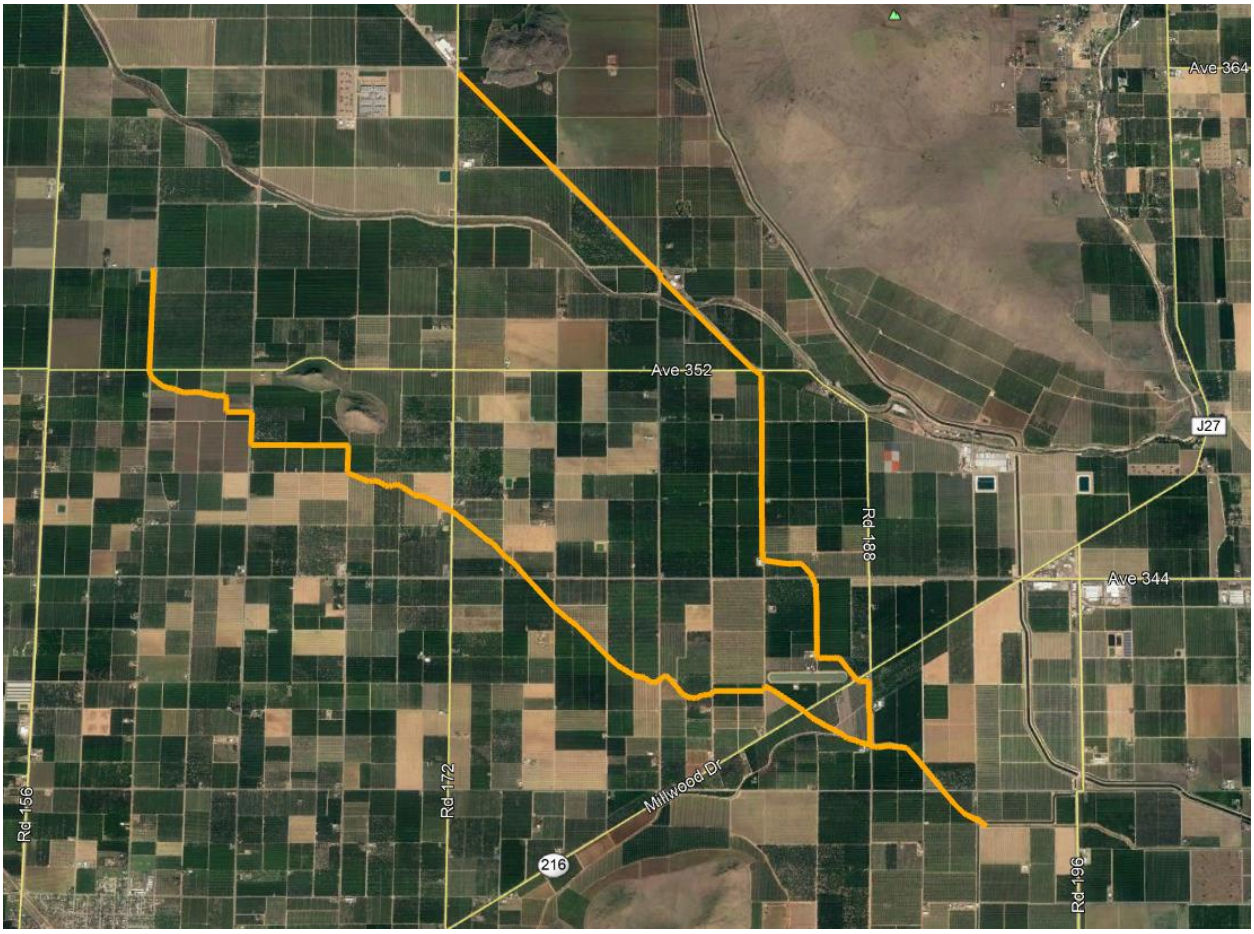

Figure 5-8 Wutchumna Ditch Spurs in EKGSA

Project Title: Wutchumna Ditch Delivery	Project ID: EK7
Project Type	
Recharge (delivery to existing channel)	
Project Location	
Intersection of Wutchumna Ditch and Tulare ID turnout west of the FKC and running west into non-districted areas of the EKGSA in Tulare County –T17S, R25E and T17S, R26E.	
Implementing Agency	
Wutchumna Water Company and Ivanhoe ID	

Project Title: Wutchumna Ditch Delivery	Project ID: EK7

Project Description - 354.44(a)

The Wutchumna Ditch Delivery Project will entail environmental permitting and management agreements. There is an existing connection to FKC through a Tulare ID turnout. Wutchumna Ditch and spur ditches will be used to capture CVP water supplies when available and recharge the underlying aquifer. The total length of ditches acting as a recharge facility is nearly 10 miles.

Measurable Objective(s) Addressed - 354.44(b)(1)

The project will primarily help stabilize groundwater levels and increase the amount of groundwater in storage. Indirectly there could be secondary benefits of some groundwater quality improvement from high quality surface water, and reduction in land subsidence.

- ☒ Chronic Lowering of Groundwater Levels
- ☐ Seawater Intrusion – *not applicable*
- ☒ Land Subsidence
- ☒ Reduction of Groundwater Storage
- ☒ Degraded Water Quality
- ☐ Depletion of Interconnected Surface Water

Circumstances and Criteria for Implementation - 354.44(b)(1)(A)

The project is in the conceptual stage and no feasibility study work has begun. Infiltration is expected based on general knowledge of the soil characteristics in the immediate project area. Implementation of the project would depend upon successful outcome of coordinating agreements and environmental clearance under NEPA. This is a medium priority project because it utilizes a readily available recharge area to address several of the measurable objectives, but agreements are needed on coordinating deliveries into the channel.

Process to Provide Notice of Implementation - 354.44(b)(1)(B)

The EKGSA will have ongoing efforts to engage stakeholders and the general public in the sustainability process, communicating the statutory requirement, the objectives of the GSP, and progress toward each identified measurable objective. Neighboring landowners will be notified about the project prior to implementation and environmental documents will be available for public review.

Estimated Annual Project Benefits (AF/yr) - 354.44(b)(2)

The actual recharge rate of the proposed project will be determined by the on-site soils. The project is expected to recharge approximately 480 acre-feet per year, on average. This is based on an anticipated delivery capacity of 16 AF/day and 30 days of CVP water available per year.

Permitting and Regulatory Requirements - 354.44(b)(3)

The project will complete all necessary permitting and regulatory requirements. It will require NEPA documentation to utilize CVP water.

Project Schedule - 354.44(b)(4) Anticipated Start & Completion, Timeframe to accrue benefits

No project schedule has been determined. Once a source of project funding is secured, a schedule including environmental review and agreements can be developed. Project implementation is anticipated to occur near the end of the first 5 years of GSP Implementation.

Evaluation of Benefits - 354.44(b)(5)

The volume of water delivered for recharge will be measured daily and summarized monthly by Wutchumna Water Company. The rate of accrual of benefits will depend on the frequency of water availability and the infiltration capacity of the soil. The water level of groundwater wells in the area will be measured and water quality in the vicinity of the project will be monitored. This data will be used to determine project impacts and benefits.

Project Title: Wutchumna Ditch Delivery	Project ID: EK7

How will project be accomplished, and what is the water source? - 354.44(b)(6)

The project will be accomplished by Wutchumna Water Company with the support of EKGSA. The water source will most likely be CVP supplies and Kaweah River flood water when available.

Legal Authority - 354.44(b)(7)

The EKGSA is made up of Friant Contractors that have the legal authority to deliver CVP water. Coordination will be needed amongst the EKGSA and Wutchumna Water Company for delivery into the Wutchumna Ditch, which is within the CVP Place of Use.

Project Cost - 354.44(b)(8) Estimated Capital Cost Estimated annual cost/AF

The estimated project capital cost is approximately $100,000 and the annual cost over a 20-year return period is estimated to be $15 to $20/AF, including operational and capital costs.

Funding Source - 354.44(b)(8)

The funding source will likely be a combination of grant funding and EKGSA landowners.

Management of Groundwater Extractions and Recharge - 354.44(b)(9)

The project would be managed by Wutchumna Water Company with the oversight of the EKGSA. Recharge volumes will be measured and reported by Wutchumna Water Company. Groundwater extraction will be by landowners in the area within the EKGSA area. Performance of the project would be a necessary part of the EKGSA's reporting requirements as well as evaluations of measurable objectives.

Level of Uncertainty - 354.44(d)

The level of uncertainty primarily involves permeability of the intended recharge area, and frequency of high flow water. The overall level of uncertainty is moderate for the volume of recharge water indicated.

5.2.11 Additional Project Types

The EKGSA has preliminarily discussed other project concepts that may be utilized in the future, but currently haven't been fully vetted for potential implementation. Future Annual Reports or GSP updates will likely have additional detail on these project concepts.

5.2.11.1 On-farm Recharge and Private Recharge Facilities

On-farm recharge entails spreading excess surface water on operational agricultural fields to recharge the aquifer. The field soil type and crop type must be considered, along with the timing when the excess water is available. Compatibility with crops is necessary for these projects, as some crops tolerate saturated conditions better than others. Tillage operations vary for different crops as well and influence the rate of percolation. On-farm recharge provides a substantial flood control benefit while maintaining agricultural beneficial use of the land. It is anticipated that the program that is developed by the EKGSA may involve incentives to encourage landowners to participate.

The construction of these projects would depend upon successful outcome of a feasibility study including geotechnical work to validate the percolation rate. There would be no permitting or regulatory requirements since it essentially is just over-irrigation of a field. Ultimately, these projects will primarily help stabilize groundwater levels and increase the amount of groundwater in storage. Depending on the location of the on-farm recharge there could be some groundwater quality benefits and some impact on reducing land subsidence. These projects will need to be managed to minimize leaching of fertilizer through the root zone., which could have a negative impact on groundwater quality.

The amount of land that will participate in the program is unknown at this time but based on the SAGBI map of the area it is conservatively estimated that 10,000 acres could participate each year when water is available. The EKGSA will notify participating landowners each time high flow water is available. Landowners will coordinate water delivery through their local district, and the district will report use to the EKGSA. The Friant Districts have the legal authority to deliver surplus CVP water within their boundaries and the entire EKGSA is within the CVP Place of Use.

These projects will have minimal cost. Any improvements required to convey and distribute water on the fields will be paid by the landowner, possibly with assistance from their District, and/or the EKGSA. Performance of the projects would be a necessary part of the EKGSA's reporting requirements as well as evaluations of measurable objectives.

5.2.11.2 Existing Conveyance Facilities Rehabilitation or Expansion

The EKGSA may propose to support the rehabilitation or expansion of existing conveyance facilities, such as diversion systems, check structures, and conveyance facilities. The intent of these improvements is to increase the capacity of the districts to divert more surface water for irrigation as in-lieu recharge, direct on-farm recharge, or for groundwater recharge basins. These projects may require land acquisition or agreements where facilities are expanded. The EKGSA will seek to maximize use of periodic floodwater, which is highly variable.

The objectives of these projects are to use current systems to their full potential, or expand facilities, to increase groundwater storage on an average annual basis. The in-lieu recharge will mitigate groundwater depletion, which has been linked to several undesirable results. Groundwater levels and quality in the nearby area will be monitored before and after implementation of these projects to measure their impacts. Demand reduction will be based on the annualized volume of water delivered for irrigation as a direct result of the conveyance facility rehabilitation or expansion. Flow rates realized before project implementation will not be factored into demand reduction.

5.2.11.3 Efficiency Improvements

The EKGSA may develop programs to fund or incentivize projects that increase water use efficiency within the EKGSA area. Execution of these projects will be based upon funding availability and farmer willingness, and they will likely be implemented on a field or farm level. Project examples include installing higher efficiency irrigation systems and/or soil moisture sensors.

Increasing the efficiency of an irrigation system may mean converting from flood to spray, or from spray to drip or subsurface drip. Soil moisture sensors paint a more accurate picture of the moisture content through the soil profile and rootzone. The intent of efficiency improvements would be to refine the irrigation process and ultimately extract only enough groundwater to meet the crop demand, minimizing waste.

5.3 Management Actions

Some management actions, such as education and outreach, will be initiated early in the GSP implementation phase, while other management actions are envisioned to be employed to reduce water demand if project development is not proceeding sufficiently to achieve the sustainability required to reduced overdraft and meet the interim milestones. This section discusses a suite of management actions the EKGSA may consider during implementation of the GSP to achieve sustainability. They may not be implemented in a strictly linear fashion, as numbered below, as some management actions must be implemented before others can be achieved, and specific actions may not be implemented at all if sustainability is achieved through projects and other actions. In addition, the EKGSA could implement some management actions area-wide, while others would be developed by the EKGSA but would be implemented by individual landowners. In some cases, the landowner may need to choose which management action they want to implement, such as choosing between crop conversion and fallowing land, because it is an economic decision that affects the livelihood of the landowner and there may not be a consistent answer across the entire area. It is expected the EKGSA will further develop and craft management actions in response to stakeholder input on parallel timelines and adapt to the estimated schedules according to the best available information and best available science at any given time.

The legal authority and basis for the management actions described in this GSP are outlined in the SGMA legislation and related provisions. SGMA describes the powers and authorities - financial authority and enforcement powers - of GSAs in Chapters 5, 8, and 9, respectively. These EKGSA authorities include adopting regulations, regulating groundwater extractions, imposing fees, monitoring, enforcing programs, and more. Though SGMA grants GSAs these powers, the pursuit and implementation of the projects and management actions is each GSA's responsibility. A GSA must enforce their legal authority to the extent necessary to achieve sustainable groundwater management for all beneficial users within a GSA and a Subbasin. In the development of the management actions, the EKGSA intends to embody the lessons learned from other groundwater managed basins and strive to accomplish the following (if applicable):

- *Develop trust by being inclusive and transparent.*
- *Use a portfolio of approaches to achieve sustainability.*
- *Ensure efficient and accurate data collection.*
- *Devise a fair and equitable groundwater allocation.*
- *Potentially craft a groundwater trading structure that reflects local hydrologic conditions.*
- *Address concerns of funding EKGSA management actions.*
- *Assure performance through incentives, penalties, and enforcement.*

The Management Actions that may be considered by the EKGSA are discussed below and grouped into the following general topics:

- EO - Education and Outreach
- WH – Well Head Requirements
- GA – Groundwater Allocation
- GMT – Groundwater Marketing/Trading
- FI – Fees and Incentives
- GP – Groundwater Pumping Restrictions

5.3.1 Education and Outreach Management Actions

5.3.1.1 Notification of Annual Groundwater Use

EO-1 Regular Communication

Education and Outreach efforts will continue to educate all landowners within the EKGSA about SGMA and how implementation of the GSP will proceed to address the groundwater overdraft situation. The EKGSA will promote education and outreach to all beneficial users within the GSA as detailed in the **Chapter 1**. Specific to Projects and Management Actions, the EKGSA may adopt a program which provides groundwater users their approximate groundwater use in acre-feet on a per acre basis as an education tool every year. The program may be established before the EKGSA would consider enforcement action on an established groundwater allocation when an allocation is established in the future as discussed in **Section 5.3.3**. The goal is to provide ongoing correspondence to groundwater users and promote awareness of the overdraft condition in the EKGSA, particularly for those groundwater users who do not currently have metered wells. This correspondence may provide individual user information as well as aggregated EKGSA groundwater data for comparison purposes. The ongoing correspondence may contain the following information:

- Individual grower's estimated groundwater use amount in acre-feet/acre.
- Average crop demand in acre-feet/acre based upon published CIMIS evapotranspiration values specific to individual's location
- GSA average groundwater extraction amount for individual grower's crop in acre-feet/acre.
- GSA average groundwater overdraft in acre-feet/acre.
- Current status of GSA adoption of groundwater allocation per acre or groundwater allocation, if applicable, per **Section 5.3.3**.
- Detailed reminder of the EKGSA powers and authorities granted in SGMA.
- Current status of EKGSA adoption of any management actions

In order to determine the individual grower's groundwater extraction amount, the EKGSA may consider multiple quantification methods for a consistent determination of groundwater extraction per acre. The various quantification methods will be discussed further below in **Section 5.3.3**.

EO-2 Non-Routine Responses to Minimum Threshold Exceedances

In addition to regular correspondence, the EKGSA may also immediately notify individual growers of a Minimum Threshold (MT) exceedance as defined in **Chapter 3 Sustainable Management Criteria**. The notice of MT exceedance would alert the monitoring well owner and groundwater extractors within a defined threshold region or management area. The notification may contain the following information:

- Description and location of the MT exceedance.
- Notice of increased frequency of water level and/or water quality monitoring.
- The potential effects to the individual growers (i.e. their well potentially going dry).
- The planned EKGSA response (i.e. trigger of specific projects and managements actions).
- Current funding opportunities available through the EKGSA or other entities, which could be used on projects to combat the determinantal effects of the MT exceedance.
- A written reminder of how individuals can contact the EKGSA, find more information, and provide public input regarding the implementation of the GSP.
- A written reminder of the GSA powers and authorities granted in SGMA, as well as noting the potential for State intervention when Undesirable Results occur that are not reconciled by the GSA.

The regular correspondence and notice of MT exceedance may not generate a quantifiable groundwater demand reduction. However, they would serve as useful education and outreach tools which may change individual

pumping practices and encourage growers to implement water conservation Best Management Practices (BMPs) and/or other demand reduction solutions.

Measurable Objectives Addressed

The goal is to provide education and correspondence with groundwater extractors and promote awareness of the EKGSA overdraft condition particularly for those groundwater extractors who do not currently have metered wells. The measurable objectives would be the number of annual correspondence letters and MT exceedance notices that are mailed each year. In preparation of the quarterly or annual letters and immediate notices, the EKGSA would develop template letters and house a current mailing address database to expedite the notification process. In addition, other ancillary measurable objectives may include the increase of persons on the EKGSA's Interested Person's List, visits to the GSA website, and attendance at public meetings and events. If the education and outreach program did result in a reduction of groundwater extraction, the marginal amount would be estimated at 1-100 acre-feet/year.

Table 5-2 Education & Outreach Measurable Objectives Checklist

Groundwater Level	X
Storage Change	X
Groundwater Quality	X
Land subsidence	X
Surface Water-Groundwater Interconnection	X
Seawater Intrusion	NA

5.3.1.2 Circumstances for Implementation EO-1 - EO-2 (Sec. 354.44.b.1.A)

The education and outreach management action may be developed and implemented shortly after the adoption of the GSP. The policy would remain indefinitely and be reevaluated at least every 5 years. A trigger for the end of this management action may be that another EKGSA management action or program provides comparable annual education letters and outreach notices.

5.3.1.3 Process for Public Notification EO-1 - EO-2 (Sec. 354.44.b.1.B)

The process for public notification will be addressed by the consistent communication and outreach between the EKGSA and the groundwater extractor. The EKGSA will develop a system to initiate communication with the grower on a regular basis and will additionally respond to overdraft or non-compliance with minimum thresholds with escalating correspondence as deemed necessary. The cost associated with EKGSA correspondence will be assessed on an annual basis.

5.3.1.4 Permitting and Regulatory Process EO-1 - EO-2 (Sec. 354.44.b.3)

No permit or regulatory process is required for the EKGSA to adopt the policy. The management action may be accomplished by EKGSA policy adoption. This management action does not rely on water from outside the jurisdiction of the EKGSA.

5.3.1.5 Status and Schedule EO-1 - EO-2 (Sec. 354.44.b.4)

The education and outreach program with annual education letter and notice of MT exceedance has not been drafted. It is expected to commence shortly after the adoption of the GSP and be completed within 1 year. The initial focus will be the annual correspondence letter since the notices of MT exceedance may not occur for many years.

5.3.1.6 Benefit Realization and Evaluation EO1 - EO-2 (Sec. 354.44.b.5)

The EKGSA will use education and outreach opportunities to encourage active engagement, open lines of communication with interested and affected stakeholders, let them know the future opportunities for input, establish communication channels, and receive feedback on the GSP implementation process.

The expected benefits may mitigate overdraft by educating the public about the current use and quality of groundwater supplies. Groundwater extractors may see that their individual use exceeds published crop demand values, EKGSA average use, and/or EKGSA groundwater allocation. Without levying penalties, the EKGSA intends for all correspondence and mailed notices to educate extractors about the EKGSA's monitoring practices, procedures, and enforcement capabilities. Other program benefits include the transparent and expeditious communication of groundwater overdraft conditions, implementation of specific projects and managements actions, funding opportunities, and potential for State intervention if undesirable results occur.

5.3.1.7 How This Management Action Will Be Accomplished EO-1 - EO-2 (Sec. 354.44.b.6)

The annual correspondence and escalation letters can be accomplished by utilizing the in-house mailing database that the EKGSA will develop and maintain. All correspondence will be drafted by EKGSA staff and will be in accordance with the actions of the Board of Directors. Further detail regarding communication can be found in **Chapter 1**.

5.3.1.8 Legal Authority EO-1 - EO-2 (Sec. 354.44.b.7)

The legal authority and basis for the management actions described in this Chapter are outlined in the SGMA and related provisions. The SGMA legislation describes the powers and authorities, financial authority, and enforcement powers of GSAs in Chapters 5, 8, and 9 respectively.

5.3.1.9 Costs EO-1 - EO-2 (Sec. 354.44.b.8)

The costs related to the education and outreach management action include one-time expenses and reoccurring annual expenses. The one-time expenses include the labor costs of the EKGSA Staff, Legal Counsel, and Consultant to prepare the formal program description and adopt the management action policy. The written policy would detail the specific content of the chosen correspondence method, the source of the data being reported, the frequency of the correspondence, mailing or delivery logistics, expected costs, and the intent of the policy. Through a Board resolution, the program would be incorporated into the EKGSA's policy manual for transparency. The database of current EKGSA mailing addresses and template letters would be created. These initial costs are estimated at $20,000. The reoccurring costs for mailed correspondence would include the costs of printing, stuffing envelopes, labeling, and postage among. The GSA may contract with local businesses that perform these mail services. In terms of the content of all correspondence, the costs associated with the EKGSA's selected groundwater extraction quantification method are not to be included in this section; these options and costs will be described in Section 6.4.3. The estimated cost of ongoing correspondence and letter mailings GSA-wide is approximately $10,000. The reoccurring costs associated with the mailing or delivery of MT exceedance notices are difficult to estimate at this time because there are multiple factors that would change the notice frequency. For example, MT exceedances may not start occurring for 10+ years, notices may only be mailed to affected portions, and exceedances may occur multiple times within a given year.

The estimated program cost/acre-foot yield would not potentially occur until after the one-time expenses of program development. The ongoing estimated program cost/acre-foot yield would be $100-$10,000/acre-foot depending upon the amount of water demand reduction (in acre-feet) and number of mailings.

5.3.2 Wellhead Requirements Management Actions

5.3.2.1 Well Metering and Sampling Requirements

The EKGSA recognizes that community involvement and outreach alone will not curtail groundwater overdraft if management actions must be implemented to reduce water demand. Additional well requirements may be required to more effectively manage and understand the dynamic groundwater conditions. Within the EKGSA, well construction permitting is managed by Tulare County Environmental Health Division (EHD) as detailed in **Chapter 1**. Obtaining a well permit is currently a ministerial process, not requiring discretionary action or CEQA. The intent of this management action is to have the EKGSA work cooperatively with the EHD to increase well requirements for new wells without disrupting the current ministerial permit process. Additionally, the EKGSA would promote constant communication with the EHD and would seek to maintain more monitoring responsibility. The EKGSA, in conjunction with EHD, may work to develop policy and/or procedures to augment the current well requirements set by the State/EHD and establish new criteria that collaborate with EKGSA and SGMA goals and include the EKGSA in review of all permit paperwork for non-de minimis extractors before EHD permit issuance. These policy and/or procedures may be applied to permits for constructing, deepening, destroying, reconditioning, and/or repairing a well. In order to increase data collection, reporting, and ongoing groundwater management efforts, additional well policy may contain the following information, if deemed appropriate:

- Registration of extraction facilities with the EKGSA to supplement and confirm information obtained from a well canvass of the area.
- Require the installation of flowmeters on all new or repaired wells, and installation of sounding tubes on all new wells.
- Require the well owner to self-report groundwater extraction volumes, static water levels, and water quality data.
- Restrictions on new well construction.

The EKGSA may consider separating the additional well requirements management action into multiple policies or be silent on various bulleted components until they have deemed them necessary. For example, the requirement of installing a flow meter on the pump discharge may be enacted before the requirement of installing a sounding tube.

The desired outcome of additional well permitting requirements is the ability to monitor groundwater extractions, water levels, and water quality in a thorough, accurate, and efficient manner across the GSA. The measurable objectives differ amongst the bulleted considerations.

WH-1 Registration of Extraction Facilities

As stated in SGMA Section 10725.6, "a GSA may require the registration of a groundwater extraction facility within the management area of the GSA." The EKGSA may adopt this policy to hopefully improve and supplement the existing well records housed by the EHD and DWR and provide a complete record of the number of wells within the area. The EKGSA has greatly benefited from the current exchange of well information and use of the online DWR Well Completion Report Map Application tool found here: https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37.
However, through local outreach and research of the proposed well monitoring network, the EKGSA suspects many existing wells do not have the State and EHD well completion reports (the well driller documentation on the geology and well construction details) or the reports have not been entered into the DWR database and/or EHD records. Unfortunately, the historic well completion reports (especially the older ones) and available DWR 429 Forms (Well Data Form indicating the state well number and detailed well location information) often have insufficient information to confidently locate the exact position of an older well, which is necessary to match up water level and quality information with the area in which pumping is occurring. In recent decades,

the advances in technology, standardization of forms, and accessibility to GPS location have significantly improved the accuracy of well completion reports through better location identification and recordkeeping. The intent of registration of groundwater extraction facilities would be to complement existing well recordkeeping and ensure that the EKGSA can fully understand and quantify the potential impacts of groundwater decline. Coupled with the registration of extraction facilities, the EKGSA may invest in a complete well canvass study to verify the number of wells and presence or absence of a flow meter.

WH-2 Installation of Well Flow Meters

The EKGSA will investigate options for quantifying groundwater use by individual landowners as discussed in **Section 5.3.3** and may require the installation of a flow meter on all groundwater extraction facilities in the future to provide accurate quantities of groundwater extraction and serve as the nexus to other management actions. The policy would describe the acceptable types of flow measurement devices, installation standards and requirements, operation and maintenance requirements, and penalties for tampering, neglect, or misconduct. For example, the flow meter would be installed inline on the pump discharge before any other connections or discharge points in accordance with the meter manufacturer's specifications. The meter must accurately quantify the volume of extracted groundwater in acre-feet and be routinely maintained by the well owner. The policy for flow meter installation may require a meter equipped with telemetry for remote reading of the groundwater extraction by the EKGSA. Failure to comply with the policy may result in civil penalty or criminal fine in accordance with SGMA Section 10732. Once the meter installation was complete, a certification report would be submitted by the landowner documenting that the work was completed in accordance with the EKGSA policy.

WH-3 Installation of Sounding Tubes and Water Quality Sample Ports

The EKGSA may require the installation of a well sounding tube, airline, electric depth gauge, and/or other water level sensor in selected locations for the purpose of measuring water levels throughout the area, especially on new well installations. In addition, the EKGSA may require the installation of a sample port on the well discharge piping in selected locations for the purpose of potentially collecting water quality samples throughout the GSA. The accurate and widespread collection of water level and water quality data could be used to supplement the monitoring network information and provide the EKGSA with additional information to monitor the success/failure of the GSP against the established Sustainable Management Criteria in Chapter 4. The policy would describe the acceptable types of water level measuring devices and sample ports, installation requirements, and penalties for tampering, neglect, or misconduct. The installation must provide or allow for the accurate measurement of static groundwater level in feet below the ground surface and water sample collection. If applicable, the water level measurement device must be routinely maintained by the well owner. Once the installation was complete, a certification report would be submitted by the landowner documenting that the work was completed in accordance with the EKGSA policy.

WH-4 Self-Reporting of Groundwater Extraction

If the EKGSA selects flow meters as the method of quantifying groundwater extraction, and if the installed meters are not equipped with telemetry, then the GSA may require the well owner to self-report to the EKGSA the metered groundwater extraction volumes on a semi-annual basis. The policy would describe the frequency of reporting, various methods of reporting, due dates, and specific instructions for data submission. The EKGSA may provide extractors with self-addressed mailer for return mailing. The mailer may include information for reporting instructions such as the groundwater extraction volume in acre-feet and include the current flow meter totalizer reading. Other information requests may include self-reporting of static water level readings if the well is equipped with sounding tubes, along with instructions on how static water level measurements should be taken twice per year once water levels have stabilized after pump shutdown. If there is limited compliance with self-reporting, the EKGSA may elect to gather the appropriate data with their own staff. The policy would describe that the frequency of the reporting may be temporarily increased if minimum thresholds are exceeded.

5.3.2.2 Circumstances for Implementation of WH-1 – WH-4 (Sec. 354.44.b.1.A)

The current situation of critical groundwater overdraft leading to the unsustainable management of groundwater resources justifies the implementation of additional well requirements. This policy requires the support and coordination of the EHD for successful implementation with any new wells. For existing domestic wells, this policy requires the support and coordination of resident beneficial users. The beneficial users within the EKGSA must be properly notified far in advance of the policy adoption especially because of the potentially for increased well owner costs and self-reporting efforts. For existing wells, there may be extenuating circumstances where the installation of a flow meter (if required) and/or sounding tube are not practical or financially advisable. These situations would need further analysis on a case-by-case basis. The policy would remain indefinitely or until another program serves the same purpose.

5.3.2.3 Process for Public Notification of WH-1 – WH-4 (Sec. 354.44.b.1.B)

The public will be notified of the proposed WH-1 – WH-4 through public meetings, correspondence, and EKGSA website. Educational correspondence regarding self-reporting of groundwater extractions would be accomplished through direct communication between the beneficial user and the EKGSA. This will take place in the form of self-reporting and the monitoring of water level and water quality which is then compiled and distributed through each mailing cycle of correspondence mailings. Should the Board of Directors choose to adopt policy addressing WH-1-WH-4, the public will be notified through established EKGSA correspondence methods as explained in Chapter 1.

5.3.2.4 Permitting and Regulatory Process WH-1 -WH-4 (Sec. 354.44.b.3)

The regulatory process would require EHD coordination and support to ensure new well permits issued within the EKGSA adhere to the EKGSA policy. No other environmental or regulatory permits would be required. Modifications to existing wells for installation of a flow meter do not require a permit. This management action does not rely on water from outside the jurisdiction of the EKGSA.

5.3.2.5 Status and Schedule WH-1 - WH-4 (Sec. 354.44.b.4)

The additional well requirements policy has not been drafted, nor has there been discussions with the County. County discussions may commence shortly after the adoption of the GSP. There currently isn't a timeline for completion.

5.3.2.6 Benefit Realization and Evaluation WH1 - WH-4 (Sec. 354.44.b.5)

The expected benefits would include a complete geo-database of groundwater extraction locations. Requiring new well permits to provide accurate information on location, depth, perforated zone, and measured water use and level would allow for more accurate data analysis of groundwater extraction, storage change, and water table fluctuations. Policy requiring metered wells would also provide private owners with personal usage history and compliment other management actions discussed herein, including education and outreach, groundwater allocation, groundwater marketing and trading, fees and incentives, and pumping restrictions. The evaluation of these benefits would be reviewed periodically and during the annual reporting cycle.

5.3.2.7 How This Management Action Will Be Accomplished WH-1 – WH-4 (Sec. 354.44.b.6)

The registration of Extraction Facilities (WH-1) will be accomplished by validating all documented extraction facilities and the EKGSA may authorize a complete well canvass study to verify the number of wells and presence of a flow meter. Additional review will take place in order to confirm the number of reported well permits and to verify the installation of meters, sounding tubes and sample ports (WH-2-WH-3). WH-4 will be accomplished by analyzing the received reports from each mailing cycle and assessing the data for accuracy.

5.3.2.8 Legal Authority WH-1 – WH-4 (Sec. 354.44.b.7)

The legal authority and basis for the management actions described in this Chapter are outlined in the SGMA and related provisions. The SGMA describes the powers and authorities, financial authority, and enforcement powers of GSAs in Chapters 5, 8, and 9 respectively.

5.3.2.9 Costs WH-1 – WH-4 (Sec. 354.44.b.8)

The additional well requirements management action would not directly generate a quantification of demand reduction. However, the foundation for the mitigation of overdraft would be established for on-going monitoring of groundwater extractions, water levels, and water quality.

The costs related to the additional well requirements management action include one-time expenses and on-going monthly expenses. The one-time expenses include the labor costs of the EKGSA Staff, Legal Counsel, and Consultant to prepare the formal program description and adopt the management action policy. Through a Board resolution, the program would be incorporated into the EKGSA's policy manual for transparency. The database of extraction facilities would be created and include individual fields for owner, location, well construction information, EKGSA additional requirements (i.e. meter, sounding tube, etc.), and future measurement data. These initial costs are estimated at $30,000. The online reporting tool may be developed for well owners to self-report their monitoring data; initial cost is estimated at $15,000. If the EKGSA were to separate the additional well requirements management action into multiple policies, the one-time costs for program description and adoption may be duplicated, but coordination efforts with the EHD would be reduced.

The ongoing monthly costs include the database maintenance, reporting website support, self-addressed post cards, and data entry costs are estimated at $75,000 annually. The adoption of this policy would have other resulting costs for the groundwater extractor including:

- Purchase and installation of the well meter, and potential sounding tube.
- For existing wells, pump discharge modifications to ensure proper meter installation per the manufacturer's specifications.
- Labor costs related to self-reporting.

5.3.3 Groundwater Allocation Management Actions

5.3.3.1 Groundwater Allocations

GSAs experiencing annual groundwater overdraft may pursue individual groundwater allocations because the development of projects and new water supplies cannot solely offset the current groundwater demands and overdraft condition. Demand management will become increasingly more important because of the reduced reliability of imported and flood water supplies, especially when taking into consideration the historical drought periods, uncertain role of climate change, and increased competition for available water supplies.

GA-1 Development of Groundwater Allocation Per Acre

The EKGSA may adopt a policy which provides a groundwater allocation on a per acre basis for the GSA as a whole, or for sub-areas of the EKGSA. The policy would identify and forecast the demands associated with prior rights, domestic, community, and environmental uses. The sustainable yield and ultimate groundwater allocation would take into consideration the existing water rights holders, irrigation districts (IDs), disadvantaged communities (DACs), public utility districts (PUDs), and environmental uses. The EKGSA, through collaboration with its beneficial users, may consider whether an equal-, reduced-, or zero-allocation is given to lands with unexercised groundwater rights. The report *Groundwater Pumping Allocations under California's Sustainable Groundwater Management Act (Environmental Defense Fund et. al, 2018)* identifies several possible methods

of establishing groundwater pumping allocations as shown in the following table excerpted from the 2018 report.

There are a myriad of advantages and disadvantages associated with each method of establishing groundwater pumping allocations. The "Comprehensive Allocation Method," which establishes allocations based on a comprehensive consideration of California groundwater law to the extent practical and is recommended by EDF, is one possible approach that could be considered because it offers the important advantage of presenting to the Court an allocation methodology that tracks judicial precedent if an adjudication is ultimately initiated.

Table 1: Methods for Establishing Groundwater Pumping Allocations

Method	Description	Advantages and Disadvantages
Pro Rata Allocation per Overlying Acre	This approach divides the available groundwater between overlying landowners proportionate to property size. This system treats all landowners equally, irrespective of whether the landowner has developed groundwater resources.	Approach Advantages ▪ Recognizes the underlying correlative right of each overlying acre to share in the reasonable use of the water within the subbasin. ▪ Is simple in approach and calculation. Approach Disadvantages ▪ Does not recognize some of the legal limitations and nuances that affect groundwater rights in a subbasin such as prescription, public use, imported water to the subbasin (see Box 3), and others (or make adjustments to the allocations based upon such limitations and nuances). ▪ It allocates a portion of the sustainable yield to overlying lands that may have not yet exercised the right to use groundwater. This raises significant questions about how you provide water for such lands, if at all, and how allocations will be adjusted when, and if, such lands exercise the right to a share of the sustainable yield. ▪ It creates inequities between those who have invested nothing to develop the right and those who have invested heavily to utilize the right.
Pro Rata Allocation per Irrigated Overlying Acre[10]	This approach certifies all existing overlying groundwater use (e.g. irrigated acres) and develops an allocation proportionate to land use. In this approach, each irrigated acre would be given a specific quantity of groundwater (e.g. inches/acre per year) that can be applied to the land. This approach grandfathers in existing groundwater users but does not give differential allocations based on historic use. Further, any reductions in the allocations to reduce overdraft would be felt proportionately across all historic users.	Approach Advantages ▪ Acknowledges existing pumping by overlying landowners. ▪ Is reasonably simple in approach and calculations. Approach Disadvantages ▪ Does not address the unexercised pumping rights on some overlying lands (to the extent such rights have not been lost to prescription or subordination). ▪ Does not consider historic quantities of groundwater pumped, which could disproportionately impact users of high water demand crops grown on overlying acreage. ▪ Does not recognize some of the legal limitations to and nuances that affect groundwater rights in a subbasin such as prescription, public use, imported water to the subbasin and others (or make adjustments to the allocations based upon such limitations and nuances).

Table 1: Methods for Establishing Groundwater Pumping Allocations

Method	Description	Advantages and Disadvantages
continued		
Allocation Based Upon a Fraction of Historic Pumping[14]	This approach establishes allocations based off historic groundwater use, grandfathering in existing users and excluding those who have not yet developed groundwater resources. This method does not make necessary determinations as to whether historic pumping is supported by claims of overlying users.	Approach Advantages ▪ Can reduce conflict among existing pumpers. Approach Disadvantages ▪ Does not apply the law of correlative rights. ▪ Does not identify appropriative or prescriptive rights. ▪ Does not recognize potentially disproportionate impacts by pumpers on groundwater overdraft. ▪ Does not account for those who have surface water supplies and rely on groundwater only as a supplemental or dry-year supply. ▪ Treats all pumping, regardless of amount, the same and may be perceived as unfair by grandfathering in higher per-acre allocations. ▪ Requires baseline information about individuals' historic groundwater use, which may not exist.
Comprehensive Allocation Method (Recommended Method)	This approach establishes allocations based on a comprehensive consideration of California groundwater law to the extent practical. This approach preserves the relative priority of overlying, prescriptive, and appropriative users and can address the unexercised rights of overlyers. See Figure 1 for a decision tree graphic description of how this approach might be applied.	Approach Advantages ▪ This method would apply California groundwater law to the conditions existing in the subbasin and make allocations accordingly. ▪ If an allocation methodology is developed in this manner, it has a reasonable probability of surviving judicial scrutiny in the context of adjudication, especially if the majority of rightholders in the subbasin find the methodology acceptable. Approach Disadvantages ▪ The law is in many cases vague and ambiguous, and also requires the exercise of interpretation and judgment. ▪ The process for applying this method is complicated and requires information to undertake. ▪ Implementing this process leaves open the possibility that someone will disagree and consider triggering an adjudication.

GA-2 Groundwater Allocation "Ramp-Down" Gradual Decrease

Once an individual groundwater allocation is determined, the GSA may adopt a policy which provides a gradual "ramp-down" allocation decrease over time to arrive at the actual groundwater allocation to allow growers time to adjust to the concept of an allocation, which for some growers may result in a significant reduction in groundwater use. The policy would detail the number of years and amount of reduction each year. For example, if the pumping amount is currently 2.50 AF/ac and the groundwater allocation is established at 1.50 AF/ac,

then a 10% reduction over a 5-year period would achieve the "ramp-down" to a groundwater allocation of 1.50 acre-feet per acre as shown below:

Table 5-3 Example Ramp Down Scenario

Year	Groundwater Allocation (AF/ac)	Reduction at Year End (%)	Reduction at Year End (AF/ac)
1	2.50	10	0.25
2	2.25	10	0.23
3	2.02	10	0.20
4	1.82	10	0.18
5	1.64	8.5	0.14
6 Actual	1.50	0	0

The annual changes in groundwater allocation would be provided in the annual correspondence mailer described in the education and outreach management action above, as well as information presented on the EKGSA website.

GA-3 Groundwater Allocation "Adaptive Management" Approach

The EKGSA may adopt a policy which states an adaptive management approach, whereby the groundwater allocation may be reviewed, changed, and reestablished periodically or during extreme drought as necessary to achieve long term sustainability. It is prudent for the EKGSA to acknowledge the current level of uncertainty in the available data and existing data gaps by providing flexibility in initial groundwater allocations as more data is gathered and analyzed in the upcoming years. Adaptive management is an approach to resource management that "promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a 'trial and error' process, but rather emphasizes "learning while doing" (Environmental Defense Fund et al., 2017).

GA-4 Groundwater Quantification Methods

The EKGSA will evaluate various methods of determining groundwater use immediately following submission of this GSP. The EKGSA may adopt a policy to specify the approved method or methods to quantify the individual and aggregate groundwater extractions for the required SGMA annual reporting and to track groundwater allocation use. If adoption of the additional well requirements policy, specifically the installation of flow meters, takes years to fully implement, the EKGSA may consider a variety or combination of quantification methods. The report *Groundwater Trading as a Tool for Implementing California's Sustainable Groundwater Management Act (Environmental Defense Fund et. al, 2017)* identifies several possible methods of quantifying groundwater use in-lieu of flowmeters as shown in this table excerpted from the 2017 EDF report.

There are various advantages, disadvantages, and costs to all of the stated quantification methods noted. The EKGSA may consider exploring some of these methods with neighboring GSAs and Subbasin-wide for an aggregated approach and mutual cost savings.

Comparison of groundwater quantification methods

Quantification method	Units	Description and enforcement method
Irrigated area	Irrigated area (acres)	**Description:** Certifying irrigated area is a coarse measurement for groundwater use, as it does not capture field-level variation in water use due to differences in crops, soils, technologies, practices, or other characteristics. **Enforcement:** Aerial flyovers or remote sensing
Irrigated area hybrid	Irrigated area (acres); Crop coefficients (acre-feet/acre)	**Description:** Irrigated acreage can be combined with crop coefficients, which more closely approximates field-level water use. This approach still cannot capture differences between irrigation strategies and technology, best management practices, soil types, and other field-level characteristics that influence water use. **Enforcement:** Annual crop survey alongside aerial flyovers or remote sensing
Calibrated energy records	Meter calibration (acre-feet/kWh); Energy use (kWh)	**Description:** Uses energy-use of pumps to estimate the volume pumped. Energy records by themselves can lead to large errors in estimating groundwater use, but can be improved with calibration. They also require that all groundwater pumps be hooked up to electricity, which is often not the case. **Enforcement:** Energy records and meter calibrations
Flow meters	Applied water (acre-feet)	**Description:** Flow meters are fairly straightforward, though are costly in terms of the equipment and, if not telemetered, the time spent for staff to conduct meter readings and periodic calibrations. Some flow meters are not tamper-proof. Use of pumped volume, through flow meters or other methods, does not account for the portion of applied water that may return to the groundwater through deep percolation. **Enforcement:** Meter readings
Remote Sensing	Evapotranspiration (acre-feet)	**Description:** Quantification of consumptive use, as a surrogate for actual pumping, can be done through methods that combine satellite imagery with ground-based weather data. Such methods are used routinely in some locations and may provide a viable mechanism for quantifying groundwater use. Some remote sensing platforms assume the full crop water requirement is met, which may lead to errors. If a field uses both surface water and groundwater, surface water volumes must be known to estimate groundwater use. **Enforcement:** Remote sensing

The goals of the groundwater allocation management action are to ensure a fair groundwater allocation, allow groundwater users time to adjust, provide future flexibility in allocation determinations, and to accurately and efficiently quantify groundwater extractions. The measurable objective is the volume of groundwater extraction in acre-feet GSA-wide and on a per acre basis.

The method of evaluation of groundwater extraction in acre-feet depends upon the EKGSA's selected quantification method or combination of methods. The evaluation of various methods may consider a wide range of factors including cost, accuracy, reliability, timeliness, functionality, personnel required, and legal defense. Once the EKGSA has established a consistent quantification method, the evaluation of the "ramp-down" gradual allocation decrease could be analyzed in the annual comparison of groundwater extraction. Though the annual groundwater extraction amount would be affected by other factors such as weather and available surface water supplies, the total extraction amount could be normalized to an average water year for comparative purposes.

Table 5-4 Groundwater Allocation Measurable Objectives List

Groundwater Level	X
Storage Change	X
Groundwater Quality	
Land subsidence	X
Surface Water Groundwater Interconnection	
Seawater Intrusion	NA

5.3.3.2 Circumstances for Implementation GA-1 – GA-4 (Sec. 354.44.b.1.A)

The EKGSA may consider an investigative study to determine the current and future needs of the existing water rights holders, IDs, DACs, PUDs, and unexercised rights to determine the sustainable yield and groundwater allocation. The selection of groundwater extraction method may be implemented shortly after the adoption of the GSP for the purposes of the required SMGA annual reporting. The selected groundwater extraction quantification method may change over time, but the groundwater allocation would remain on-going.

5.3.3.3 Process for Public Notification GA-1 – GA-4 (Sec. 354.44.b.1.B)

All public notification will take place in the form of regular correspondence from the EKGSA, as well as any supplementary communication between the grower and the EKGSA as deemed necessary by the Board.

5.3.3.4 Permitting and Regulatory Process (Sec. 354.44.b.3)

The EKGSA is responsible to adhere to state water rights law. No permit or regulatory process is required for the EKGSA to adopt the groundwater allocation policy. The GSA may consider the advantages & disadvantages of the listed methods due to differing levels of accuracy and reliability. However, *SGMA 10725.4 (c)* allows GSAs to investigate property and extraction facilities, though encroachment permits, or access agreements may be necessary in some locations. This management action does not rely on water from outside the jurisdiction of the EKGSA.

5.3.3.5 Status and Schedule GA-1 – GA-4 (Sec. 354.44.b.4)

The policy for groundwater allocation per acre, ramp-down gradual decrease, adaptive management, and groundwater extraction quantification method (GA-1 – GA-4) have not been drafted, but development is expected to commence shortly after the adoption of the GSP and likely be completed within the first few years of GSP Implementation.

5.3.3.6 Benefit Realization and Evaluation GA-1 – GA-4 (Sec 354.44.b.5)

The expected benefits may mitigate overdraft by improving the EKGSA's knowledge of aggregate and individual groundwater extractions. The development of a groundwater allocation per acre may be based on the EKGSA's current understanding of the sustainable yield and may change as more information or knowledge is gained. The groundwater allocation management action alone may generate a negligible quantifiable demand reduction, but it would benefit Education and Outreach (See EO1-EO2) and serve as a prerequisite to other management actions including groundwater marketing and trading, fees and incentives, and pumping restrictions (GMT 1-5, FI 1-4) over the planning horizon and by 2040 at the latest.

5.3.3.7 How This Management Action will be Accomplished GA-1 – GA-4(Sec. 354.44.b.6)

The EKGSA will consider the option of a "Comprehensive Allocation Method" as detailed in the 2018 EDF report as a possible approach in addressing GA-1. The annual correspondence mailer will address any annual changes in groundwater allocation based from annual data reported to the EKGSA (GA-2). The EKGSA will consider utilizing an adaptive management approach in which allocations are assessed and changed as deemed

necessary by the Board of Directors in order to address GA-3. Lastly, the GSA will adopt necessary policy to assist in establishing quantification methods for obtaining data for the required SGMA reporting requirements.

5.3.3.8 Legal Authority GA-1 – GA-4 (Sec. 354.44.b.7)

The legal authority and basis for the management actions described in this Chapter are outlined in the SGMA and related provisions. The SGMA describes the powers and authorities, financial authority, and enforcement powers of GSAs in Chapters 5, 8, and 9 respectively.

5.3.3.9 Costs GA-1 – GA-4 (Sec. 354.44.b.8)

The costs related to the groundwater allocation management action include one-time expenses and reoccurring annual expenses. The one-time expenses include the labor costs of the EKGSA Staff, Legal Counsel, and Consultant to prepare the formal program description and EKGSA Board adopt the management action policy. The written policy would describe the groundwater allocation method, available source data, assumptions, groundwater allocation per acre, the gradual decrease to actual allocation, the adaptive management approach, the groundwater extraction quantification methods, expected costs, and the overall intent of the policy. Through a Board resolution, the program would be incorporated into the EKGSA's policy manual for transparency. At this time, only preliminary discussions have been held regarding the potential policy.

The reoccurring costs associated with the EKGSA's selected groundwater extraction quantification vary considerably depending upon the selected method and frequency of data collection.

1. Crop Coefficient Calculations – determined by annual crop survey and standard crop coefficients
    a. $5,000 labor coordination to and handling cropping information obtained from Agriculture Commissioner or another source.
    b. $20,000 for mapping and calculating groundwater demand
    c. Estimated $25,000 annually
2. Flow meters – determined by meter readings
    a. Assumes meters are furnished and installed by well owner following specifications developed by the EKGSA
    b. Assumes meter readings are self-reported or meters are telemetry
    c. Estimated $15,000 annual labor to collect, validate and input meter readings into EKGSA database. Does not include costs of "policing" meter use.
3. Remote sensing of evapotranspiration – determined by remote sensing
    a. Data purchased from one of several vendors offering remote sensing service of acceptable accuracy for use in individual field water budgets – estimated $120,000 annually
    b. Field level water budget analysis tracking surface water deliveries and effective precipitation - estimated $50,000 annually
4. Calibrated energy records – determined by energy records and meter calibrations
    a. Bulk rate pricing of $250/electric meter/year
    b. Assumes 5,000 to 6,000 meters GSA wide (non-de minimis users).
    c. Estimated $1.5 million annually

It is not anticipated that the groundwater allocation management actions would directly result in a quantifiable demand reduction. However, the foundation for the mitigation of overdraft would be established for on-going monitoring of groundwater extractions.

5.3.4 Groundwater Marketing/Trading Management Actions

5.3.4.1 Groundwater Marketing and Trading

If a groundwater allocation policy including individual allocations and chosen quantification method is adopted, the EKGSA may pursue a groundwater market and trading program to provide beneficial users more flexibility in utilizing their allocation. This management action would detail a groundwater allocation carryover structure, banking program, water marketing strategy study, trading structure and related rules.

GMT-1 Groundwater Allocation Carryover Structure

The EKGSA may adopt a policy to define groundwater allocation carryover provisions year-to-year and/or allow multi-year pumping averages. The inter-annual flexibility may be useful to growers who could change cropping patterns or fallow acreage. Though there is a risk that extreme drought may induce exceptionally high pumping in a single year, groundwater extractors may be able to strategize and better manage their assets.

GMT-2 Water Marketing Strategy Study

The EKGSA may consider a study of water marketing strategies in an effort to acquire more surface water. The study may focus on the development of a groundwater banking/trading program and coordination with other agencies that could potentially market water into the EKGSA.

GMT-3 Groundwater Banking Program

The EKGSA may adopt a policy to define a groundwater banking program. The banking program would consider using surface water supplies when available in lieu of groundwater pumping. Though not feasible for all users, growers capable of surface water recharge on-farm may be able to percolate surface water, or other transferred water, for recharge credits. There are many complexities and considerations required to initiate and successfully manage a banking program. The EKGSA must acknowledge and discuss any other water bank/credit systems in existence. The EKGSA may approve past replenishment projects and determine the timeframe for any banking efforts that took place prior to banking program adoption. The EKGSA may consider adjusting banked credits if future changes in sustainable yield and/or groundwater allocation require adjustment. The EKGSA may define a "leave-behind" amount for groundwater migration and operational and evaporative losses, as well as to buffer against impacts to neighboring wells. The EKGSA may consider finite timelines or expiration dates on banked water or ongoing "leave-behind" amounts.

GMT-4 Groundwater Trading Structure

In addition to a groundwater banking program, the EKGSA may adopt a policy to define a groundwater trading structure. The report *Groundwater Trading as a Tool for Implementing California's Sustainable Groundwater Management Act (Environmental Defense Fund et. al, 2017)* identifies several possible groundwater trading structures. The GSA may consider a variety of structures including, but not limited to those shown in this table excerpted from the 2017 EDF report.

There are various advantages, disadvantages, and costs to all of the trading structures noted, and others may exist also. The EKGSA may consider exploring some of these options with the Subbasin GSAs for an aggregated approach and mutual cost savings. Trading may be executed through short-and long-term leases, permanent transfers, inter-annual water exchanges, or dry-year option contracts. The EKGSA may determine physical trade limitations such as distance, aquifer, soil conditions, or management areas.

Comparison of trading structures

Trading structure	Description	Administrator	Advantages and disadvantages	Participant costs
Bilateral contracts or "coffee shop" markets	The most common form of water transactions worldwide, no formal trading mechanism exists. Participants largely learn of one another by word of mouth.	None; informal and decentralized	**Advantages** • Costless to agency to implement **Disadvantages** • Difficulty identifying an interested party • Difficulty in price negotiation • Difficulty in regulatory compliance	No third-party fees; high search and transactions costs
Brokerage	Representation of a buyer or seller in a water rights transaction.	Private sector	**Advantages** • Helps identify interested parties • Helps to negotiate price • Specialized agents help in regulatory compliance **Disadvantages** • Still somewhat decentralized • Pricing often favors the represented party	Brokerage fee
Bulletin boards	A physical or electronic board where interested parties can list information about their water rights for others to get in contact with them.	Private sector, regulatory agencies	**Advantages** • Centralizes trading activity to a degree **Disadvantages** • Difficulty in price negotiation • Difficulty in regulatory compliance	No third-party fees; moderate search and transactions costs
Auctions and reverse auctions	A physical or electronic system in which buyers outbid one another (auction) or sellers undercut one another (reverse auction) to trade water.	Private sector, regulatory agencies	**Advantages** • Centralizes trading activity to a degree **Disadvantages** • Asymmetric pricing: One side reaps the benefits or gains of trade • Difficulty in regulatory compliance	Auction fee if privately run
Electronic clearing-houses or "smart markets"	Leverages the power of computer optimization and a tailor-made algorithm to match participants within the trading rules and by price points.	Private sector, regulatory agencies	Advantages: • Centralizes trading activity • Automates regulatory compliance • Includes price discovery mechanism Disadvantages: • Intensive startup costs to develop	Trading fee, if privately run

GMT-5 Regulate Groundwater Allocation Transfers Outside of GSA

The EKGSA may adopt a policy to regulate groundwater allocation transfers outside of the EKGSA boundaries. Approval would need to be obtained if water is banked within the EKGSA area and the groundwater allocation is intended to be transferred out of the GSA, or if a common landowner intends on transferring his allocation from in the EKGSA to land he owns in another GSA. The EKGSA may assure performance by enforcing rigid penalties for illegal actions. The EKGSA may approve external transfers in limited quantities for emergency situations and levy fees for metering the transferred amount.

Table 5-5 Groundwater Market/Trading Measurable Objectives Checklist

Groundwater Level	X
Storage Change	X
Groundwater Quality	X
Land subsidence	X
Surface Water Groundwater Interconnection	X
Seawater Intrusion	NA

5.3.4.2 Circumstances for Implementation GMT-1 – GMT-5 (Sec. 354.44.b.1.A)

The carryover policy (GMT-1) may be implemented shortly after the adoption of the groundwater allocation per acre and, once adopted, likely remains indefinitely. With regards to the marketing study (GMT-2), the EKGA can consider to implement at any time after the initial GSP submittal, however it is recommended to be completed with the first 5 years of GSP Implementation, as it would be critical in developing a groundwater market in the EKGSA. The remaining marketing/trading management action policies (GT-3 – GT-5) require other policies and/or decisions to be made prior to developing. Allocation and measurement policies are required to develop banking, trading, and/or transferring policy. Once these policies are in place, they are likely to remain in place indefinitely.

5.3.4.3 Process of Public Notification GMT-1 – GMT-5 (Sec. 354.44.b.1.B

All public notification will take place in the form of regular correspondence from the EKGSA, as well as any supplementary communication between the grower and the EKGSA as deemed necessary by the Board.

5.3.4.4 Permitting and Regulatory Process GMT-1 – GMT-5 (Sec. 354.44.b.3)

No permit or regulatory process is required for the EKGSA to adopt policy on any of the groundwater market/trading management actions. However, once policy is in place, groundwater banking (GMT-3) and groundwater trading (GMT-4) will likely require conformance with CEQA. Management actions associated with groundwater banking, trading, and transferring outside the EKGSA may involve external sources of water, pending agreements and partnerships.

5.3.4.5 Status and Schedule GMT-1 – GMT-5 (Sec. 354.44.b.4)

The policy for these actions has not been drafted. It is expected to commence shortly after the adoption of the GSP and potentially implemented within the first 5 years of GSP Implementation.

5.3.4.6 Benefit Realization and Evaluation GMT-1 – GMT-5 (Sec. 354.44.b.5)

The expected benefits for groundwater allocation carryover, market strategy study, groundwater banking, and groundwater trading structure may include increased flexibility for groundwater users to manage supplies, improve water reliability, improve coordination with other users and agencies, and potentially encourage on-farm changes such as crop or irrigation method conversion. The policy for regulating groundwater allocation transfers outside the EKGSA may mitigate local overdraft and deepening cones of depression by ensuring groundwater supplies are consumed or retained within the EKGSA boundary. Emergency groundwater allocation transfers may be accounted and recorded by the EKGSA. Methods for evaluation may be resulting increased water supplies, demand reduction, and/or quantity of GSA transfer permits.

5.3.4.7 How This Management Action Will be Accomplished GMT-1 – GMT-5 (Sec. 354.44.b.6)

The EKGSA will evaluate and establish the policy to be implemented regarding defining groundwater allocation carryover provisions year-to-year and/or allow multi-year pumping averages (GMT-1). The EKGSA will address GMT-2 by considering a study of water marketing strategies. Such a study may focus on the

development of a groundwater banking/trading program and coordination with other agencies that could potentially market water into the area. The EKGSA will explore, analyze and possibly develop future policy to address groundwater banking and trading structures to be implemented. Lastly in order to address GMT-5 the EKGSA may adopt a policy to limit groundwater allocation transfers outside of the GSA or Subbasin.

5.3.4.8 Legal Authority GMT-1 – GMT-5 (Sec.354.44.b.7)

The legal authority and basis for the management actions described in this Chapter are outlined in the SGMA and related provisions. The SGMA describes the powers and authorities, financial authority, and enforcement powers of GSAs in Chapters 5, 8, and 9 respectively.

5.3.4.9 Costs GMT-1 – GMT-5 (Sec.354.44.b.8)

The costs related to the groundwater marketing/trading management action include one-time expenses and reoccurring annual expenses. The one-time expenses include the labor costs of the EKGSA Staff, Legal Counsel, and Consultant to prepare the formal program description and EKGSA Board adopt the management action policy. The written policy would describe the marketing and/or trading, available source data, assumptions, groundwater measurement methods, the adaptive management approach, potential fees and charges, and the overall intent of the policy. Through a Board resolution, the program would be incorporated into the EKGSA's policy manual for transparency. At this time, no discussions have been held regarding the potential policy.

The estimated costs associated with the EKGSA's selected groundwater marketing and trading management action options are estimated as follows:

1. Groundwater allocation carryover structure
    a. $10,000 labor and coordination to draft the policy
    b. Estimated $15,000 annually for administration and data management
2. Water Marketing Study
    a. Estimated $400,000 to perform study, based on other GSA efforts
    b. Potential funding to 50% available through the USBR
3. Groundwater Banking Program
    a. $20,000 labor and coordination to draft the policy
    b. On-going annual costs will vary pending program and management method selected
    c. Fees and charges may be incorporated into the policy to cover on-going administrative costs or supplement funding for other projects or water purchases.
4. Groundwater Trading Structure
    a. $20,000 labor and coordination to draft the policy
    b. On-going annual costs will vary pending program and management method selected
    c. Fees and charges may be incorporated into the policy to cover on-going administrative costs or supplement funding for other projects or water purchases.
5. Groundwater transfer out of the GSA
    a. $10,000 labor and coordination to develop the policy
    b. Fees and charges may be incorporated into the policy to cover on-going administrative costs or supplement funding for other projects or water purchases.

5.3.5 Fees and Incentives Management Actions

5.3.5.1 Fees and Incentives

The EKGSA will explore multiple financing options to cover its operational costs as detailed in the GSP Implementation (**Chapter 5.3.8.1.1**). Specific to Projects and Management Actions, the EKGSA may adopt policy to levy groundwater fees and/or provide individual incentives to groundwater users to reduce groundwater extractions. The EKGSA may consider an economic study to determine the best strategy for curbing groundwater overdraft while minimizing economic impact. Potential fee structures and/or incentives would affect groundwater users differently, so a combination fee or incentives structure may also be considered.

FI-1 Pumping Fees for Groundwater Allocations Exceedances

Once a groundwater allocation policy including individual allocations and chosen quantification method has been adopted, the EKGSA may adopt a policy to levy fees for pumping beyond the current groundwater allocation. The EKGSA realizes certain landowners will need or elect to utilize an amount of groundwater in excess of their annual allocation. In order to meet such demands, while minimizing overdraft conditions and sustaining the groundwater aquifer, the EKGSA must augment water supplies or manage demands. The pumping fee is proposed to fund the costs of augmenting water supplies and/or managing demands. It is likely there will be several fee structures developed throughout the State. The EKGSA may follow one of these examples or develop its own basis for a pumping fee.

FI-2 Pumping Fees for Groundwater Extractions

If an individual groundwater allocation per acre policy is not established or takes many years to adopt, the EKGSA may adopt a policy to levy tiered fees per acre-feet of pumped groundwater. The EKGSA must first adopt policy on groundwater quantification as described in **Section 5.3.3** to develop this type of policy. If pumping fees were not paid, the EKGSA may consider liens or cease and desist orders.

FI-3 Well Head Fees

An alternative approach independent of groundwater allocation per acre and quantification method of extraction, the EKGSA may adopt a policy to levy flat rate well head fees. To implement this policy the EKGSA would need to register groundwater extraction facility, such that the GSA can efficiently and accurately collect the well head fee. If well head fees were not paid, the GSA may consider liens or cease and desist orders.

FI-4 Incentives

The following examples provide basic information on possible incentive program structures should the EKGSA choose to adopt policy that establishes these programs to be implemented. The EKGSA may incentivize these, or other programs as deemed necessary, with Board approval.

Example 1 – May adopt a policy to incentivize groundwater extractors through incentives to construct canal or basin infrastructure to utilize available imported and flood waters.

Example 2 – May adopt a policy to incentivize groundwater extractors through incentives to change crop type to one with lower water demand.

Example 3 – May adopt a policy to incentivize groundwater extractors through incentives to rotate crops and temporarily fallow portions of their irrigated acreage to reduce water demand.

Example 4 – May adopt a policy to incentivize farmers to implement on-farm best management practices (BMPs) such as soil moisture sensors, high efficiency irrigation methods, metering to apply precise irrigation, and deficit irrigation.

Example 5 – May adopt a policy to incentivize farmers to retire or permanently fallow agricultural land.

Table 5-6 Fees & Incentives Measurable Objectives Check List

Groundwater Level	X
Storage Change	X
Groundwater Quality	
Land subsidence	X
Surface Water Groundwater Interconnection	
Seawater Intrusion	NA

5.3.5.2 Circumstances for Implementation FI-1 – FI-4 (Sec. 354.44.b.1.A)

The EKGSA may consider an investigative study to determine the most effective and equitable fee and incentive structure. Prerequisites of levying groundwater fees may include the installation of a flow meter or other quantification method for groundwater extractors (excluding de minimis extractors). Prerequisites to well head fees may be the registration of groundwater extraction facility and database creation.

5.3.5.3 Process for Public Notification FI-1 – FI-4 (Sec. 354.44.b.1.B)

The EKGSA would utilize continuous correspondence as discussed in EO-1-EO-2 to notify the public as to various opportunities to participate in these programs. Additionally, the EKGSA will utilize such correspondence to inform on policy development and/or implementation regarding fees and incentives.

5.3.5.4 Permitting and Regulatory Process FI-1 – FI-4 (Sec. 354.44.b.3)

No permit or regulatory process is required for the EKGSA to adopt these policies. The EKGSA has the power, through SGMA and related provisions, to adopt these ordinances. Specific canal or basin infrastructure may require CEQA compliance and potentially rely on external water sources.

5.3.5.5 Status and Schedule FI-1 – FI-4 (Sec. 354.44.b.4)

The policies regarding fees and incentives have not been drafted. It is expected to be evaluated during the first 5 years of GSP Implementation and potentially implemented within 2 years of policy adoption. Policy fees, associated non-payment penalties, and incentives amounts may be reviewed by the EKGSA annually.

5.3.5.6 How This Management Action Will be Accomplished FI-1 – FI-4 (Sec. 354.44.b.6)

Groundwater extraction fees and agricultural land conversion have great potential to significantly reduce the demand on groundwater supplies. The quantification of the possible water savings depends on the program pursued and the number of participants.

5.3.5.7 Benefit Realization and Evaluation (Sec. 354.44.b.5)

The expected benefits are potential mitigation of local overdraft by incentivizing groundwater extractors to reduce pumping or pump groundwater supplies in a sustainable fashion. The ancillary benefits include additional funds for the EKGSA to invest in other projects and management actions. The method of evaluation may be reviewing the effective fee structures, amounts and number of fees levied. The groundwater savings are estimated 0 - 30,000 acre-feet per year. It may vary significantly depending upon levied fees, water year, and available transfers/banked credits.

5.3.5.8 Legal Authority FI-1 – FI-4 (Sec. 354.44.b.7)

The legal authority and basis for the management actions described in this Chapter are outlined in the SGMA and related provisions. The SGMA describes the powers and authorities, financial authority, and enforcement powers of GSAs in Chapters 5, 8, and 9 respectively.

5.3.5.9 Costs FI-1 – FI-4 (Sec. 354.44.b.8)

The costs related to the fees and incentives management action include one-time expenses and ongoing annual expenses. One-time expenses include the labor costs of the EKGSA Staff, Legal Counsel, and Consultant to prepare the formal program description and adopt the management action policy. Through a Board resolution, the program would be incorporated into the EKGSA's policy manual for transparency. If the EKGSA were to separate the fees and incentives management action into multiple policies, the one-time costs for program description and adoption would be duplicated, but ongoing efforts would be reduced.

Fees: The one-time expenses are estimated at $15,000 cost to draft and adopt the policy. The ongoing costs related to levying fees of any type include accounting, billing, and processing payments. These costs are estimated at $25,000 annually. Once adopted, the levied fees will recoup these costs and generate revenue for the EKGSA to fund other projects and management actions.

Incentives: The one-time expenses are estimated at $15,000 cost to draft and adopt the policy. Since the incentives program would be voluntary with an unknown number of participants, it is assumed the EKGSA would define a maximum budget account with each corresponding type of incentive and would define the parameters of the incentives program. In addition, there would costs associated with field verification prior to enrollment in the Incentives program. Ongoing costs may range from $10,000 - $1,000,000 annually.

5.3.6 Groundwater Pumping Restrictions Management Actions

5.3.6.1 Groundwater Pumping Restrictions

The EKGSA may consider a groundwater pumping restrictions management action encompassing policies related to the prohibition of new groundwater exports, requiring new developments to prove sustainable water supply, pumping restrictions during droughts, and moratorium on new production wells.

GP-1 Regulate Groundwater Exports

Though groundwater exports outside of the EKGSA are not currently a common practice, it is understood the changing water market conditions may entice beneficial users to seek financial gains by exporting groundwater. Thus, the EKGSA may adopt a policy to charge a fee for existing groundwater exports and/or prohibit new groundwater exports outside of the EKGSA boundary. The EKGSA may assure performance by enforcing rigid penalties for illegal actions. The EKGSA may approve external exports in limited quantities for emergency situations and levy fees for metering the exported amount. Policy fees and penalties may be reviewed by the EKGSA Board annually.

GP-2 Require New Developments to Prove Sustainable Water Supply

The EKGSA may adopt a policy to require new developments (non-de minimis extractors) to prove sustainable water supplies based upon the current groundwater allocation. The EKGSA may review and comment on all new development environmental documents to ensure water balance and corresponding mitigation measures are implemented. This policy requires the support and coordination of the County and/or City during their typical project permitting process.

GP-3 Pumping Restrictions

The EKGSA may adopt a policy to reduce or temporarily suspend groundwater pumping during specific intervals and/or in specific regions. Restrictions may be the result of minimum threshold exceedances. The EKGSA may consider significant penalties for violators of excessive abuse.

Table 5-7 Groundwater Pumping Restrictions Measurable Objectives Check List

Groundwater Level	X
Storage Change	X
Groundwater Quality	
Land subsidence	X
Surface Water Groundwater Interconnection	
Seawater Intrusion	NA

5.3.6.2 Circumstances for Implementation GP-1 – GP-3 (Sec. 354.44.b.1.A)

The groundwater pumping restrictions policy may have certain components that may be considered sooner than others. If groundwater export becomes a significant concern in the EKGSA, the EKGSA may act more quickly to develop a policy. Developing policy requirements for new developments will require coordination with the County and/or City.

5.3.6.3 Process for Public Notification GP-1 – GP-3 (Sec. 354.44.b.1.B)

The EKGSA will utilize the established methods of correspondence as described in EO-1-EO-2 to coordinate directly with the grower to address necessary actions associated with groundwater pumping restrictions. If deemed necessary, the EKGSA will adopt policy to, address, issue warnings and implement pumping restrictions if future circumstances require it. Certain circumstances and/or triggers of minimum threshold exceedances may expedite the policy adoption.

5.3.6.4 Permitting and Regulatory Process GP-1 – GP-3 (Sec. 354.44.b.3)

No permit or regulatory process is required for the EKGSA to adopt the policy describing the prohibition of native groundwater exports or pumping restrictions. No external water source is used.

The regulatory process to adopt the policy describing requirements for new developments to provide sustainable water supplies requires cooperation from the County/City to ensure the EKGSA reviewed and commented on the environmental documents prior to County/City approval. The regulatory process would require EHD coordination and support to ensure new well permits issued within the EKGSA adhere to EKGSA policy. This management action does not rely on water from outside the jurisdiction of the EKGSA.

5.3.6.5 Status and Schedule GP-1 – GP-3 (Sec. 354.44.b.4)

The policy has not been drafted. It is expected the EKGSA will evaluate these policy options within the first 5 years of GSP Implementation. During this evaluation and receiving input from stakeholders, the EKGSA will develop a more detailed schedule.

5.3.6.6 Benefit Realization and Evaluation GP-1 – GP-3 (Sec. 354.44.b.5)

The expected benefits may mitigate overdraft and minimum threshold exceedances by ensuring groundwater supplies are utilized in accordance with the groundwater allocation and consumed or retained within the EKGSA boundary. Emergency groundwater exports may be metered and recorded by the EKGSA. The method of evaluation may be reviewing the financial impact, number of new developments, and/or number of emergency export permits. Estimated 0 – 30,000 acre-feet per year may be retained within the EKGSA, which may vary significantly depending upon levied fees, water year, available transfers/banked credits, etc.

5.3.6.7 How This Management Action Will be Accomplished GP-1 – GP-3 (Sec. 354.44.b.6)

The EKGSA may adopt a policy to charge a fee for groundwater exports and/or prohibit groundwater exports outside of the EKGSA boundary in order to accomplish GP-1. Additionally, the EKGSA will be assessing

groundwater conditions and may adopt policy in which GP-2 and GP-3 would be directly addressed and could become implemented policy.

5.3.6.8 Legal Authority GP-1 – GP-3 (Sec. 354.44.b.7)

The legal authority and basis for the management actions described in this Chapter are outlined in the SGMA and related provisions. The SGMA describes the powers and authorities, financial authority, and enforcement powers of GSAs in Chapters 5, 8, and 9 respectively.

5.3.6.9 Costs GP-1 – GP-3 (Sec. 354.44.b.8)

The costs related to the groundwater pumping restrictions management action include one-time expenses and ongoing annual expenses. One-time expenses include the labor costs of the EKGSA Staff, Legal Counsel, and Consultant to prepare the formal program description and adopt the management action policy. Through a Board resolution, the program would be incorporated into the EKGSA's policy manual for transparency. The one-time expenses are estimated at $15,000 cost to draft and adopt the policy. The ongoing costs related to managing groundwater pumping restrictions and coordinating with the County/City may be covered through a permit fee and/or pumping charge.

5.3.7 Interconnected Surface Water Data Gap Work Plan

Within the EKGSA, the presence and understanding of potential interconnected surface water is not well understood. This Management Action sets forth a Work Plan to perform additional efforts specific to filling data gaps and performing additional research and analysis specific to the interconnected surface water indicator in the Kaweah Subbasin, particularly in the EKGSA. Note that absent a full data set and other potential unknowns, some components of the Work Plan are spoken to in generalities as the specific future steps (i.e., type of analytical tool) will be better understood as the Work Plan is undertaken.

5.3.7.1 Management Action Description

EKGSA plans to perform a Work Plan, described below, to fill data gaps and better understand the presence of interconnected surface waters, if any, and potential adverse impacts caused by groundwater extraction. Through the Work Plan and its pending results, the EKGSA can evaluate to the extent interconnected surface waters exist and to what extent whether impacts due to groundwater pumping are significant and unreasonable. This information can then be used to develop sustainable management criteria. This Work Plan is anticipated to be performed in partnership, in part or in whole, with the Greater Kaweah GSA which is also implementing a Work Plan on this topic. The EKGSA will be focusing on the reaches of the Kaweah River, Antelope Creek, Cottonwood Creek, Lewis Creek, Frazier Creek, and Yokohl Creek that are highlighted in **Figure 3-10** and **Section 3.4.2**, which explains the rationale for focusing Work Plan in these areas.

The Work Plan will be performed within the following four (4) major components and are described in further detail below.

Phase 1: Filling Data Gaps and Further Research

Phase 2: Analytical Tool Development

Phase 3: Interconnection Analysis and Determination

Phase 4: SMC Refinement and Incorporation into 2025 GSP Update

<u>Phase 1: Filling Data Gaps and Further Research</u>

With interconnected surface water being an identified data gap, the EKGSA will work towards filling data gaps through research and further data collection. There are many different types of data to be gathered and/or better understood to improve the EKGSA's knowledge of interconnected surface waters. The data and research intended to be collected are listed below:

- *Groundwater levels – There are gaps in the groundwater level monitoring points near the selected waterways. Without groundwater level data, the EKGSA is unable to understand the proximity of groundwater to the surface water channel and how seasonal or annual groundwater elevations interact with the surface water channels. Early in the Work Plan, the EKGSA will look to identify new monitoring locations through existing wells or new wells to be installed.*
- *Pumping well locations, its beneficial uses, and estimated quantity – Active pumping along or in regional proximity to the selected waterways is not understood in the detail needed for determining whether there are adverse impacts to interconnected surface water ways.*
- *Stream flow and/or estimated hydrology – Some of the selected water ways have little or no ability monitor surface water flows. Or there is not enough known about studies or analyses that may have been developed to estimate flows based on hydrological conditions. Pending further research, new or additional stream measurement sites may be installed in locations of the selected waterways.*
- *Presence of Riparian habitat and/or Groundwater Dependent Ecosystems (GDE) – Further investigations will be performed utilizing available data sets for the presence of riparian and/or GDEs along the selected water ways. Field*

investigations may be performed to confirm physical presence and current status of these habitats. These efforts, combined with other monitoring efforts of groundwater levels and streamflow, will be used to better understand if adverse impacts are being potentially experienced in the interconnected reaches due to groundwater depletion.

- *Soils/geological considerations – Further investigation and review of the soils and geological conditions will be evaluated to guide the physical parameters for how surface and groundwater move through the strata present in the selected water ways. The flux through the channel bottoms as well as drawdown characteristics of the regional aquifer around the selected waterways will be reviewed to incorporate into the analytical tool and further analysis to understand mechanics for water movement naturally as well as impacted through groundwater extraction.*
- *Influence of the mountain front recharge – Additional research to determine the volume coming off the mountain front watersheds and how it impacts the upper reaches of the waterways is needed. The Kaweah Subbasin has estimated mountain front recharge in its Water Budgets, however the location and magnitude in different portions of the mountain front is not well understood.*

Phase 2: Analytical Tool Development

As the additional research and data gaps are being filled, the EKGSA will begin to evaluate an analytical tool that will be appropriate and practical to support decision making and management. At this time, it is unknown the type of tool that will be appropriate but may range from a model, series of equation calculations, or other analytical method that provides for quantifying surface water depletions with respect to groundwater extraction. The USGS Circular 1376 provides guidance on potential approaches and will be closely reviewed during this phase.

It is envisioned this tool will be developed in a manner that can support analysis of a zone of influence around the selected surface waterways to evaluate the impacts groundwater extraction may have on surface flows in all or portions of the studied reaches.

Phase 3: Interconnection Analysis and Determination

Following the previous phases to perform additional research, fill data gaps, and develop an analytical tool based on the larger data set; the effort of this phase will include the analysis and estimation of the impacts on surface water depletions caused by groundwater extraction, if any. The established study zones from Phase 2 will be analyzed to determine the estimated groundwater extractions and surface water depletion or losses over varying water year types (hydrology) and varying seasons within a water year (i.e., Spring, Fall, etc.). This analytical step will be aimed at driving toward establishing more refined sustainable management criteria in applicable areas for the 2025 GSP update. The refinements may increase or reduce the current reaches with preliminary SMC, pending the results of prior phases.

Phase 4: SMC Refinement and Incorporation to 2025 GSP Update

The final phase of the Work Plan is the refinement of SMC and incorporation into the 2025 GSP Updates. The level of refinement needed is unknown at this time. However, the EKGSA understands that providing the results of the Work Plan and modifying SMC, where applicable, is targeted for the 2025 GSP updates due in January 2025.

Table 5-8 Interconnected Surface Water Data Gap Work Plan Measurable Objectives Check List

Groundwater Level	
Storage Change	
Groundwater Quality	
Land subsidence	
Surface Water Groundwater Interconnection	X
Seawater Intrusion	NA

5.3.7.2 Circumstances and Criteria for Implementation

The circumstances for implementing are critical as there is little data and information to inform and support groundwater management related to the interconnected surface water sustainability indicator. The EKGSA is committed to implementing the Work Plan to better understand the presence of interconnected surface waters, if any, and protect against adverse impacts caused by groundwater extractions.

5.3.7.3 Public Notice and Outreach Process

Appropriate notification and outreach will be conducted consistent with GSA authorities and requirements. As results from the Work Plan become available, they will be reported at EKGSA Board and committee meetings, which are open to the public. Management changes stemming from the results of the Work Plan will occur following a review and public comment period.

5.3.7.4 Estimated Annual Project Benefits

This Work Plan will provide better data and understanding of the location of interconnected surface waters within the EKGSA, if any. The results of the Work Plan could reduce groundwater pumping in the vicinity of interconnected surface waters and protect surface water users and riparian or GDEs from adverse impacts related to groundwater extraction. An annual benefit cannot be defined at this time.

5.3.7.5 Permitting and Regulatory Process

Permits for installation of monitoring wells would be needed from Tulare County. However, since these monitoring wells will not have extraction capability, obtaining permits should be procedural. Work within a surface water way, for example to install a stream gauge, could require permits from agencies such as the Army Corps of Engineers, State Water Resources Control Board, and/or California Department of Fish & Wildlife if the action does not fall into an exemption. Right of entry or access agreements with local landowners may be needed pending location.

5.3.7.6 Status and Schedule of Management Action

The Work Plan has yet to begin. The proposed schedule for the Work Plan is summarized in the following table. This is a preliminary schedule. Pending data gathered and/or timing of such data, there may be shifts or re-ordering of phases/tasks to better adapt and facilitate completion.

Table 5-9 Anticipated Work Plan Schedule

Phase	Description	Estimated Timeline
1	Additional research; data gap filling (monitoring well installation, stream gauge installation, etc.); data collection	October 2022 – June 2024
2	Analytical Tool Development – the type of tool will be determined with additional data and research	March 2023 – December 2023
3	Interconnection Analysis and Determination	January 2024 – July 2024
4	SMC Development and Incorporation into 2025 GSP	July 2024 – January 2025

5.3.7.7 Expected Benefits and Targeted Sustainability Indicators

The management action will improve knowledge on the timing and volume of interconnected surface water depletions caused by groundwater extraction, if any. Pending the results of the Work Plan, the EKGSA could develop more specific SMC and/or management actions set to protect surface water users and riparian or GDEs from adverse impacts caused by groundwater pumping.

5.3.7.8 Source and Reliability of Water

An additional water source is not required for this Work Plan effort. However, hydrology is an important factor in understanding the natural variability in surface water way flow behavior. The ephemeral nature of the water ways and the ranges of flows that naturally occur out of the Mountain Front is highly dependent on hydrology. Continuing drought conditions may impact the timeline and results of the Work Plan.

5.3.7.9 Legal Authority Required

The EKGSA has the authority to implement and perform the Work Plan as the SGMA legislation grants authority to GSAs to perform any act necessary or proper to implement and follow the regulations (§10725.2). This authority allows the EKGSA to implement the Work Plan and move toward better understanding this sustainability indicator with respect to conditions within the Kaweah Subbasin and develop further SMC or rules, pending results of this Work Plan.

5.3.7.10 Costs and Funding

As described in the Work Plan, there is some uncertainty in the direction next steps will take as more data and information is gathered and better understood. Costs to collect more data, develop a methodology to analyze surface water interconnection and nexus to groundwater extractions, and understand the location of interconnected surface waters within the EKGSA, if any could vary widely. Estimates for performing the Work Plan through 2024 (to be incorporated into the 2025 Update) range from $150,000 to upwards of $750,000 for the data gap filling and potential installation of wells and gauges, technical tool development, and analysis. The cost to the EKGSA in implementing will be whole or in part of this estimate. The EKGSA and GKGSA will be looking to develop partnerships on this effort, as it most directly impacts their GSA boundaries. The EKGSA may also look to funding opportunities at State and/or Federal levels that support such efforts.

5.3.7.11 Management of Groundwater Extractions

The management action could lead to better quantification of groundwater production which could deplete interconnected surface waters and the timing and quantity for which it may occur. Pending results of the Work Plan, groundwater extractions in certain proximities of surface water channels could be reduced to minimize or eliminate depletions caused by groundwater pumping.

5.3.7.12 Level of Uncertainty

There is high certainty the Work Plan will be implemented, the EKGSA is committed to following the Work Plan as previously set forth. The level of uncertainty associated with the direction of the Work Plan and the corresponding results are high as, absent current data, the certainty related to presence of interconnected surface waters and the nexus to groundwater production is not well understood. Specifically, the potential inability to monitor streamflow data during a range of hydrologic conditions due to persistent, multi-year drought conditions may impede the gathering of foundational data needed to significantly understand any potential interconnectivity between surface water ways and groundwater.

5.3.8 Well Monitoring and Mitigation

5.3.8.1 Drinking Water Well Monitoring Program

While on the path to achieving Subbasin-wide sustainability, there are regions of the EKGSA where domestic wells may be negatively impacted if water levels reach the proposed minimum thresholds. Recognizing that there are several communities and citizens that rely on groundwater through small system and private domestic wells within the region, the EKGSA may choose to create a program to monitor impacts to water users dependent on groundwater for their drinking water supply. A Drinking Water Wells Monitoring Program (DWWMP) could include a combination of different strategies that provide solutions to gather critical data, protect groundwater quality and quantity, and provide safe and affordable drinking water to the residents of the EKGSA. Aspects of such a program may include:

- *Drinking Water Wells Monitoring Network*
  - Conduct a drinking water well vulnerability assessment to understand: (1) where drinking water wells that are more vulnerable to groundwater level changes are located, and (2) whether changes in groundwater levels may be exacerbated in specific areas by pumping volume or location.
  - Define drinking water wells monitoring network based on the drinking water wells assessment. This network would be used to assess impacts to drinking water caused by changes in groundwater levels and quality.
- *Adaptive Management System Development*
  - Develop a preventative warning system that alerts groundwater managers when groundwater levels are dropping to a level that negatively affects drinking water users. Such system may include quantitative threshold triggers between the measurable objective and the minimum threshold that can be used to assign levels of warning and recommend corrective action.
- *Drinking Water Well Impact Tool/Model*
  - Develop a model or tool from the monitoring network data and adaptive management framework to evaluate groundwater levels and predict potential groundwater impacts to drinking water wells.
- *Protection Measures*
  - At-risk wells may be eligible for mitigation via the EKGSA's mitigation program (***Section 5.3.8***).
- *Funding*
  - If implemented, a secure and reliable source of funding for the DWWPP would need to be identified. Options could include land-based fee assessments, utilization of grant funding, collaboration with CV-SALTS management zones replacement drinking water efforts, and/or Safe and Affordable Funding for Equity and Resilience (SAFER) Program grant funds.

Table 5-10 Drinking Water Well Monitoring Program Measurable Objectives Check List

Groundwater Level	X
Storage Change	
Groundwater Quality	X
Land subsidence	
Surface Water Groundwater Interconnection	
Seawater Intrusion	NA

5.3.8.1.1 Circumstances for Implementation (Sec. 354.44.b.1.A)

The current situation of critical groundwater overdraft leading to the unsustainable management of groundwater resources justifies the implementation of a DWWMP.

5.3.8.1.2 Process for Public Notification (Sec. 354.44.b.1.B)

The public will be notified of the DWWMP through public meetings, correspondence, and EKGSA website.

5.3.8.1.3 Permitting and Regulatory Process (Sec. 354.44.b.3)

No environmental or regulatory permits are expected to be required at this time to implement a DWWMP. Land access agreements with drinking water well owners may be needed to conduct monitoring.

5.3.8.1.4 Status and Schedule (Sec. 354.44.b.4)

The DWWPP policy has not been drafted and there would need to be discussions with stakeholder groups. Drafting the policy may commence shortly after the adoption of the GSP. There currently isn't a timeline for completion.

5.3.8.1.5 Benefit Realization and Evaluation (Sec. 354.44.b.5)

The expected benefits would include a complete geo-database of groundwater extraction locations. Through the DWWPP, a tool may be developed that evaluates potential drinking water well impacts. The expected benefits of water quality sample ports and analytical testing would fill data gaps and provide extractors with useful information. The benefits of developing a DWWPP include protecting the Human Right to Water within the EKGSA, balancing community and economic development needs, and improved understanding of potential impacts on drinking water quality. The evaluation of these benefits would be reviewed periodically and during the annual reporting cycle.

5.3.8.1.6 How This Management Action Will Be Accomplished (Sec. 354.44.b.6)

The development of a DWWPP will be accomplished by bringing together a sub-committee of experts, local stakeholder representatives, and EKGSA representatives to explore and develop the policies required to successfully launch the DWWPP.

5.3.8.1.7 Legal Authority (Sec. 354.44.b.7)

The legal authority and basis for the management actions described in this Chapter are outlined in the SGMA and related provisions. The SGMA describes the powers and authorities, financial authority, and enforcement powers of GSAs in Chapters 5, 8, and 9 respectively.

5.3.8.1.8 Costs to Implement (Sec. 354.44.b.8)

The cost to develop a DWWPP will vary vastly based on the scope and depth of the program. Costs would include both one-time start-up expenses and on-going expenses. The one-time expenses include the labor costs of the EKGSA Staff, Legal Counsel, and Consultant to prepare the formal program description, host stakeholder engagement meetings, incorporate domestic beneficial users feedback, and adopt the management action policy. In addition, there are the one-time costs to canvass and locate drinking water wells within the EKGSA, develop the domestic well database, and build the appropriate modeling tool. These startup costs are estimated at $100,000. The ongoing monthly costs include database maintenance, data entry costs, monitoring costs including field and analytical fees, and cost of sending outreach to community members, are estimated at $50,000 annually.

5.3.8.2 Mitigation Program

The Kaweah Subbasin GSAs have agreed to each implement a Mitigation Program to mitigate for certain impacts caused to beneficial uses and users due to groundwater level declines and land subsidence. The framework for this coordinated Mitigation Program is in the Kaweah Subbasin Coordination Agreement included in **Appendix 1-A**. The following describes the EKGSA's Mitigation Program in conformance with the Coordination Agreement.

The purpose of the Mitigation Program is to mitigate for continued overdraft pumping for groundwater levels and land subsidence. Each Kaweah Subbasin GSA will adopt and implement a Mitigation Program to identify impacts caused by pumping within the GSA's boundaries that may require mitigation. Each Mitigation Program will separately identify the impacts to beneficial uses that the Mitigation Program is intended to address. Each Mitigation Program will include a claim process to address impacts to: (i) domestic and municipal wells; (ii) agricultural wells; and (iii) critical infrastructure. Because the Mitigation Program will resolve impacts from groundwater management, significant and unreasonable results to wells and land uses that may occur prior to reaching MT will be avoided.

Table 5-11 Mitigation Program Measurable Objectives Check List

Groundwater Level	X
Storage Change	
Groundwater Quality	
Land subsidence	X
Surface Water Groundwater Interconnection	
Seawater Intrusion	NA

5.3.8.2.1 Mitigation Program Framework Process

Identification of Need for Mitigation

The Mitigation Program will begin with a plan to establish the process for identification of wells or land uses in need for mitigation. The process may include: 1) an application process by the landowner or well user; or 2) data collection by the GSA and outreach to the affected user. The GSPs in the Subbasin set Measurable Objectives and Minimum Thresholds based on 2015 groundwater levels and land elevation. Impacts from that point further will be evaluated as potentially affected due to the allowance of some level of continued overdraft.

Evaluation

Once a potential well or land use has been identified as possibly impacted, an evaluation will occur by EKGSA to determine whether the well has been adversely impacted by declining groundwater levels or by land subsidence which have been identified as occurring because of allowable continued overdraft conditions. The EKGSA plans to use a "stoplight" approach to well mitigation that provides mitigation to impacted wells prior to hitting minimum thresholds. EKGSA specific mitigation plan triggers, conditions, qualifications, outreach methods, mitigation proposed, and groundwater management action responses are summarized in **Table 5-12**.

Qualifications

GSAs may qualify mitigation based on a user's compliance with the GSA's GSP, Rules & Regulations, and other laws or regulations. For example, a user who has caused or contributed to overdraft may not qualify for the Mitigation Program.

Mitigation
Once a well has been identified as adversely impacted due to declining groundwater levels or land subsidence, the proper mitigation to alleviate impacts must be determined.

For groundwater level impacts, this could include any of the following:

- Repairing the well;
- Deepening the well;
- Constructing a new well;
- Modifying pump equipment;
- Provide temporary or permanent replacement water;
- Coordinate consolidation with existing water systems; or
- With the consent of the affected user, providing other acceptable means of mitigation.

For land use impacts, this could include any of the following:

- Increased restrictions in groundwater extractions for certain regional areas;
- Repair to canals, turnouts, stream channels, water delivery pipelines, and basins;
- Repair to damaged wells;
- Addressing flood control;
- Repair to other damaged infrastructure including highways, roads, bridges, utilities, and buildings; or
- With the consent of the affected user, providing other acceptable means of mitigation.

Various factors may reflect the proper mitigation methods for the specific well or land use at issue. For example, age, location, the financial impact to the beneficial user as a result of mitigation, and the beneficial user of the well may reflect which mitigation measures are optimal.

Table 5-12 EKGSA Domestic Well Mitigation Triggers, Conditions, Investigations/Qualifications, Outreach, Mitigation, and Groundwater Management Actions

Trigger	Conditions	Investigation/ Qualifications	Outreach	Mitigation	GW Management
Green	Groundwater conditions are stable at or above established MO. No issues are anticipated.	Typical monitoring schedule and GSP Management.	Annual Monitoring Report.	None expected.	Continue GSP Planning at measurable objective management
Yellow	Groundwater conditions below established MO and above 50% of established MT by Threshold Region.	Monitoring Network indicating some areas may need further investigation. Initiation of investigation and vetting of specific conditions. Evaluate monitoring frequency.	Annual Monitoring Report; Visual representation of impacted area on GSA map.	Following investigation/ qualification - GSA implementing applicable mitigation method for the specific issue.	GSA to evaluate annual allocation amount in next allocation period.
Orange	Groundwater conditions below 50% of operational range and above the established MT by Threshold Region.	Monitoring Network indicating areas need further investigation. Initiation of investigation and vetting of specific conditions. Evaluate monitoring frequency.	Annual Monitoring Report; Visual representation of impacted area on GSA map; Increased communications.	Following investigation/ qualification - GSA implementing applicable mitigation method for the specific issue.	GSA to evaluate localized groundwater pumping limits or actions.
Red	Groundwater conditions at or below established MTs by Threshold Region.	Monitoring indicating many areas need further investigation. Initiation investigation and vetting of specific conditions. Monitoring frequency increased.	Annual Monitoring Report; Visual representation of impacted area on GSA map; Increased communications; Working with local agencies.	Following investigation/ qualification - GSA implementing applicable mitigation method for the specific issue. Looking into larger, long-term solutions to address significant impacts.	GSA to evaluate broader groundwater pumping limits or actions.

5.3.8.2.2 Circumstances for Implementation (Sec. 354.44.b.1.A)

This is a high priority program that is necessary to mitigate the impacts of declining water levels and land subsidence and provide water supply to meet basic health and safety needs. EKGSA, in coordination with GKGSA and MKGSA, is committed to implementing this Program. Funding is available for the Program through GSAs implementation of assessments, fees, charges, and penalties. In addition, the GSAs will explore grant funding.

5.3.8.2.3 Process for Public Notification (Sec. 354.44.b.1.B)

Public outreach and education will be provided during development of the Mitigation Program and prior to implementation by each GSA. Prior to implementation, extensive outreach will be geared toward notifying landowners of the Mitigation Program requirements, facilitate how to qualify for the Mitigation Program, and how to apply for assistance. Outreach will be offered in multiple languages as appropriate for the GSA. Outreach methods could include workshops, mailings, flyers, website postings, Board meeting announcements, etc.

Common elements developed at the Kaweah Subbasin level shall be shared with the public through coordinated workshops and public meetings. As material and data become available, the Kaweah Subbasin GSAs will coordinate workshops for the public to attend. While special workshops can be utilized, the Kaweah Subbasin GSAs will utilize the quarterly Kaweah Subbasin Management Committee (Management Committee) meetings as a resource to share Workplan updates. The Management Committee is a coordinated meeting between representatives from each GSA, and the public is invited to attend and participate in the meetings. Meetings shall be noticed on GSA websites and shall be sent to interested parties. Interested parties are collected on an ongoing basis in the Kaweah Subbasin. Individual outreach plans specific to each GSA Mitigation Program shall be developed and shared with the public via individual outreach efforts at each.

5.3.8.2.4 Permitting and Regulatory Process (Sec. 354.44.b.3)

The GSAs will be required to comply with any CEQA requirements prior to approval and implementation of the Program. No other permits or other regulatory requirements are expected to be necessary for the Program at this time.

5.3.8.2.5 Status and Schedule (Sec. 354.44.b.4)

Each GSA will formulate and implement a mitigation claims process for domestic and municipal use impacts within the first quarter of 2023, and complete all other aspects of the Mitigation Program by June 30, 2023. The initial claims process shall include reference to local programs and resources from the County, State, non-profit organizations, and the Kaweah Water Foundation (local CV-SALTS Management Zone).

As the Kaweah Subbasin GSAs anticipate that the individual Mitigation Programs will require time to be developed and established in a public and transparent fashion, in the interim, the Kaweah Subbasin GSAs will coordinate the development of an Interim Domestic Well Mitigation Program at a yet to be determined funding level and emergency criteria to make the limited funding available for drinking water well mitigation.

5.3.8.2.6 Benefit Realization and Evaluation (Sec. 354.44.b.5)

The proposed Program will directly mitigate impacts due to chronic lowering of groundwater levels and land subsidence. The Program will provide a direct benefit to the beneficial users in the GSA who have had their well impacted because of continued overdraft conditions while the GSA implements other project and management actions to achieve sustainability. The metric for measuring program benefits will be the number of wells that are impacted and mitigated under this Program.

The Kaweah Subbasin GSAs intend to utilize the Annual Report submitted to DWR to report on and update progress on the Mitigation Program(s). With the information presented, the Kaweah Subbasin GSAs anticipate pursuing locating and refining the potential number of wells impacted by lowering of groundwater levels to the MTs in the Kaweah Subbasin. The Kaweah Subbasin GSAs intend to leverage new tools developed by the DWR, such as the Dry Domestic Well Susceptibility Tool, and well surveys to establish a refined estimate of drinking water well impacts. The Kaweah Subbasin GSAs will continue to evaluate impacts to beneficial uses and users of land subsidence.

5.3.8.2.7 How This Management Action Will Be Accomplished (Sec. 354.44.b.6)

The project will be implemented by the GSA once fully developed and a funding source is identified. This program relies on available groundwater. The GSAs may evaluate alternative sources of supply.

5.3.8.2.8 Legal Authority (Sec. 354.44.b.7)

California Water Code Section 10725.2 provides the GSA has the powers and authorities "perform any act necessary or proper" to implement SGMA regulations and allows the GSA to adopt rules, regulations, ordinances, and resolutions necessary for SGMA implementation. Because the Department is required to evaluate whether the Plan provides a reasonable means to mitigate for continued overdraft, a mitigation program is an act necessary or proper to implement SGMA. (23 CCR §355.4(b)(6).)

5.3.8.2.9 Costs and Funding (Sec. 354.44.b.8)

Following are preliminary cost drivers for implementing the program. These will be refined during project development and finalized prior to efforts to secure funding.

> Development of Policies and Procedures. Each GSA will have consulting and legal costs to develop the Program policies and procedures, which costs will vary by GSA.
>
> Develop Funding. The Subbasin will collaborate with programs and funding sources that already exist. Each GSA will need to develop long-term funding. This could include preparation of grant applications, a land-based fee assessment, or other options. These costs will vary by GSA.
>
> Public Outreach. Public outreach will be performed in each GSA. These costs will vary by GSA and will be estimated during development of the Program.
>
> Project Administration. General administration costs for the program will vary by GSA and will be determined during the development of the Program.
>
> Well Mitigation. Well mitigation costs will vary by GSA and location within each GSA in accordance with groundwater levels and the specific minimum thresholds that have been determined. An estimate of well mitigation costs will be developed by each GSA as part of their Program development and funding plan development. As a preliminary estimate to understand approximate magnitude, the number of wells that may be impacted within the EKGSA based on known data at this time (as described in **Appendix 3-D**) is approximately 115 wells. Recent estimates for drilling a new PVC domestic well is in the range of $88 - $125 per linear foot (LF). For estimating the potential magnitude of cost for this program, it was assumed that 100 LF could be needed for assisting potentially impacted wells beyond their current construction. Applying the cost per LF to 115 wells results in a range from $1.0 - $1.5 million.

Each GSA will develop a funding mechanism for the Mitigation Program, which is dependent on the specific GSA needs for specific expected impacted wells, critical infrastructure, and land uses within each GSA. Funding is anticipated to be available for each GSA's Mitigation Program through implementation of assessments, fees, charges, and penalties. In addition, the GSAs will explore grant funding. The State has many existing grant

programs for community water systems and well construction funding. County, state, and federal assistance will be needed to successfully implement the respective Mitigation Programs. Each GSA may, separately or in coordination with other GSAs, also work with local NGOs that may be able to provide assistance or seek grant monies to help fund the Mitigation Program. GSAs may act individually or collectively to address and fund mitigation measures.

Below is a list of funding being sought within the Kaweah Subbasin:

- *The Safe and Affordable Funding for Equity and Resilience (SAFER) Program through the California State Water Resources Control Board*
- *Household Water Well Program through the United State Department of Food and Agriculture*
- *Household Water Well System Grant Program through the United State Department of Food and Agriculture*

5.3.8.2.10 Management of Groundwater Extractions

The Program will may impact groundwater extractions, if impacts show accelerated rates of groundwater extraction needs to occur. The Program will not directly impact recharge activities, but actively encourages that course of action. The Program is meant to mitigate for impacts caused by continued overdraft pumping until sustainability has been reached.

5.3.8.2.11 Level of Uncertainty

The GSAs are committed to the Program and required through the Coordination Agreement to implement the Program by the scheduled defined herein. There are uncertainties associated with mitigation costs and funding sources.

6 Plan Implementation

The adoption of the GSP will be the official start of the Plan Implementation. The EKGSA will continue its efforts to engage the public and secure the necessary funding to successfully monitor and manage groundwater resources in a sustainable manner. While the GSP is being reviewed by DWR, the EKGSA will coordinate with various stakeholders and beneficial users to improve the monitoring networks and begin the implementation process for projects and management actions.

6.1 Estimate of GSP Implementation Costs

Legal Requirements:
§ 354.6. Agency Information

When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:

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

The EKGSA preliminary estimate of plan implementation costs includes four categories:

1. *GSA Administration*
2. *Ongoing GSP Implementation*
3. *Plans to Fill Data Gaps*
4. *Projects & Management Actions*

GSA Administration

This includes the costs of annually operating the EKGSA including, but not limited to, the executive officer's salary, audit, legal counsel, insurance, and potentially office space. The extent of administrative costs will be impacted by the direction the EKGSA follows in the years ahead. The EKGSA is utilizing a shared staff model where all labor for executive leadership, engineer, analyst, and administration are shared with a member agency. In the future, the EKGSA can evaluate moving to a hired executive staff model where all labor for executive leadership and administration costs, and all other work is performed by consultants. The current costs, estimated using the shared staff model currently in use, is approximately $211,000 annually.

Ongoing GSP Implementation

The ongoing costs of GSP implementation include, but are not limited to, basin coordination/policy development, engineering, outreach, monitoring, annual reporting, and data collection for 5-year updates. The expected implementation costs may vary based on EKGSA staffing and/or policy decisions in the future. Costs are estimated using the existing shared staff model and is approximately $856,100 annually.

Plan to Fill Data Gaps (One-Time Cost)

Proper implementation of this GSP, especially as it relates to execution of projects and management actions, is contingent upon filling current data gaps. This process will require determining which measures are necessary to build and maintain a comprehensive assessment of the water budget and ultimately verify groundwater sustainability. This plan to fill data gaps includes, but is not limited to, installing stream gauges, dedicated monitoring wells, and conducting a Proposition 218 vote. Costs are estimated to be approximately $1,230,000.

Projects & Management Actions

Projects and management actions/programs will be required to achieve groundwater sustainability. Estimated costs generally include planning, design, and construction of infrastructure. The project costs listed are estimates

and may be adapted, added to, or eliminated by the EKGSA Board should it be deemed necessary. The funding for projects and management actions will likely come from specific project proponents and/or beneficiaries. Thus, these costs are not included in **Table 6-1** summarizing the EKGSA implementation costs. Further discussion regarding projects and their individual components, as well as their estimated timelines can be found in the Projects and Management Actions Chapter (**Chapter 5**).

Table 6-1 Estimated EKGSA Implementation Costs

East Kaweah GSA Initial GSP Implementation Budget	
Activity	**Est. Budget**
GSA Administration	
Executive Leadership (Executive/Analyst)	$ 125,000
Administration	30,000
Office Space and Correlated Costs	-
Legal	35,000
Engineering (Gov.)	5,000
Auditing	5,000
Insurance	6,000
Miscellaneous	5,000
Total GSA Administration	**$ 211,000**
GSP Implementation	
Basin Coordination/Policy Development	$ 100,000
Engineering	190,000
Outreach	10,000
Monitoring	
GW Level Monitoring (Semi Annual)	12,000
GW Quality Monitoring (Quarterly)	200,000
Subsidence Monitoring (Annual)	1,600
Satellite Imagery - Demand (Monthly)	250,000
DMS Management	15,000
Annual Reporting	25,000
Collection for For 5-year Update	75,000
Annual Ongoing GSP Imp Costs	**$ 878,600**
Total Annual Costs	**$ 1,089,600**
Fill Data Gaps	
Stream Gauges (5)	$ 200,000
Dedicated Monitoring Wells (7)	525,000
Well Video Logging	175,000
Five Year Update	250,000
Prop 218	80,000
Mitigation Program	*1,600,000*
Interconnected Surface Water Work Plan	*500,000*
Total to Fill Data Gaps	**$ 4,935,000**
Estimated GSP Implementation Costs	**$ 6,024,600**

6.2 Identify Funding Alternatives

Shortly after the GSP is submitted, the EKGSA pursued a Proposition 218 Election for securing funds for annual administration and general implementation costs associated with implementation of this GSP. The Proposition 218 Election, which was approved by voters in October 2020, established a maximum rate in a given fiscal year with the highest possible rate being $9.37/acre. The assessment rate will be set annually by the GSA Board, based on the budget needs, but will not exceed the proposed maximum rate established in the Proposition 218. The projects and management actions proposed in this GSP will require supplemental funding beyond the 2020 Proposition 218 effort as only the annual administration and general implementation efforts were included. Therefore, other funding mechanism(s) will be required.

The EKGSA and/or its member agencies or other Kaweah Subbasin GSAs will apply for various grant funding opportunities to offset some of the capital costs associated with implementation of the GSP, whether it be a water supply project or to fill an existing data gap. The EKGSA will explore federal and state grant funding opportunities and low interest loans to help finance the initial steps of plan implementation.

If local, state, and federal funding is not readily available or insufficient, the EKGSA may consider implementing policies or actions to impose fees which, after formal adoption, would generate a revenue stream for future GSP implementation costs. The fees could be based on several factors including, but not limited to, allocating projects costs to project beneficiaries, estimated pumping quantities, land area, or other method as determined by the EKGSA. The EKGSA could elect to impose penalties for not meeting milestones or exceeding allocation limits. Penalty revenue could be utilized to fund projects.

6.3 Schedule for Implementation

Figure 6-1 shows the estimated timeline for project implementation starting in 2020 and spanning to 2040. It is important to note that projects may initiate at different times and the estimation of implementation may be altered by the EKGSA at any time, should it be deemed necessary. Additionally, the availability of surface water necessary for projects is subject to hydrology which is unpredictable and variable. The EKGSA plans to continue broadening its scope in attempting to obtain additional resources to be utilized by these and other projects. The depicted schedule does not list specific implementation steps (i.e. environmental documentation, agreements, project design, and construction) for each project or management action.

Figure 6-2 represents the glide path to sustainability for the EKGSA GSP, shown as a cumulative mitigation. The overall EKGSA overdraft is currently estimated to be approximately 28,000 acre-feet prior to the development of the GSP. It is assessed that by 2025, 5% of the pre-existing overdraft value will have been resolved. In the year 2030 it is estimated that through GSP implementation 25% of the estimated overdraft will have been resolved. In 2035 the percentage jumps to 55%, with 100% of the overdraft resolved by 2040. This figure provides is an estimated projection, and actual results from both projects and management actions may differ from this expectation.

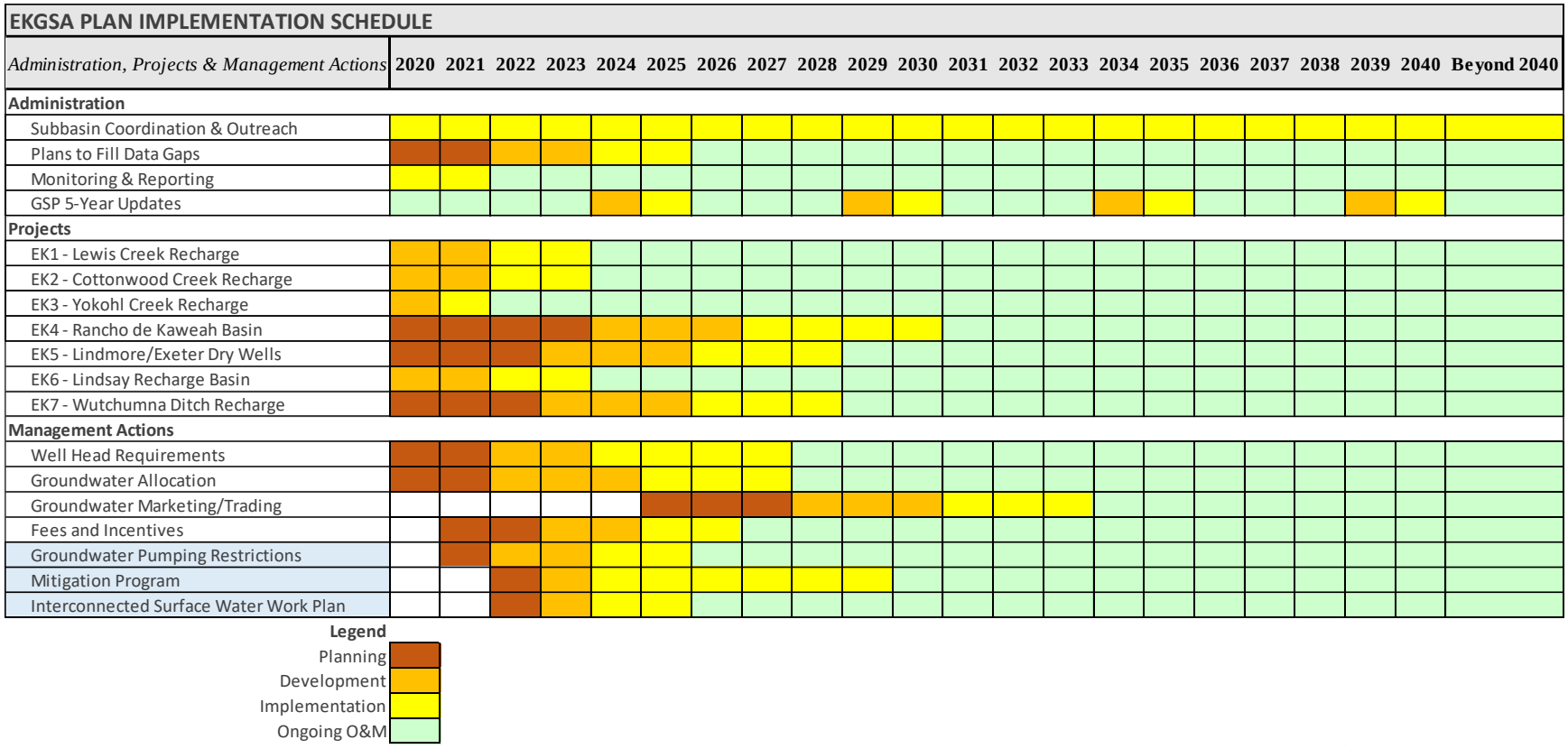

Figure 6-1 EKGSA GSP Implementation Schedule

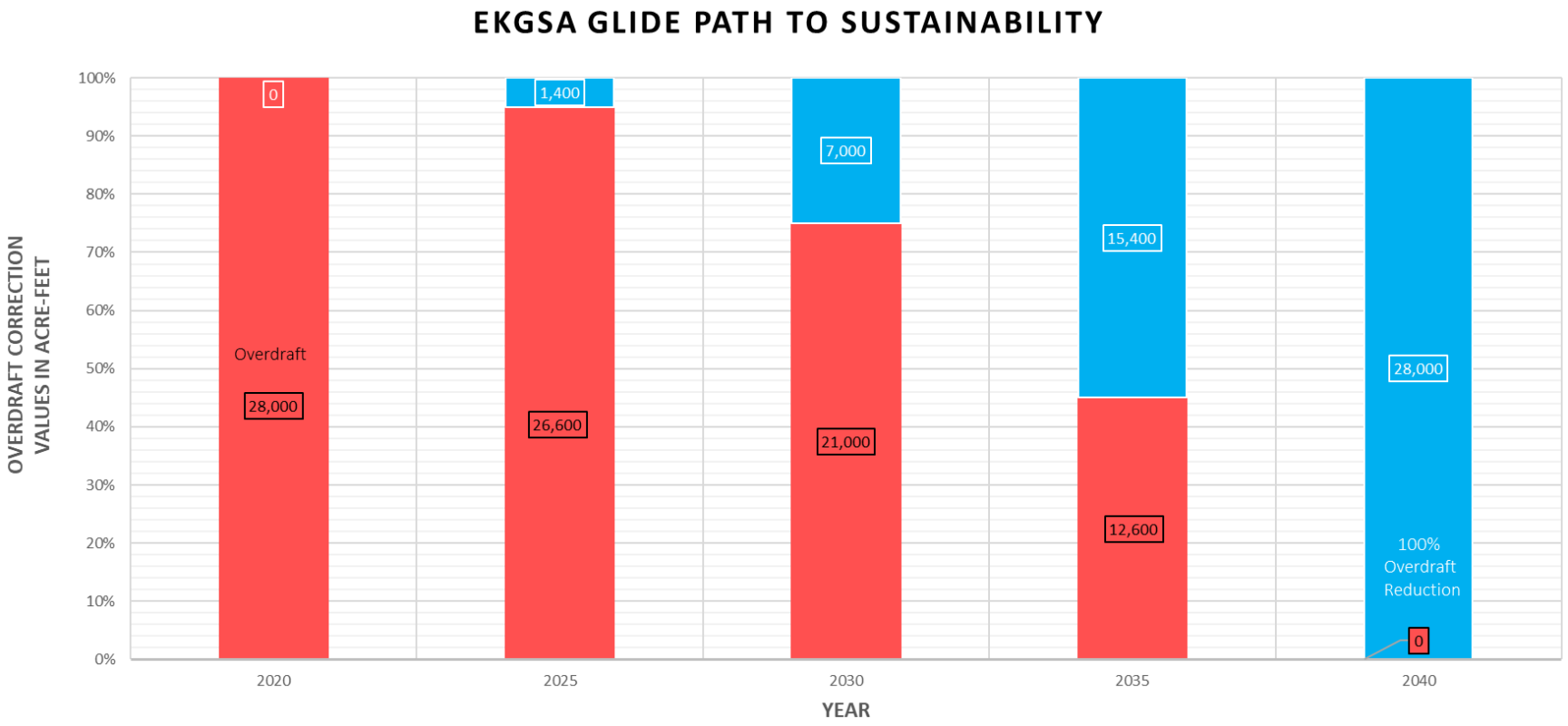

Figure 6-2 EKGSA Glide Path to Sustainability

6.4 Data Management System

The EKGSA's Data Management System (DMS) will be coordinated with all the Kaweah Subbasin GSAs. A single location for data collection, aggregation, and analysis will benefit not only the EKGSA, but all GSAs within the Kaweah Subbasin. The DMS platform, GSA management, and functionality is further defined in the Kaweah Subbasin Coordination Agreement and in **Appendix 4-B**.

6.5 Annual Reporting

Legal Requirements:
§ 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.

The EKGSA will develop and submit annual reports on April 1 of each year following the initial GSP (2020). The annual reports will follow the guidelines set forth in §356.2 of the SGMA legislation. Per the guidelines, there will be three key sections in the report as shown in the outline below.

1. *General Information*
    a. *Executive Summary for the annual report*
    b. *Location map of the region covered by the annual report*
2. *Basin Conditions*
    a. *Groundwater elevation monitoring data, including contour maps and hydrographs*
    b. *Groundwater extraction data*
    c. *Surface water supply data*
    d. *Total water use data*
    e. *Change in groundwater storage, including maps and comparison to January 1, 2015*
3. *Progress of GSP implementation.*
    a. *Progress on GSP implementation*
    b. *Progress towards achieving sustainability*

6.6 Periodic Evaluations

Legal Requirements:
§ 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.

The EKGSA will amend the GSP at least every five years as prescribed in the SGMA Legislation. Periodic evaluations will include the result of Basin operations and progress in achieving sustainability. Progress will be evaluated using current groundwater conditions, status of projects or management actions, evaluation of undesirable results relating to measurable objectives and minimum thresholds, changes in the monitoring network, summary of enforcement or legal actions, and agency coordination efforts. This is in accordance with SGMA law §356.4. Periodic Evaluation by Agency.

Certain components of the GSP may be re-evaluated more frequently than every five years, if deemed necessary. This may occur, for example, if sustainability goals are not being met, additional data is acquired, or priorities change. While the EKGSA is evaluating various components of the GSP (i.e. sustainable management criteria), the EKGSA will be seeking feedback from stakeholders through a public process utilizing adequate and appropriate materials. Decisions will be made at public board meetings and coordinated at the Subbasin level, as needed. Results from these processes and any changes will be incorporated into the GSP when it is resubmitted to DWR every five years.

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Appendix 1-A

Kaweah Subbasin Coordination Agreement

2022 FIRST AMENDED KAWEAH SUBBASIN COORDINATION AGREEMENT

GREATER KAWEAH GROUNDWATER SUSTAINABILITY AGENCY
MID-KAWEAH GROUNDWATER SUSTAINBILITY AGENCY
EAST KAWEAH GROUNDWATER SUSTAINABILITY AGENCY

Plan Manager: Eric Osterling
eosterling@greaterkaweahgsa.org

Table of Contents

Appendices:

DEFINITIONS

1. "Agency" or "GSA": refers to a groundwater sustainability agency as defined in SGMA.

2. "Agreement": refers to this Coordination Agreement, unless indicated otherwise.

3. "Annual Report": refers to the report required by California Water Code Section 10728.

4. "Basin": means the Kaweah Subbasin within the Tulare Lake Hydrologic Region, San Joaquin Valley Groundwater Basin, defined in DWR's 2016 Bulletin 118 Interim Update as Basin 5-22.11, as same may be amended from time to time.

5. "Basin setting": refers to the information about the physical setting, characteristics, and current conditions of the Basin as described by the Agency in the hydrogeologic conceptual model, the groundwater conditions, and water budget, and Management Areas (if applicable) pursuant to California Code of Regulations, title 23, Sections 354.12-354.20.

6. "Confidential Information": as discussed in Section 3.3 of this Agreement, refers to data, information, modeling, projections, estimates, plans, and other information that are not public and in which the Party has a reasonable expectation of confidentiality, regardless of whether such information is designated as "Confidential Information" at the time of its disclosure. Confidential Information also includes information which is, at the time provided, (a) disclosed as such in writing and marked as confidential (or with other similar designation) at the time of disclosure and/or (b) disclosed in any other manner and identified as confidential at the time of disclosure and is also summarized and designated as confidential in a written memorandum delivered within thirty (30) days of disclosure.

7. "DWR": refers to the California Department of Water Resources.

8. "Groundwater": means water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels.

9. "Groundwater flow": refers to the volume and direction of groundwater movement into, out of, or throughout a basin.

10. "Management Team Committee": refers to the governing body originally established in the Parties' MOU that is charged with making recommendations regarding this Agreement and other Kaweah Subbasin related compliance issues to each GSA.

11. "Measurable objectives": refers to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted GSP to achieve the sustainability goal for the Basin.

12. "Memorandum of Understanding" or "MOU": refers to the November 1, 2017 Memorandum of Understanding signed by the Parties concerning GSP-related cooperation and coordination in the Kaweah Subbasin.

13. "Minimum Thresholds": refers to a numeric value for each sustainability indicator used to define undesirable results.

14. "Plan" or "GSP": refers to a groundwater sustainability plan as defined by SGMA.

15. "Plan Manager": refers to an employee or authorized representative of the Parties appointed by the Coordination Committee to perform the role of the Plan Manager set forth in Section 1.3 of this Agreement.

16. "Principal aquifers": refers to aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems.

17. "Representative monitoring": refers to a monitoring site within a broader network of sites that typifies one or more conditions within the Basin or an area of the Basin.

18. "Sustainability indicator": refers to any of the effects caused by groundwater conditions occurring throughout the Basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x). Sustainability indicators include 1) chronic lowering of groundwater levels, 2) reduction of groundwater storage, 3) seawater intrusion [not applicable], 4) degraded groundwater quality, 5) land subsidence, and 6) depletions of interconnected surface water.

19. "Water source type": represents the source from which water is derived to meet the applied beneficial uses, including groundwater, recycled water, reused water, and surface water sources identified as Central Valley Project, local supplies, and local imported supplies.

20. "Water use sector": refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation.

21. "Water year": refers to the period from October 1 through the following September 30, inclusive, and is labeled by the ending year (e.g. the last day of Water Year 2019 is September 30, 2019).

22. "Water year type": refers to the classification provided by DWR for the San Joaquin Valley, based on unimpaired runoff. The water year type is based on a numerical index and includes five (5) classifications: Wet, Above Normal, Below Normal, Dry, and Critical.

1. INTRODUCTION

1.1. PURPOSE.

The purpose of this Agreement is to comply with SGMA's coordination agreement requirements and ensure that the multiple GSPs within the Basin are developed and implemented utilizing the same methodologies and assumptions as required under SGMA and Title 23 of the California Code of Regulations, and that the elements of the GSPs are appropriately coordinated to support sustainable management.

The Parties intend that this Agreement describe how the multiple GSPs, developed by the individual GSAs, are implemented together to satisfy the requirements of SGMA. The Parties intend this Agreement will be incorporated as part of each individual GSP developed by the Parties.

1.2. ADJUDICATION OR ALTERNATIVE PLANS IN THE BASIN. (§357.4(f).)

As of the date of this Agreement, there are no portions of the Basin that have been adjudicated or have submitted for DWR approval an alternative to a GSP pursuant to Water Code Section 10733.6.

1.3. PLAN MANAGER. (§357.4(b)(1).)

In accordance with the Title 23, California Code of Regulations Section 357.4(b)(1), the Parties hereby agree on a point of contact with DWR. The Plan Manager shall be the General Manager for the Greater Kaweah GSA. The Parties may agree to amend the appointed Plan Manager upon unanimous consent of the GSAs and written notification to DWR. The Plan Manager shall serve as the point of contact for DWR as specified in California Code of Regulations, Section 357.4, subd. (b)(1). The Plan Manager's role as the point of contact between the Management Team Committee and DWR. In this role, the Plan Manager shall, at the direction of the Management Team Committee, submit all GSPs, plan amendments, supporting information, monitoring data and other pertinent information, Annual Reports, and periodic evaluations to DWR when required. The Plan Manager may communicate other information to DWR at the request of the Management Team only. The Plan Manager has no authority to take any action or represent the Management Team Committee or a particular GSA without the specific direction and authority of the Management Team Committee or the particular GSA. The Plan Manager is obligated to disclose all communications he/she receives in his/her capacity as Plan Manager to the Management Team Committee, either in open or closed session meetings, or as otherwise appropriate.

2. BASIN SETTING

2.1. INTRODUCTION (§354.12)

The detailed basin setting for the Kaweah Subbasin, as required for GSPs prepared in accordance with Title 23, California Code of Regulations Section 354.12, is provided in Appendix 1 of this Agreement. The attached Basin Setting includes the physical setting, the Hydrogeologic Conceptual Model, groundwater conditions and water budget pursuant to Title 12, CCR Sections 354.12-354.18.

3. EXCHANGE OF DATA AND INFORMATION (§357.4(b)(2))

3.1. EXCHANGE OF INFORMATION.

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

3.2. PROCEDURE GOVERNING THE EXCHANGE OF INFORMATION.

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

Nothing in this Agreement shall be construed to prohibit any Party from voluntarily exchanging information with any other Party by any other mechanism separate from the Management Team Committee.

3.3. NON-DISCLOSURE OF CONFIDENTIAL INFORMATION.

It is understood and agreed to that, pursuant to Section 3.1 of this Agreement, a Party to this Agreement may provide one or more of the other Parties with confidential information. To ensure the protection of such confidential information and in consideration of the agreement to exchange said information, the Parties agree as follows:

3.3.1. The confidential information to be disclosed under this Agreement ("Confidential Information") includes data, information, modeling, projections, estimates, plans, and other information that are not public and in which the Party has a reasonable expectation of confidentiality, regardless of whether such information is designated as "Confidential Information" at the time of its disclosure.

3.3.2. In addition to the above, Confidential Information shall also include, and the Parties shall have a reasonable duty to protect, other confidential and/or sensitive information which is, at the time provided (a) disclosed as such in writing and marked as confidential (or with other similar designation) at the time of disclosure; and/or (b) disclosed in any other manner and identified as confidential at the time of disclosure and is also summarized and designated as confidential in a written memorandum delivered within thirty (30) days of the disclosure.

3.3.3. The Parties shall use the Confidential Information only for the purposes set forth in this Agreement.

3.3.4. The Parties shall limit disclosure of Confidential Information within its own organization to its directors, officers, partners, attorneys, consultants, members and/or employees having a need to know and shall not disclose Confidential Information to any third party (whether an individual, corporation, or other entity) without prior written consent. A Party shall satisfy its obligations under this paragraph if it takes affirmative measures to ensure compliance with these confidentiality obligations by its employees, agents, consultants and others who are permitted access to or use of the Confidential Information.

3.3.5. This Agreement imposes no obligation upon the Parties with respect to any Confidential Information that (a) was possessed before receipt; (b) is or becomes a matter of public knowledge through no fault of the receiving Party; (c) is rightfully received from a third party not owing a duty of confidentiality; (d) is disclosed without a duty of confidentiality to a third party by, or with the authorization of, the disclosing Party; or (e) is independently developed.

3.3.6. If there is a breach or threatened breach of any provision of this section, it is agreed and understood that the non-breaching Party shall have no adequate remedy in money or other damages and accordingly shall be entitled to injunctive relief; provided however, no specification in this Agreement of any particular remedy shall be construed as a waiver or prohibition of any other remedies in the event of a breach or threatened breach of any provision of this Agreement.

3.3.7. If and to the extent the information covered by this provision is requested pursuant to the California Public Records Act (PRA), the Party subject to the PRA shall coordinate with the other Parties regarding its disclosure and obtain approval from a Party prior to disclosing information that the Party has disclosed pursuant to this provision in response to the PRA. To the extent the Party responding to the PRA is sued or otherwise challenged for withholding confidential information at the request of another Party, the Party requesting the non-disclosure shall indemnify the Party subject to the PRA for any costs and fees related to litigation or other such challenge.

4. METHODOLOGIES & ASSUMPTIONS (§357.4(b)(3))

In accordance with the Title 23, California Code of Regulations Section 357.4(b)(3) and California Water Code Section 10727.6 the Parties have entered into this Agreement to ensure that the individual GSPs in the Basin utilize the same data and methodologies for the following assumptions: 1) groundwater elevation data, 2) groundwater extraction data; 3) surface water supply; 4) total water use; 5) change in groundwater storage; 6) water budget; and 7) sustainable yield, and that such methodologies and assumptions will continue to be used in the future development and implementation of such GSPs.

The methodologies and assumptions were developed based on existing data/information, best management practices, and/or best modeled or projected data available.

Information regarding the agreed upon methodologies and assumptions, is attached as Appendix 1 to this Agreement.

5. MONITORING NETWORK (§§354.32-354.40)

5.1. The Parties developed a monitoring network and monitoring network objectives for the Basin in accordance with California Code of Regulations, Title 23, Sections 354.32 – 354.40. Each network facilitates the collection of data in order to characterize groundwater and related surface water conditions in the Basin and evaluate changing conditions that occur from implementation of the individual GSPs. The individual GSPs include monitoring objectives, protocols, and data reporting requirements as necessary under SGMA and SGMA Regulations.

5.2. The monitoring network(s) demonstrate short-term, seasonal, and long-term trends in groundwater and related surface water conditions. Each Party's GSP will include the monitoring network objectives for the Basin, including an explanation of how the network develops and implements to monitor groundwater and related surface water conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the effectiveness of GSP implementation. The monitoring network(s) accomplish the following: a) demonstrate progress toward achieving measurable objectives described in the GSPs; b) monitor impacts to the beneficial uses or users of groundwater; c) monitor changes in groundwater conditions relative to applicable measurable objectives and minimum thresholds; and d) assist with quantifying annual changes in water budget components.

5.3. The Parties hereby agree, consistent with Section 3 of this Agreement, to share information necessary to create a Basin map displaying the location and type of each monitoring site within the Basin, and a report in tabular format, including information regarding the monitoring site type, frequency of measurement, and purpose for which the monitoring site is being used.

5.4. Information regarding the agreed upon monitoring networks, which is subject to future review and modification, is attached as Appendix 2 to this Agreement.

6. COORDINATED WATER BUDGET (§357.4(b)(3)(B))

6.1 In accordance with the California Code of Regulations, Title 23, Section 357.4 (b)(3)(B), the Parties have prepared a coordinated water budget for the Basin as described herein and required by California Code of Regulations, Title 23, Section 354.18. The water budget provides an accounting and assessment of the total 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. Said water budget is included as part of Appendix 1 to this Agreement.

6.2 All aspects of the coordinated water budget as described herein are addressed in the Basin Setting. In addition, the current water budget for the period 1997-2017 has been apportioned under a water accounting framework among each of the Parties as set forth in Appendix 3 to this Agreement. This water budget is preliminary and based on best available data. Further discussions among the Parties must occur after adoption of GSPs concerning mutual responsibilities in achieving the Subbasin's Sustainable Yield by 2040, or as may be otherwise extended by DWR per Water Code §10727.2 (b) (3) once further data is obtained. The Parties acknowledge that significant data gaps exist within the existing Basin Setting as further described in Section 9 below. The Parties explicitly acknowledge to use good faith efforts to obtain data necessary and to reevaluate the water budget as needed. The Parties agree to use scientifically approved methods of data collection of such data relative to the development or understanding of groundwater extractions, groundwater inflow, and groundwater storage/levels.

6.3 With improved data collection and basin understanding, the water budget will be modified to reflect the updated understanding. The Subbasin GSAs will meet at least annually to review Subbasin data relative to the water budget. Revisions to the water budget will occur no less than every two years. Attached hereto and incorporated by reference is Appendix 3, the Water Accounting Framework.

7. SUSTAINABLE YIELD AND UNDESRIABLE RESULTS (§357.4(b)(3)(C)

In accordance with Title 23, California Code of Regulations Section 357.4(b)(3)(C), the Parties hereby agree to a sustainable yield for the basin, which is supported by a description of the undesirable results for the basin, and an explanation of how the minimum thresholds and measurable objectives defined by each Plan relate to those undesirable results, based on information described in the basin setting as described in Appendix 1 attached hereto and incorporated by reference. The sustainable yield is further defined in Appendix 3. The causes and criteria to define undesirable results with respect to the local beneficial uses and users is described in Appendix 6.

8. COORDINATED DATA MANAGEMENT SYSTEM (§357.4(e))

In accordance with the Title 23, California Code of Regulations Section 357.4(e), the Parties hereby describe a coordinated data management system for the Basin. As required by SGMA and accompanying Regulations, the Parties will coordinate to maintain a data management system that is capable of storing and reporting information relevant to the development and/or implementation of the GSPs and monitoring network of the Basin.

Information regarding the agreed upon coordinated data management system, which is subject to future review and modification, shall be attached as Appendix 4 to this Agreement.

9. IDENTIFICATION OF DATA GAPS (§354.38)

The Parties will periodically evaluate the monitoring network in Appendix 2 to determine if there are data gaps that could affect the ability of the Subbasin to meet the sustainability goal of the subbasin. Current data gaps are identified in Appendix 5. At minimum, every five years, the Parties will provide an evaluation of data gaps in the five-year assessment, including steps to be taken to address data gaps before the next five-year assessment. The Parties agree to use good faith efforts to obtain data needed to fill all data gaps and to reevaluate both this Coordination Agreement and the GSPs as necessary once data gaps have been filled.

10. ADOPTION AND USE OF THE COORDINATION AGREEMENT

10.1. COOPERATIVE IMPLEMENTATION OF GSPS. (§357.4(C))

In accordance with the Title 23, California Code of Regulations Section 357.4(c), the Parties hereby explain how the Plans implemented together, satisfy the requirements of the Act and are in substantial compliance with SGMA and SGMA regulations. Each Party will ensure their GSP complies with the statutory requirements of SGMA. The Parties to this Agreement intend that their individual GSPs will be implemented together in order to satisfy the requirements of SGMA. In a coordinated manner, the collective GSPs have satisfied the requirements of Sections 10727.2 and 10727.4 of the California Water Code by providing a description of the physical setting and characteristics of the separate aquifer systems within the Basin, the methodologies and assumptions specified in Water Code Section 10727.6, both as referenced in Section 2.1 herein. They have further developed a common sustainability goal and description of the Subbasin's undesirable results, both as set forth in Appendix 6. The Parties' minimum thresholds, measurable objectives, and monitoring protocols together provide a description of how the Subbasin will be sustainably managed during the GSP implementation phase. Furthermore, the Parties have developed a coordinated water budget and monitoring network, in addition to their individual GSPs, which, when implemented together, suffice to

provide the mandated data and fulfill the requirements set out in SGMA and its accompanying regulations.

The Parties have developed and calibrated a Subbasin numerical groundwater and surface water model that has been applied to simulate the operation of their combined projects and management actions and thereby demonstrate how their GSPs conform to measurable objectives and achieve sustainable yield by 2040. A description of the relevant model simulations and results are as described in Appendix 7 to this Agreement. Through the five-year GSP assessment process and continued dialogue with neighboring subbasins as to their role in influencing the changes in storage within the Kaweah Subbasin, residual storage reductions remaining from the modeling scenarios analyzed thus far will be addressed with implementation of additional projects and/or accelerated implementation of management actions designed to reduce groundwater extractions.

10.2. GSP AND COORDINATION AGREEMENT SUBMISSION (§357.4(D).)

In accordance with the Title 23, California Code of Regulations Section 357.4(d), the Parties hereby agree to the following process for submitting all Plans, Plan amendments, supporting information, all monitoring data and other pertinent information, along with annual reports and periodic evaluations. The Parties agree to submit their respective GSPs to DWR through the Management Team Committee and Plan Manager in accordance with SGMA and its accompanying regulations. The Plan Manager will be responsible for submittal of GSPs to DWR in accordance with California Water Code Section 10733.4, subdivision (b)(1)-(c). However, prior to this submittal, the Management Team Committee shall vote to approve submittal. The approval shall consist of the review of the multiple GSPs in the Subbasin by the Management Team Committee for coordination and consistency. If the Management Team Committee identifies incomplete coordination or inconsistencies that amount to a concern regarding compliance with sections of SGMA, the Management Team Committee will work with the Parties to resolve these issues prior to submittal. Parties intend that this Agreement suffice to fulfill the requirements of providing an explanation of how the GSPs implemented together satisfy Water Code Sections 10727.2, 10727.4 and 10727.6 for the entire Basin.

11. KAWEAH SUBBASIN ORGANIZATIONAL STRUCTURE AND OTHER MISCELLANEOUS PROVISIONS

11.1. GOVERNANCE. (§357.4(b)(2))

In accordance with the Title 23, California Code of Regulations Section 357.4(b)(2), the Parties hereby agree on the following responsibilities for meeting the terms of the agreement and the procedures for resolving conflicts.

11.1.1. Management Team Committee.

The Parties intend for the Management Team Committee as previously established in the Parties' MOU agreed upon until the effective date of this Coordination

Agreement. The Management Team Committee will consist of three (3) representatives appointed by each Party to this Agreement.

- Compensation. Each Management Team Committee member's compensation for service on the Management Team Committee, if any, is the responsibility of the appointing Party.

- Term. Each Management Team Committee member shall serve at the pleasure of the appointing Party and may be removed from the Management Team Committee by the appointing Party at any time.

- Meetings. The Management Team Committee will meet at least monthly, or more frequently as needed, to carry out the activities described in this Agreement. The Management Team Committee will prepare and maintain minutes of its meetings.

11.1.2. Quorum for Management Team Committee Meetings.

In order to take action at a meeting of the Management Team Committee, a majority of the Management Team Committee members must be present at the meeting, with at least one representative from each Party.

11.1.3. Compliance with Open Meetings Laws.

The Management Team Committee shall meet on a regular basis for the purposes described in this Agreement. The Management Team Committee shall comply with the Ralph M. Brown Act (Government Code Section 54950 et seq.) as applicable and shall post agendas as required.

11.1.4. Management Team Committee Officers.

The Management Team Committee may, from time to time, select from amongst its members a Chairman, who shall act as presiding officer, a Vice Chairman, to serve in the absence of the Chairman, and any other officers as determined by the Management Team Committee. There also shall be selected a Secretary, who may, but not need be, a member of the Management Team Committee. All officers shall remain in office for two years, unless removed pursuant to a majority vote of the Management Team Committee.

11.1.5. Management Team Committee Meeting Voting Provisions.

Each GSA will be entitled to one (1) vote on the Management Team Committee. The process for declaring such vote must be determined by each respective GSA. Recommendations from the Management Team Committee shall be made to the Parties' respective GSAs only upon the unanimous vote of the Management Team Committee. Should unanimity not be reached, the votes shall be reported to each GSA's Board of Directors for further direction.

11.1.6. Adoption of Management Team Committee Recommendations.

Recommendations approved by unanimous consent of the Management Team Committee shall be reported to each GSA Board, with the process and manner for GSA approval left to the discretion of each GSA. If a GSA fails to approve a recommendation of the Management Team Committee, the Management Team Committee shall reconvene and endeavor to develop an alternative recommendation that may resolve any issues which resulted in the failure to approve. If the Management Team Committee is unable to develop an alternative recommendation, or if a GSA fails to approve the Management Committee's alternative recommendation, the Parties shall evaluate whether to enter into the dispute resolution process outlined in Section 11.3 of this Agreement.

11.1.7. Failure of Management Team Committee to Reach Consensus.

The Parties acknowledge that at all times consensus may not be reached amongst the Management Team Committee. All matters in which consensus of the Management Team Committee cannot be reached shall be reported to the GSA Boards of Directors. The Management Team Committee shall reconvene after the unresolved issue has been reported to the GSA Boards of Directors. If the Management Team Committee is still unable to reach consensus, the Parties shall evaluate whether to enter into the dispute resolution process outlined in Section 11.3 of this Agreement.

11.2. RESPONSIBILITIES OF THE PARTIES.

The Parties to this Agreement agree to work collaboratively to comply with SGMA and this Agreement. Each Party to this Agreement is a GSA and acknowledges it is bound by the terms of the Agreement. This Agreement does not otherwise affect each Party's responsibility to implement the terms of their respective GSP. Rather, this Agreement is the mechanism through which the Parties will coordinate portions of the multiple GSPs to ensure such GSP coordination complies with SGMA.

11.3. DISPUTE RESOLUTION.

Any GSA may choose to initiate the following dispute resolution process by serving written notice to the remaining GSAs of the following: (1) identification of the conflict; (2) description of how the conflict may negatively impact the sustainability of the Kaweah Subbasin; and (3) a proposal for one or more resolutions. The Parties agree to designate representatives to meet and confer with each other within thirty (30) days of the date such notice is given and said representatives shall then meet within a reasonable time to address all issues identified in the notice. Should the representatives be unable to reach a resolution within ninety (90) days of the written notice, the Parties shall enter informal mediation in front of a mutually agreeable mediator.

11.4. MODIFICATION.

The Parties hereby agree that this Agreement shall be reviewed as part of each five-year assessment and may be supplemented, amended, or modified only by the mutual agreement of all the Parties. No supplement, amendment, or modification of this Agreement shall be binding unless it is in writing and signed by all Parties.

11.5. WITHDRAWAL, TERMINATION, ADDING PARTIES.

11.5.1. A Party may withdraw from this Agreement without causing or requiring termination of this Agreement effective upon six months' notice to the Management Team Committee. Any Party who withdraws shall remain obligated to pay its share of all debts, liabilities, and obligations the Party incurred, accrued, or approved pursuant to this Agreement prior to the effective date of such withdrawal.

11.5.2. A new Party may be added to this Agreement if such entity is an exclusive GSA that has developed and will implement its own separate and complete GSP.

11.5.3. This Agreement may be rescinded by unanimous written consent of all the Parties. Nothing in this Agreement shall prevent the Parties from entering into another coordination agreement.

11.6. MISCELLANEOUS.

11.6.1. Severability.

If any provision of this Agreement is for any reason held to be invalid, unenforceable, or contrary to any public policy, law, statute and/or ordinance, then the remainder of this Agreement shall not be affected thereby and shall remain valid and fully enforceable.

11.6.2. Third Party Beneficiaries.

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

11.6.3. Construction and Interpretation.

This Agreement was finalized through negotiations of the Parties. Each Party has had a full and fair opportunity to review and revise the terms herein. As a result, the normal rules of construction that any ambiguities are to be interpreted against the drafting Party shall not apply in the construction or interpretation of this Agreement.

11.6.4. Good Faith.

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

11.6.5. Execution.

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

11.6.6. Notices.

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

11.6.7. No Admission or Waiver

Nothing in this Coordination Agreement is intended to modify the water rights of any Party or of any Person (as that term is defined under Section 19 of the Water Code). Nothing in this Coordination Agreement shall be construed as an admission by any Party regarding any subject matter of this Coordination Agreement, including without limitation any water right or priority of any water right that is claimed by a Party or any Person. Nor shall this Coordination Agreement in any way be construed to represent an admission by a Party with respect to the subject or sufficiency of another Party's claim to any water or water right or priority or defenses thereto, or to establish a standard for the purposes of the determining the respective liability of any Party or Person, except to the extent otherwise specified by law. Nothing in this Coordination Agreement shall be construed as a waiver by any Party of its election to at any time assert a legal claim or argument as to water, water right or any subject matter of this Coordination Agreement or defenses thereto. The Parties hereby agree that this Coordination Agreement, to the fullest extent permitted by law, preserves the water rights of each of the Parties as they may exist as of the effective date of this Coordination Agreement or at any time thereafter. Any dispute or claim arising out of or in any way related to a water right alleged by a Party may be separately resolved before the appropriate judicial, administrative or enforcement body with proper jurisdiction and is specifically excluded from the dispute resolution procedures set forth under this Coordination Agreement.

IN WITNESS WHEREOF, the Parties have entered into this Agreement as of the date executed below:

GREATER KAWEAH GROUNDWATER SUSTANABILITY AGENCY

By: _____

Date: 7-22-2022

MID KAWEAH GROUNDWATER SUSTAINABILITY AGENCY

By: _____

Date: 7/21/22

EAST KAWEAH GROUNDWATER SUSTAINABILITY AGENCY

By: _____

Date: 7/25/22

Appendices

Coordination Agreement

Kaweah Subbasin

Appendix 1
Basin Setting Report

Included separately due to file size

Appendix 2
Monitoring Network Summary

Appendix 2

Monitoring Network Summary

This appendix provides a summary of the monitoring networks for the management of groundwater resources within the Kaweah Subbasin in Tulare and Kings Counties. Groundwater management will be conducted by the Eastern Kaweah Groundwater Sustainability Agency (GSA), Greater Kaweah GSA, and the Mid-Kaweah GSA according to their respective groundwater sustainability plans (GSPs). Specific details of the monitoring networks can be found in the respective GSPs. This appendix will be revised periodically to reflect the expansion of the networks as data gaps are filled by ongoing management efforts.

The monitoring networks are focused on three of the six sustainability indicators, including Groundwater Levels, Water Quality, and Subsidence. Groundwater Storage will be addressed by Groundwater Levels by proxy. Seawater Intrusion is not applicable to the Kaweah Subbasin since the Pacific Ocean is located more than 80 miles to the west, beyond the Coast Mountains. Interconnected Surface Water has not been identified as applicable at this time in Mid-Kaweah and will be addressed by proxy via Groundwater Levels in the Eastern Kaweah GSA.

Groundwater Levels

Figure A-2-1 illustrates the location of monitoring wells that will be used for semi-annual measurements of groundwater levels and estimates of groundwater storage. Selected wells may be monitoring monthly within the MKGSA by the Cities of Tulare and Visalia. The three GSAs will utilize a total of 126 wells, as summarized below.

Purpose / GSA:	Greater Kaweah	Mid-Kaweah	Eastern Kaweah
Groundwater Levels	40	43	43

Groundwater Quality

Figure A-2-2 illustrates the location of wells that will be used for monitoring groundwater quality. The three GSAs will utilize a total of 285 wells, as summarized below. Most of these wells will be public supply wells which are sampled according to the requirements of the California Division of Drinking Water. Primary constituents of concern (COCs) as listed below.

Metal	Anion	Organic Compound
Arsenic	Nitrate	DBCP (1,2-dibromo-3-chloropropane)
Chromium-VI	Perchlorate	TCP (1,2,3-trichloropropane)
Sodium	Chloride	PCE (perchloroethylene/tetrachloroethylene)
Total Dissolved Solids (TDS)		

The data management system will accumulate all available data from the various sources of data but will focus on the primary COCs and their respective measurable objective and minimum threshold. Data sources include the Groundwater Ambient Monitoring and Assessment Program (GAMMA), Irrigated Lands Regulatory Program (ILRP), Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS), and other programs as the data become available.

Purpose / GSA:	Greater Kaweah	Mid-Kaweah	Eastern Kaweah
Groundwater Quality	60	110	70

Subsidence

Figure A-2-3 illustrates the location of stations that will be used for monitoring subsidence. The three GSAs will utilize a total of 32 stations, as summarized below.

Purpose / GSA:	Greater Kaweah	Mid-Kaweah	Eastern Kaweah
Subsidence	14	8	10

Figure A-2-1. Location Map for Monitoring Wells for Groundwater Levels

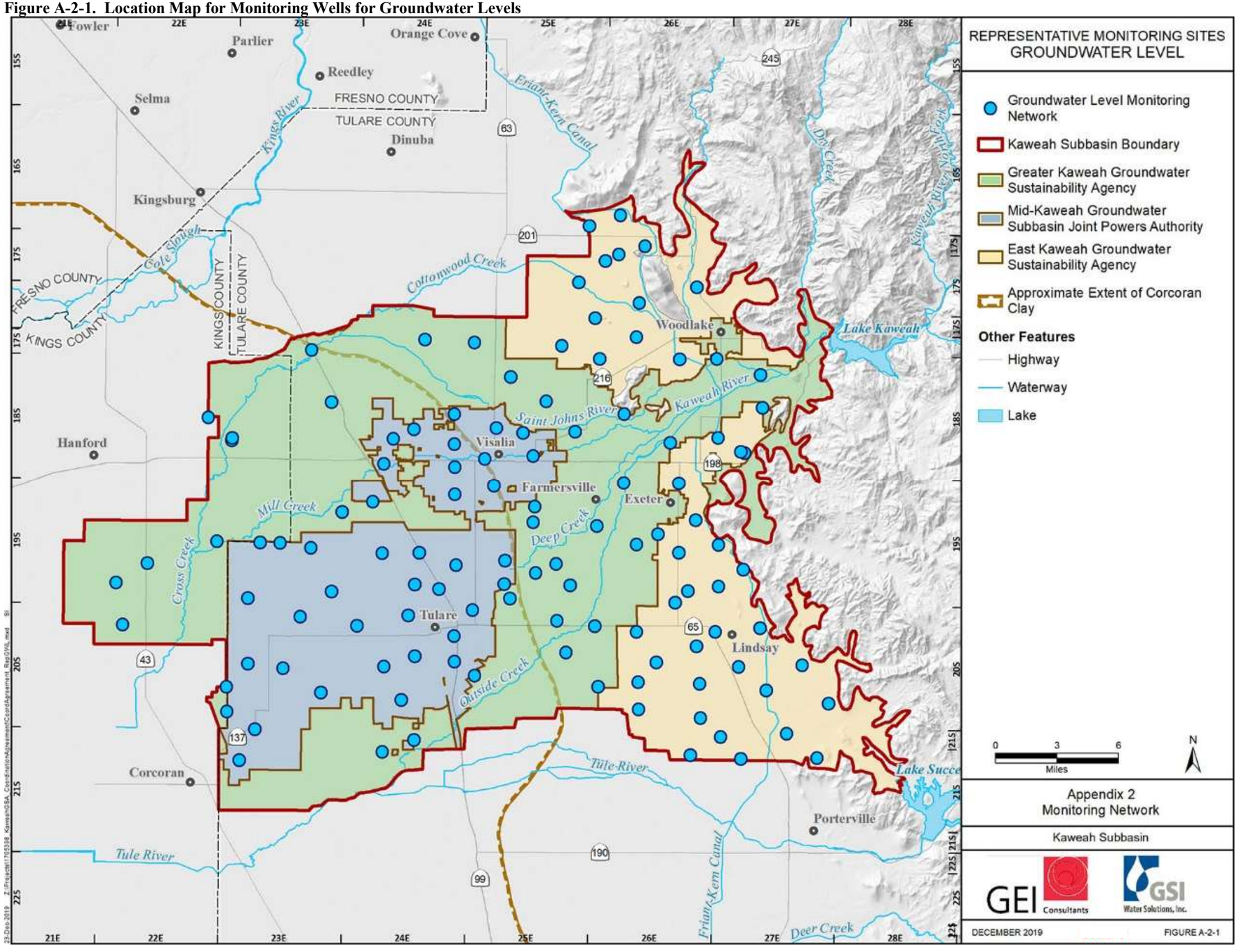


Figure A-2-2. Location Map for Supply Wells for Groundwater Quality Monitoring

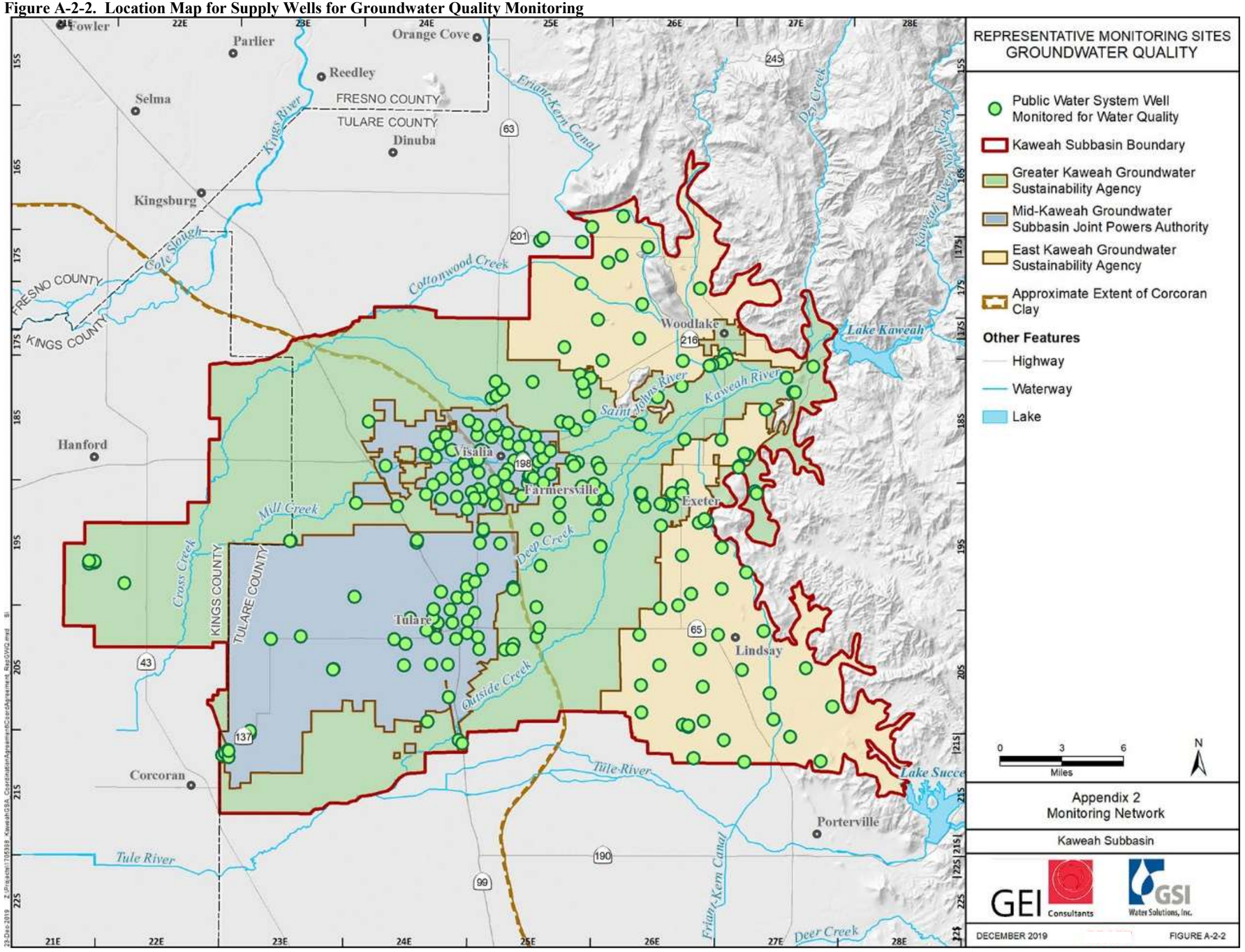
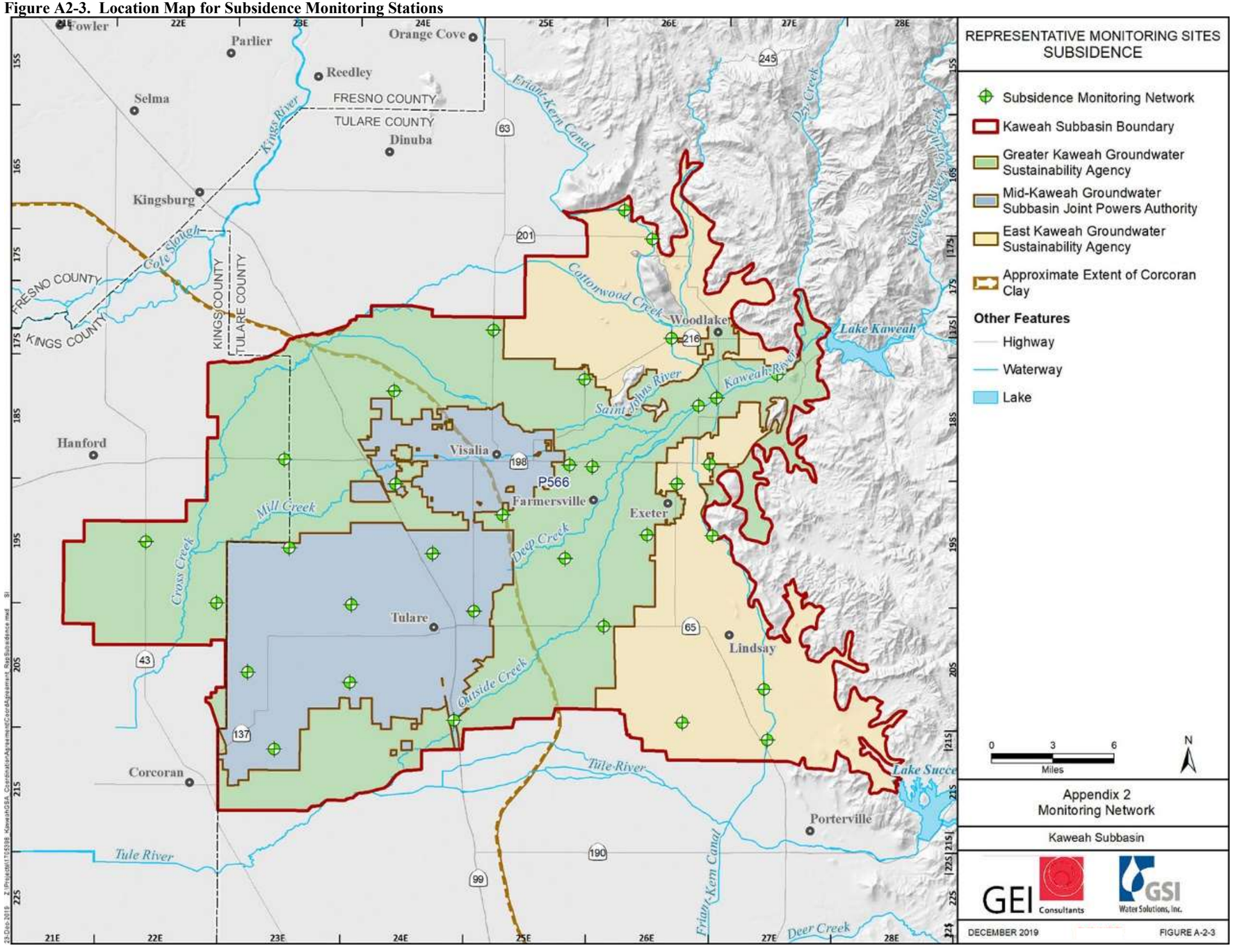


Figure A2-3. Location Map for Subsidence Monitoring Stations



Appendix 3
Water Accounting Framework Summary

Water Accounting Framework

Appendix 3 to Kaweah Subbasin Coordination Agreement

For purposes of creating a water budget pursuant to 23 Cal. Code Regs. §354.18, the GSAs in the Kaweah Subbasin have agreed that the Sustainable Yield for the Subbasin shall be divided amongst the GSAs for purposes of development of their GSPs as described in the Kaweah Subbasin water budget. The water budget is not an allocation of final determination of any water rights. This understanding is consistent with § 10720.5(b) of SGMA, which provides that nothing in SGMA or in a plan adopted under SGMA determines or alters surface or groundwater rights under common law or any provision of law that determines or grants surface water rights.

The Subbasin GSAs have discussed water budgets and have developed a means to account for various components of the water budget. These discussions accounting also included recognition of water storage and conveyance infrastructure within the Subbasin as owned/operated by various water management entities within each GSA.

These discussions culminated in an agreed-to methodology to assign groundwater inflow components to each GSA consistent with categories that recognize a native, foreign and salvaged portion of all such components. In general, this methodology defines the native portion of groundwater inflows to consist of those inflows which all well owners have access to on a pro-rata basis; the foreign portion to consist of all imported water entering the Subbasin from non-local sources under contract by local agencies or by purchase/exchange arrangements; and the salvaged portion to consist of all local surface and groundwater supplies stored, treated and otherwise managed by an appropriator/owner of the supply and associated water infrastructure systems (e.g. storm water disposal systems and waste water treatment plants).

The methodology and apportionment of groundwater inflow components is as shown in Table 3.1:

Table 3.1

Components of Groundwater Inflow

Native

- Percolation from rainfall
- Streambed percolation (natural channels) from Kaweah River watershed sources
- Agricultural land irrigation returns from pumped groundwater
- Mountain front recharge

Foreign

- Streambed percolation from imported sources
- Basin recharge from imported sources
- Ditch percolation from imported sources
- Agricultural land irrigation returns from imported sources

Salvaged

- Ditch percolation from previously appropriated Kaweah River sources
- Additional ditch/field recharge from over-irrigation
- Captured storm water returns
- Wastewater treatment plant returns
- Basin percolation from previously stored Kaweah River sources
- Agricultural land irrigation returns from Kaweah River watershed sources

*Except for mountain front recharge, sub-surface inflows in and out of the Subbasin are excluded from this accounting methodology and no ownership claims are asserted nor disavowed per this methodology.

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Applying the accounting methodology in Table 6.1 to each GSA and their member entities that hold appropriative and contract water rights and/or salvaged water infrastructure systems results in the following quantification to each GSA, shown in Table 3.2:

Table 3.2
(values in acre-feet)

	Native Water			
	East	**Greater**	**Mid**	**Total**
Perc of Precip (Ag and 'Native' non-Ag land)	23,666	44,213	20,974	**88,854**
Streambed Perc from Kaweah River Sources	16,767	31,324	14,860	**62,952**
Irrigation Ret. Flow from Pumped GW	41,484	77,501	36,766	**155,752**
Mountain Front Recharge	14,976	27,978	13,273	**56,227**
Total Native	**96,894**	**181,017**	**85,874**	**363,784**
GSA % of Total Native	**27%**	**50%**	**24%**	

	Foreign Water			
	East	**Greater**	**Mid**	**Total**
Streambed Perc from Imported Sources	0	11,730	2,523	**14,253**
Ditch Perc from Imported Sources	0	1,204	21,745	**22,949**
Basin Perc from Imported Sources	0	1,050	14,305	**15,355**
Irrigation Ret. Flow from Imported Sources	12,073	1,241	7,140	**20,453**
Total Foreign	**12,073**	**15,225**	**45,713**	**73,010**
GSA % of Total Foreign	**17%**	**21%**	**63%**	

	Salvaged Water			
	East	**Greater**	**Mid**	**Total**
Ditch Perc from Kaw River Sources	8,835	49,771	34,880	**93,486**
Additional Recharge	226	6,892	5,697	**12,815**
Stormwater Return Flows	508	2,370	8,491	**11,368**
WWTP Return Flows	1,470	3,129	13,878	**18,477**
Basin Perc from Kaweah River Sources	0	16,005	23,479	**39,484**
Irrig. Ret. Flow from Kaweah River Sources	4,555	31,039	11,981	**47,574**
Total Salvaged	**15,593**	**109,205**	**98,406**	**223,205**
GSA % of Total Salvaged	**7%**	**49%**	**44%**	

	East	**Greater**	**Mid**	**Total(*)**
Grand Total	**124,560**	**305,447**	**229,992**	**659,999**
GSA % of Total	**19%**	**46%**	**35%**	

(*) Excludes net sub-surface inflow of 60 taf/yr

Note: All data is derived from the Basin Setting and is based on water budget for the period Water Year 1997 to 2017 for the Kaweah Subbasin.

As noted in Table 3.2, net sub-surface inflow is omitted from this quantification. Sub-surface inflows and outflows are discussed and quantified in the Basin Setting report (Appendix 1) and are embodied in scenarios of future groundwater conditions as simulated by application of

the Subbasin computer model. As discussed in that report, the Subbasin's safe yield is estimated to be about 720,000 AF, which amount includes net sub-surface inflow. As defined in SGMA however, the Subbasin's sustainable yield may be additionally impacted when considering undesirable results for other sustainability indicators. The Parties therefore have preliminarily determined that the sustainable yield may be something less and have agreed that the total groundwater inflow of 660,000 AF identified in Table 3.2 will constitute the sustainable yield, which amount does not take into consideration net sub-surface inflow from adjacent subbasins. The estimated sustainable yield will continue to be revised pursuant to the monitoring of sustainability indicators and avoidance of undesirable results.

At this stage, inter-basin discussions concerning water budgets and associated credits for such sub-surface flows are not to the point of delineating Subbasin assignments thereof. The quantification as described serves primarily to shape future discussions among the Kaweah Subbasin GSAs concerning mutual responsibilities in achieving sustainability by 2040.

As additional data becomes available and water budget components are refined, the Subbasin water budget and estimates of sustainable yield will be periodically reevaluated, no less frequently than two years. Likewise, the individual GSA water balances will also be reviewed as this reevaluation occurs at the Subbasin level.

Appendix 4
DMS Summary

Appendix 4 -**DMS Summary**

Memo

To: Kaweah Subbasin GSAs
Mike Hagman, East Kaweah GSA
Eric Osterling, Greater Kaweah GSA
Paul Hendrix, Mid-Kaweah GSA

From: Chris Petersen and Maria Pascoal, GEI Consultants

Date: [Status]

Re: Draft Specifications for the Kaweah Subbasin Data Management System

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The Sustainable Groundwater Management Act (SGMA) regulations, established by the California Department of Water Resources (DWR), require that a Groundwater Sustainability Plan (GSP) must have a Data Management System (DMS) capable of securely storing and displaying information relevant to the development and implementation of the GSP. The Kaweah Subbasin will be managed by three Groundwater Sustainability Agencies (GSAs) under three GSPs. To effectively and cost-efficiently share data, the GSAs will use one DMS to store the Subbasin's SGMA data.

The DMS for the Kaweah Subbasin is currently being developed by GEI Consultants, Inc. (GEI) with data and analytical support from GSI Water Solutions (GSI). The purpose of this memorandum is to describe the specifications of the DMS. These specifications were developed based on the DMS development meeting held with the three GSAs in April 2018 and supported by Task Order KSB-05.2018 Amendment 2, Task 1 – Data Management System. This memorandum includes the following sections:

1. SGMA DMS Requirements
2. Data Structure
3. Data Contents
4. Web Interface
5. DMS Hosting
6. Summary

SGMA DMS Requirements

The Kaweah Subbasin DMS will be designed to meet the system and data requirements of SGMA.

1.1. System Requirements

The GSP Regulations (California Code of Regulations, Title 23, Division 2, Chapter 1.5, Subchapter 2) give broad requirements on data management, stating that a GSP must adhere to the following guidelines for a DMS:

> ***§ 352.6. Data Management System***
>
> *Each Agency shall develop and maintain a data management system that is capable of storing and reporting information relevant to the development or implementation of the [Groundwater Sustainability] Plan and monitoring of the basin.*
>
> *Note: Authority cited: Section 10733.2, Water Code.*
> *Reference: Sections 10727.2, 10728, 10728.2, and 10733.2, Water Code.*
>
> ***§ 352.4. Data and Reporting Standards***
>
> *(c) The following standards apply to wells:*
>
> *(3) Well information used to develop the basin setting shall be maintained in the Agency's data management system.*
>
> *Note: Authority cited: Section 10733.2, Water Code.*
> *Reference: Sections 10727.2, 10727.6, and 10733.2, Water Code.*
>
> ***§ 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.*
>
> *Note: Authority cited: Section 10733.2, Water Code.*
> *Reference: Sections 10728, 10728.2, 10733.2, and 10733.8, Water Code.*

1.2. Data Requirements

SGMA defines sustainable groundwater management as "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results."[1] Furthermore, SGMA outlines six undesirable results as follows:[2]

> *One or more of the following effects caused by groundwater conditions occurring throughout the basin:*
>
> *(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic*

[1] §10721(v)
[2] §10721(x)

lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

(2) Significant and unreasonable reduction of groundwater storage.

(3) Significant and unreasonable seawater intrusion.

(4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

(5) Significant and unreasonable land subsidence that substantially interferes with surface land uses.

(6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

The presence or absence of the six undesirable results in a groundwater basin is determined by examining the sustainability indicator data for each. The Kaweah Subbasin DMS will store data relevant to each sustainability indicator as appropriate. There are multiple metrics by which the sustainability indicators may be observed. These metrics, as defined in the GSP Regulations and described by DWR in the Sustainable Management Criteria Best Management Practice (BMP) document,[3] are shown in **Figure 1**.

Figure 1. DWR's Sustainability Indicator Metrics

Sustainability Indicators	Lowering GW Levels	Reduction of Storage	Seawater Intrusion	Degraded Quality	Land Subsidence	Surface Water Depletion
Metric(s) Defined in GSP Regulations	• Groundwater Elevation	• Total Volume	• Chloride concentration isocontour	• Migration of Plumes • Number of supply wells • Volume • Location of isocontour	• Rate and Extent of Land Subsidence	• Volume or rate of surface water depletion

[3] https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Sustainable_Management_Criteria_2017-11-06.pdf.

The Kaweah Subbasin DMS is designed to store data for each of the six sustainability indicators. Each sustainability indicator may track one or more types of data, as shown in **Table 1**.

Table 1. DMS Data Types to Monitor the SGMA Sustainability Indicators

Sustainability Indicator	Tracking Data							
					Water Quality			
	Water Level	Extensometer	GPS	InSAR	Chloride	±10 constituents	Stream stages	Well* and/or Site Data
Subsidence	✓	✓	✓	✓				✓
Water levels	✓							✓
Groundwater storage	✓							✓
Seawater intrusion	Not applicable (per GSP development)							
Surface water/ groundwater interaction	✓						✓	✓
Water quality	✓				✓	✓		✓

*May include aquifer, construction, lithology, and/or screen data

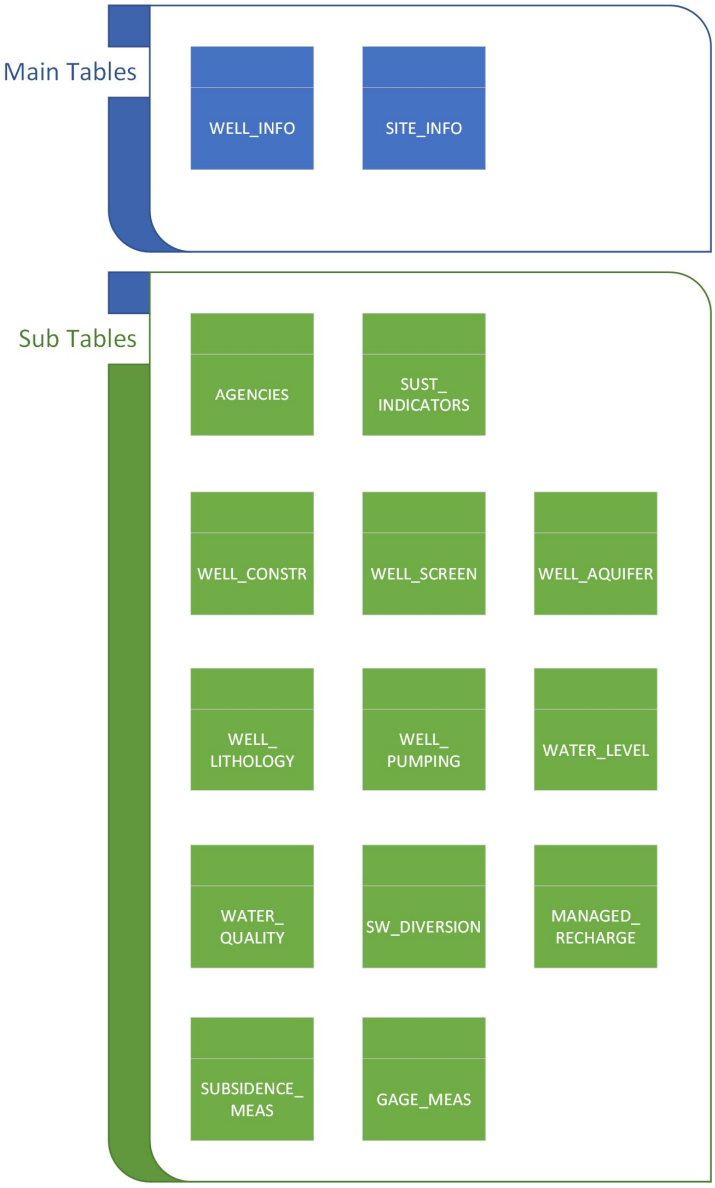
The Kaweah Subbasin DMS will accept the types of data shown in the columns of **Table 1**. However, the DMS will not necessarily be populated with historical data for each type. Data that was relied upon for 2020 GSP development is what will be uploaded in the DMS.

Data Structure

The DMS will consist of a database plus an online web viewer. Data stored in the DMS is separated by categories into tables. The tables contain columns and rows of data. Each field holds a specific type of data, such as a number, text, or date. The primary DMS data tables are shown as **Figure 2**. The figure is color-coordinated to show the relationship between tables:

- **Blue Tables** – Main tables that include point data with a unique identification and unique point location to be added to the database (e.g., Well_Info and Site_Info)
- **Green Tables** – Sub tables related to the main table that hold additional details about the well or site (e.g., correlation of a well point with water level or water quality)

Figure 2. Kaweah Subbasin DMS Tables – Main and Sub



A brief description of each main and sub table is provided in **Table 2**. There are lookup tables within each of the main and sub tables, but the lookup tables are very detailed and not outlined here. The lookup tables can be found in the upload templates described in the next section of this document.

Table 2. DMS Table Descriptions

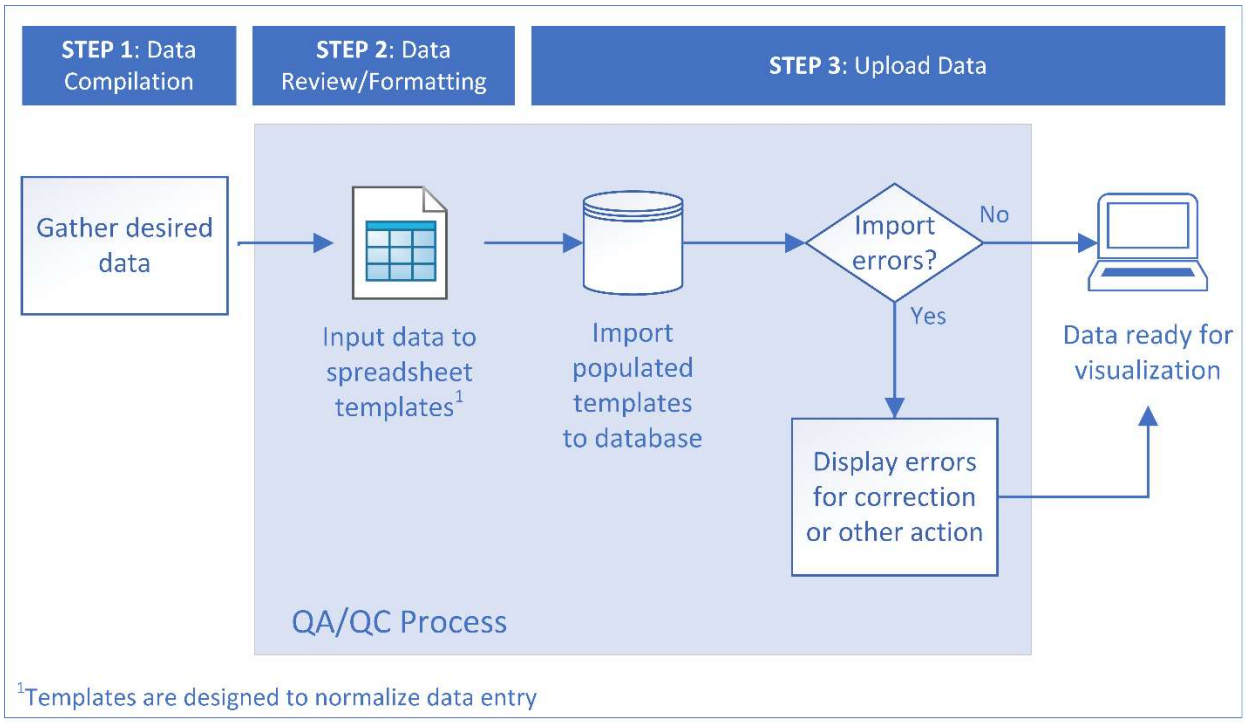
Table	Description
Main Tables	
Site Info	Information about type of station (well, recharge site, diversion, gage, extensometer, GSP) and geographic location
Well Info	General information about well, including identifiers used by various agencies
Sub Tables	
Agencies	Agency associated with the well and/or site or the collection of data at a well or site
Sustainability Indicators	Minimum Thresholds and Measurable Objectives set for monitoring network sites tracking Sustainable Management Criteria for SGMA compliance
Well Construction	Well construction information including depth, diameter, etc.
Well Construction Screen	Supplements 'Well Construction' with well screen information (one well can have many screens)
Well Geologic Aquifer	Information about the aquifer parameters of the well such as pumping test information, confinement, and transmissivity
Well Geologic Lithology	Lithologic information at a well site (each well may have many lithologies at different depths)
Water Level	Water level measurements for wells
Well Pumping	Pumping measurements for wells, annual or monthly
Managed Recharge	Recharge measurements for a recharge site, annual or monthly
SW Diversion	Diversion volume measurements for a diversion site, annual or monthly
Water Quality	Water quality data for wells or any other type of site
Subsidence Measurement	Elevation measurements from stations tracking land subsidence
Gage Measurement	Stage or discharge water level measurements from stream gages

Data Contents

Historical data will be populated into the DMS as needed to support the 2020 GSPs. State and Federal data available via online public databases will be brought directly from the data source to the DMS by the DMS development team.

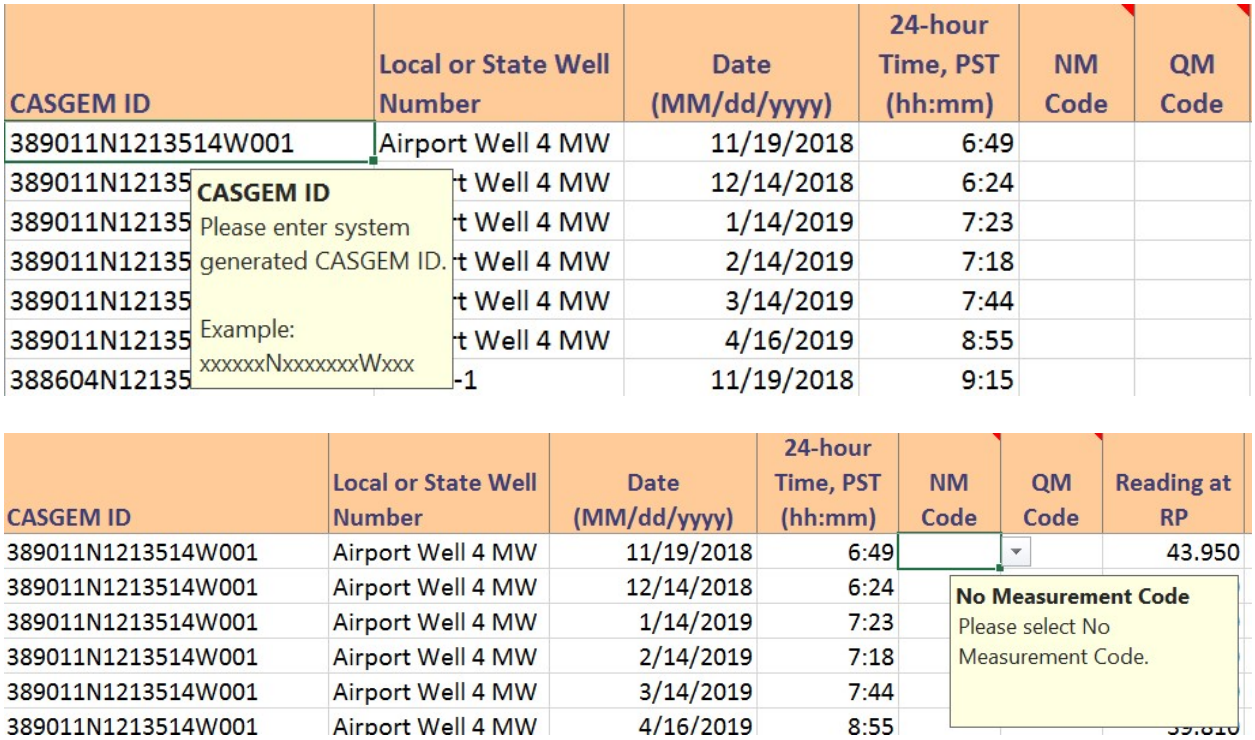
Local Kaweah Subbasin data used to support GSP development will be collected by GEI and put into spreadsheet templates designed to normalize data entry. The templates will include a set of rules restricting formatting, alphanumeric properties, and other filters. This template process is shown as **Figure 3**.

Figure 3. Template Import Process for Local Data



The templates include validation parameters similar to CASGEM templates. CASGEM templates are shown in **Figure 4** as an example. The templates will have pop-up windows to describe what should be filled in for each column. If a specific filter must be applied, only values that meet the criteria will appear in a drop-down list. GEI will upload data to the DMS using these templates.

Figure 4. CASGEM Template Examples



CASGEM ID	Local or State Well Number	Date (MM/dd/yyyy)	24-hour Time, PST (hh:mm)	NM Code	QM Code
389011N1213514W001	Airport Well 4 MW	11/19/2018	6:49		
389011N12135	t Well 4 MW	12/14/2018	6:24		
389011N12135	t Well 4 MW	1/14/2019	7:23		
389011N12135	t Well 4 MW	2/14/2019	7:18		
389011N12135	t Well 4 MW	3/14/2019	7:44		
389011N12135	t Well 4 MW	4/16/2019	8:55		
388604N12135	-1	11/19/2018	9:15		

CASGEM ID	Local or State Well Number	Date (MM/dd/yyyy)	24-hour Time, PST (hh:mm)	NM Code	QM Code	Reading at RP
389011N1213514W001	Airport Well 4 MW	11/19/2018	6:49			43.950
389011N1213514W001	Airport Well 4 MW	12/14/2018	6:24			
389011N1213514W001	Airport Well 4 MW	1/14/2019	7:23			
389011N1213514W001	Airport Well 4 MW	2/14/2019	7:18			
389011N1213514W001	Airport Well 4 MW	3/14/2019	7:44			
389011N1213514W001	Airport Well 4 MW	4/16/2019	8:55			

All the Main and Sub Tables listed in **Table 2** will have a template. The compiled data will be reviewed by GEI before it is migrated into the database. The data review process will be focused and limited in scope. It will include the following checks:

- Identifying outliers that may have been introduced during the original data entry process
- Removing or flagging questionable data

Once the data has been compiled, input to the templates, and reviewed, it will be uploaded to the DMS and displayed on a visualization tool (GIS map) interface.

Moving forward, the templates will be used by the Kaweah Subbasin GSAs to prepare future data for DMS input.

Web Interface

The DMS begins with a database, stored locally or online, and is accompanied by a viewer that allows administrators to see the data in a user-friendly interface. The proposed Kaweah Subbasin DMS is a database built in Oracle plus a web application designed in JAVA.

The web application will display well and other instrument (e.g., extensometer) locations, identifying which wells or instruments are part of a representative monitoring network for the SGMA sustainability indicators.

- Clicking on a well site will display available historical water level or water quality data on a hydrograph
- Clicking on other monitoring points (e.g., extensometers) will display available historical data in tabular and chart format

The map displaying the DMS data will include additional geographic features such as GSA, local agency, and Bulletin 118 basin boundaries to provide context and facilitate interaction with the data.

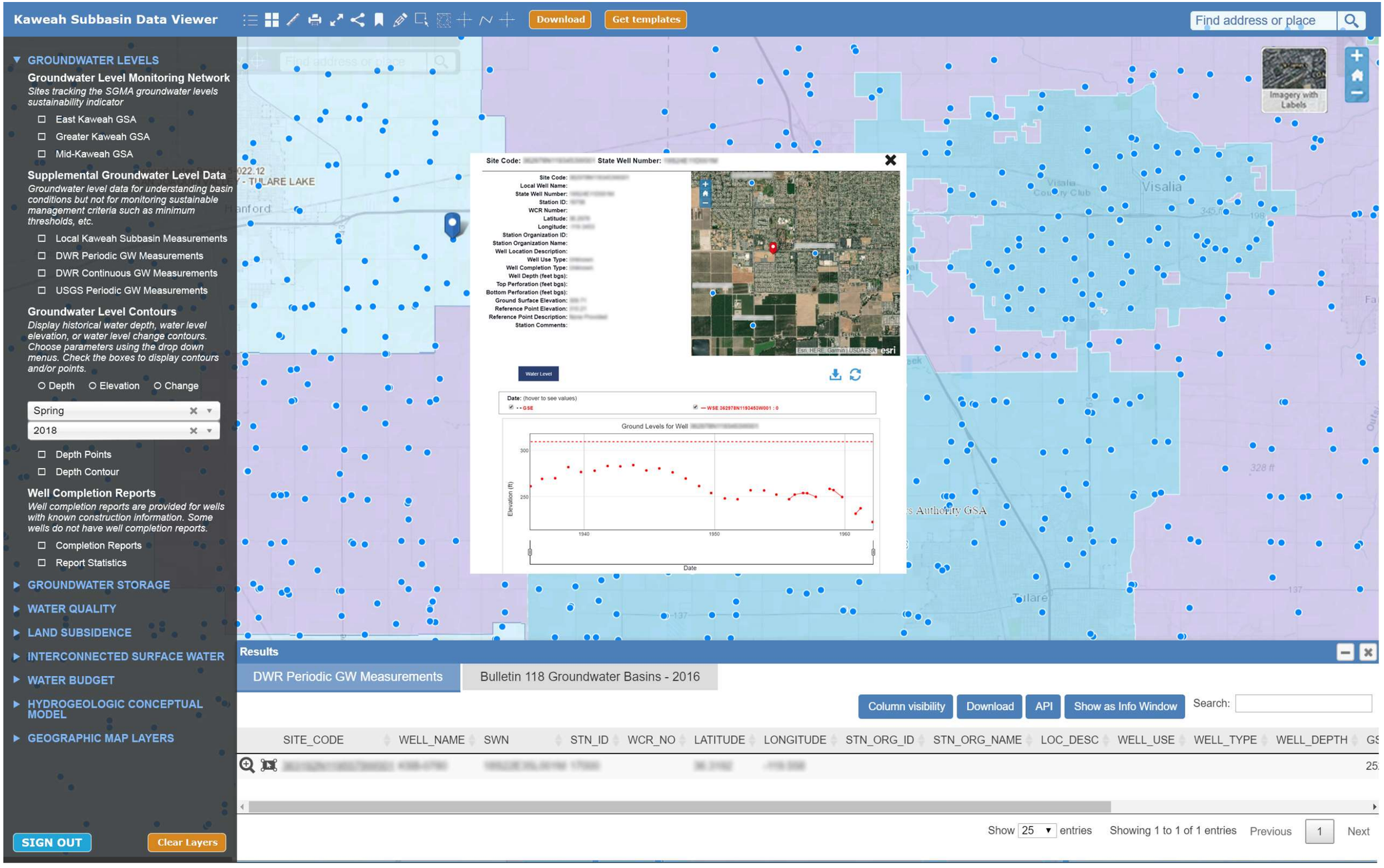
Representative monitoring network data will be made available for export to a spreadsheet format for analytical and reporting purposes. GSP Regulations Article 7 §356.2 outlines specific components to be reported annually (paraphrased):

- *General information including executive summary and location map (narrative)*
- Groundwater elevation contour maps (sourced by DWR) and hydrographs
- Groundwater extraction
- Surface water supply used or available for use, for groundwater recharge or in-lieu use
- *Total water use by water use sector and source (calculated)*
- Change in groundwater storage displayed in map and graph formats
- *Description of progress towards implementing the GSP (narrative)*

The items listed above are needed for each annual report to DWR. The Kaweah Subbasin DMS is designed to store all these items except for those shown in *italics*, which are either narratives or calculations that are done outside of the DMS.

See **Figure 5** for an example design for the Kaweah Subbasin data viewer.

Figure 5. Example Design for Kaweah Subbasin Data Viewer



DMS Hosting

GEI will host the DMS for the duration of the amended Task Order – through December 2019. After that time, hosting will be transferred to either a Kaweah Subbasin GSA or a participating agency. As of the April 2018 DMS Development Meeting, the GSAs decided to postpone choosing where the DMS would be hosted from the year 2020 forward. If needed, GEI may continue to host the DMS for a nominal fee.

Summary

The Kaweah Subbasin DMS will contain the information used to support GSP development. The data stored will be based on the requirements of SGMA and include relevant historical data collected during GSP development for each of the six sustainability indicators. The DMS will consist of an Oracle database with a web-based viewer designed using JAVA. Data will be available for export from the DMS using the web-based viewer. The DMS will be hosted on a GEI server through December 2019, after which time it will be hosted by a Kaweah Subbasin agency or stay with GEI for a fee.

Appendix 5
Data Gaps Summary

Appendix 5

Data Gaps Summary

This appendix provides a summary of the current data gaps in the Kaweah Subbasin. It represents the gaps that were identified at the time of 2020 GSP preparation by the Kaweah Subbasin GSAs: East Kaweah GSA (EKGSA), Mid-Kaweah GSA (MKGSA), and Greater Kaweah GSA (GKGSA).

The three abovementioned GSAs agreed to, at a minimum of every five years, provide an evaluation of data gaps and to make a good-faith effort to address data gaps. These commitments are documented in the Kaweah Subbasin Coordination Agreement.

In general, the Kaweah Subbasin GSPs identify a need for expanding the spatial extent and density of the monitoring networks for water levels, water quality, and subsidence. They also indicate a need for increased knowledge about the existing monitoring network including geological/hydrogeological information, well logs, and well construction information. Table A-5-1 provides a summary of the primary data gap topics.

Table 5-1. Primary data gap topics by GSP

Data Gap Topic	EKGSA GSP	MKGSA GSP	GKGSA GSP
Geological/hydrogeological information	X	X	X
Well logs	X	X	X
Well construction information	X	X	X
Stream flow monitoring	X		
Spatial extent and density of **water level** monitoring network		X	X
Spatial extent and density of **water quality** monitoring network			X
Spatial extent and density of **subsidence** monitoring network	X	X	X
Groundwater-dependent ecosystems (GDEs)	X		X
Subsurface inflows and outflows	X		
Surface water deliveries	X		
Recharge basin data collection	X		
Irrigation demand	X		
M&I demand	X		
Accurate well count, type (domestic, irrigation, etc.), and status (active, inactive, abandoned[, destroyed])		X	X
Hydraulic parameters of principal aquifers based on pumping tests		X	X
Water quality information for domestic and agricultural wells		X	X
Interconnected surface water	X		X
Pumping records		X	
Rocky Hill Fault: evaluation of flow	X		
Intermontane Valley areas	X		
Septic system contamination (Nitrate)	X		

Each of the three Kaweah Subbasin GSPs contain a list of the principal data gaps for its respective GSA area. The summary lists extracted from each GSP are provided below.

East Kaweah

From the EKGSA GSP, **Section 2.6 – Identification of Data Gaps**:

"Identification of data gaps will continue to be a work in progress. The principal data gaps are listed below, which are subject to revision during the course of completion of this GSP.

- Geological/hydrogeological information for all areas of the EKGSA.
  - The SkyTEM effort should assist in filling this data gap
  - New and/or better well logging for monitoring and production wells can also be informative in locations with little or no data
- Well construction information such as: depth of well, perforation intervals, casing diameter, and use
  - Strongly encourage the Kaweah Subbasin GSAs and Tulare County [to] initiate a well canvas of the area to develop a better data set
  - Potential Drinking Well Observation Plan can assist with gathering well data for specific drinking water wells in the region
- Stream flow monitoring on Cottonwood, Yokohl, Lewis, and Frazier Creeks
  - Gauges are proposed to be constructed, especially for the creeks potentially to be used for recharge activities
  - Specific watershed studies for these creek watersheds can be performed to better inform the estimations of creek flows and seepage
- Consistent subsidence monitoring
  - Likely remedied with more consistent InSAR data
  - Specific infrastructure to be surveyed for subsidence impacts
- Presence of GDE
  - Likely linked with the added stream flow monitoring
  - More consistent groundwater level monitoring in the intermontane valleys
- Water Budget Components
  - Further development of subsurface inflows and outflows from the mountain front and neighboring subbasins
  - Improved understanding of surface water deliveries within district boundaries
  - Retention/Recharge basin data collection and tracking as more recharge is developed
  - Improved understanding of irrigation demand and method for crop and soil types within the Subbasin and EKGSA
  - Improved tracking of M&I demands."

Greater Kaweah

From the GKGSA GSP, **Section 2. Basin Setting**:

"The following data gaps were identified for the GKGSA:

- Accurate count of wells in GKGSA area, including well type (domestic, irrigation, etc.) and status (active, inactive, abandoned, [destroyed]). A detailed reconnaissance survey is underway to verify location and operational status of wells within GKGSA's jurisdiction but was not yet complete to inform this plan).
- Construction details of wells, especially production/screen interval(s). This data gap is significant and limits a comprehensive understanding of groundwater level and groundwater quality conditions above and below the Corcoran Clay.
- Lithologic composition of aquifer, including geophysical logs at strategic locations.
- Hydraulic parameters of principal aquifers based on pumping tests.
- Water quality data for domestic and irrigation wells.
- Measurements of subsidence within the GKGSA. The historical record of measured subsidence is incomplete and provides no information to inform an understanding of subsidence with depth.
- Groundwater elevation monitoring in areas with shallower groundwater levels to confirm whether or not the potential interconnected surface water and/or GDEs are present."

Mid-Kaweah

From the MKGSA GSP, **Section 2. Basin Setting**:

"The following data gaps were identified for the MKGSA:

- Accurate count of wells in MKGSA area, including well type (domestic, irrigation, etc.) and status (active, inactive, abandoned[, destroyed])
- Construction details of wells, especially production/screen interval(s). This was a significant data gap that prevented a comprehensive understanding of groundwater level and groundwater quality conditions above and below the Corcoran Clay
- Groundwater production records from direct measurement and locally generated estimates of groundwater use in rural areas of the MKGSA. This information will improve the water budget.
- Lithologic composition of aquifer, including geophysical logs at strategic locations
- Hydraulic parameters of principal aquifers such as transmissivity, storativity and porosity based on pumping tests preferably. This information could then help with the interpretation of Aerial Electro-Magnetic (AEM) data recently collected.
- Water quality data for small rural community, domestic (rural residential home owners) and agricultural irrigation wells
- Understanding of groundwater quality trends with depth (i.e. between upper and lower principal aquifers and vertical changes within each principal aquifer). With this information, an improved understanding is possible regarding depth of base of freshwater throughout the MKGSA as well as the Kaweah subbasin as a whole.

- Measurements of subsidence within the MKGSA. The historical record of measured subsidence is incomplete and provides no information to inform an understanding of subsidence with depth. Correlation between subsidence and release of arsenic from clay mineralogy represents a data gap that needs to be filled through improved sampling and subsidence monitoring.
- Expanded monitoring of groundwater levels and groundwater quality in small rural communities and disadvantaged communities

A compilation of every reference to a data gap in any of the three Kaweah Subbasin GSPs or in the Kaweah Subbasin Basin Setting document is provided as **Table 5-2**. In general, the plan to fill a data gap is presented alongside or nearby the text where the gap is identified in the GSP or Basin Setting document.

Table 5-2. All Data Gap Reference Table

GSP	Section	Page	Data Gap
GKGSA	2.2	2-2	**Summary List** The following ***data gaps*** were identified for the GKGSA: • Accurate count of wells in GKGSA area, including well type (domestic, irrigation, etc.) and status (active, inactive, abandoned[, destroyed]). A detailed reconnaissance survey is underway to verify location and operational status of wells within GKGSA's jurisdiction but was not yet complete to inform this plan). • Construction details of wells, especially production/screen interval(s). This ***data gap*** is significant and limits a comprehensive understanding of groundwater level and groundwater quality conditions above and below the Corcoran Clay. • Lithologic composition of aquifer, including geophysical logs at strategic locations. • Hydraulic parameters of principal aquifers based on pumping tests. • Water quality data for domestic and irrigation wells. • Measurements of subsidence within the GKGSA. the historical record of measured subsidence is incomplete and provides no information to inform an understanding of subsidence with depth. • Groundwater elevation monitoring in areas with shallower groundwater levels to confirm whether or not the potential interconnected surface water and/or GDEs are present. The ***data gaps*** will be addressed as GKGSA implements the Management Actions designed to close such gaps, as described in Section 7.4 to establish a subbasin-wide Monitoring Network as described in Section 4 of this Plan.
GKGSA	4	4-1	In areas where existing monitoring does not meet the SGMA requirements, this section identifies the ***data gaps*** and proposed measures to address these ***data gaps*** during the SGMA implementation period, so the monitoring improves with time. Any such improvement will be implemented as recognized and the results will be evaluated during the 5-year updates.
GKGSA	4.10.1	4-20	**4.10.1: Data Gaps** The following section describes ***data gaps*** for groundwater elevations, groundwater quality, and land subsidence.

GSP	Section	Page	Data Gap
GKGSA	4.10.1.1	4-21	**4.10.1.1: Groundwater Elevation and Storage** As referenced in Regulation §352.4, "If an Agency relies on wells that lack casing perforations, borehole depth, or total well depth information to monitor groundwater conditions as part of a Plan, the Agency shall describe a schedule for acquiring monitoring wells with the necessary information, or demonstrate to the Department that such information is not necessary to understand and manage groundwater in the basin. Well types and construction details will need to be determined to improve the monitoring network. Downhole well surveys and desktop surveys will be utilized for existing wells to fill in the well construction details gap. New dedicated monitoring wells and converted production wells will be utilized to fill in the monitoring network spatial extent and density. Improvement will occur during the initial few years of the implementation period, prior to the first 5-year update. Currently, the Kaweah Subbasin has a total of 14 SGMA compliant, dedicated monitoring wells that may be used for groundwater level monitoring. An additional six monitoring wells are proposed through the DWR's Technical Support Services (TSS) program. Two of the proposed six wells are located within the GKGSA. While the reminder of the wells used in the interim have been identified as Key Wells in the Basin Setting, they are not dedicated SGMA compliant monitoring wells. To address this GKGSA, in coordination with EKGSA and MKGSA, plans to expand the spatial coverage of groundwater level monitoring wells by adding SGMA compliant wells at or near the locations of existing Key Wells as shown in Figure 4 3. The full development of the SGMA-compliant monitoring network is scheduled to take place over the SGMA implementation period of 2020 to 2040.
GKGSA	4.10.1.2	4-21	**4.10.1.2: Groundwater Quality** Groundwater quality data are mostly available from the reoccurring sampling requirements for public water systems, primarily the Cities of Exeter, Farmersville, and Woodlake, but also for smaller systems within the GKGSA. Additional groundwater quality data will be available from the IRLP program and the upcoming CV-SALTS program and will provide further coverage in agricultural and rural areas. DWR will construct two new nested monitoring wells for the GKGSA as part of the Technical Services Support program. In addition, inactive production wells will be converted to monitoring wells to improve the spatial extent and density of the monitoring network. Improvement will occur during the initial few years of the implementation period, prior to the first 5-year review. As described in Section 4.9, groundwater quality monitoring under existing regulatory programs for public water systems currently provide adequate coverage for the Constituents of Concern listed in the Basin Setting. For areas lacking a public water system, the IRLP and CV-SALTS programs can be used to provide groundwater quality data in the interim. Dedicated SGMA compliant monitoring wells are also eligible for use in groundwater quality sampling and can be brought in to the monitoring network as they are completed.

GSP	Section	Page	Data Gap
GKGSA	4.10.1.3	4-21	**4.10.1.3: Land Subsidence** Land subsidence has been limited by the availability of data, notwithstanding the continuous GPS data for station P566 near Farmersville since 2005 and station CRCN near Corcoran since 2010, limited and variable coverage of InSAR data for 2007 to 2010 and 2015 to 2018, and the recent 2-year period (2016-2018) of KDWCD GPS data for various locations within and around GKGSA. The continued implementation of the KDWCD Land Surface Elevation Monitoring Plan will provide additional data on future subsidence at 12 locations within GKGSA and seven locations with MKGSA plus eight locations outside the Kaweah Subbasin. The GKGSA will coordinate with adjacent subbasins, especially in the southwestern portion of the subbasin where subsidence is greatest and could be affect surface infrastructure. The KDWCD Land Surface Elevation Monitoring Network and InSAR are adequate to address the requirements of SGMA, in terms of spatial distribution. Additional refinement to KDWCD may be considered as part of interbasin coordination efforts for areas which experience higher rates of subsidence.
GKGSA	4.10.1.4	4-21	**4.10.1.4: Interconnected Surface Water** As part of addressing the ***data gap*** of spatial distribution for SGMA-compliant groundwater level monitoring, the GKGSA and other GSAs of the Kaweah Subbasin will coordinate for the installation of SGMA-compliant groundwater level monitoring to validate existing data and confirm whether or not Interconnected Surface Waters are present in the Kaweah Subbasin in proximity to the Kaweah and St. Johns Rivers. As part of addressing the data gap of spatial distribution for SGMA compliant groundwater level monitoring, the GKGSA and other GSAs of the Kaweah Subbasin will coordinate for the installation of SGMA compliant groundwater level monitoring to validate whether or not Interconnected Surface Streams are present in the Kaweah Subbasin in proximity to the Kaweah and St. Johns Rivers.
GKGSA	5.5.1	5-15	The minimum threshold for land subsidence will be a rate of annual decline in land surface elevation. Land subsidence will be measured at the representative land subsidence monitoring network, as shown on Figure 4-5. In evaluating historic groundwater elevation data with subsidence data, an acceptable correlation was not evident, so the proxy use of groundwater levels is not possible. The absence of an acceptable correlation is notable because the mechanism for subsidence is relatively low groundwater levels and the associated compaction of clay units in response to the reduction in pore pressure. We believe the inability to establish this correlation stems from a high level of uncertainty due to: • Incomplete subsidence records from existing monitoring stations. • Insufficient number of subsidence monitoring stations. • Lack of pumping records by well. • Insufficient well construction and lithologic information to correlate pumping depths with subsidence depths. • Subsidence is a more of a regional condition whereas groundwater levels are very local and can be quite variable due to local subsurface conditions. These causes represent ***data gaps*** that will be filled through management actions during Plan implementation.
GKGSA	8.1.2.1	8-3	**8.1.2.1: Groundwater Elevations in GKGSA, last paragraph:** Groundwater contour maps submitted during the first five years may reflect a composite of the principal aquifers within the subbasin due to ***data gaps*** as discussed in the Basin Setting Report (Appendix 2A) of this Plan. As additional dedicated monitoring wells are installed, and as more knowledge is gained regarding subbasin hydrogeology, groundwater conditions within each separate aquifer will be better understood. The geophysical data collection project described in Section 7 will also aid in this regard.

GSP	Section	Page	Data Gap
GKGSA	8.2	8-6	In accordance with § 356.4 of the Regulations, the GKGSA will conduct a periodic evaluation of its Plan no less frequently than at five-year intervals and provide a written assessment to DWR of such evaluations. The assessments will include, but not be limited to, the following... • Description of alterations to the monitoring network and its improvements to address ***data gaps***...
GKGSA	8.2.1	8-7	**8.2.1: Monitoring Network Assessment and Improvement**: The GKGSA recognizes that its initial monitoring network as described in Section 4 of this Plan includes existing monitoring sites lacking sufficient information such as well depth, screen intervals, and reliable well-log records, thereby reflecting significant ***data gaps***. Assessing these ***data gaps*** is a priority and will be conducted in accordance with § 352.2 and § 354.38 of the Regulations. Specific elements of such an assessment are to include: • Targeting areas where an insufficient number of monitoring sites exist or where sites are considered unreliable or do not meet monitoring network standards • Identifying ***data gap*** locations and reasons for their occurrence and surrounding issues that restrict monitoring and data collection • Actions to be undertaken to close identified ***data gaps***, including the addition and/or installation of new monitoring wells or surface-water measuring facilities, closure of inadequate well density areas, and needed adjustments to monitoring and measurement frequencies
MKGSA	1.4.3.1	1-12	**1.4.3.1: County of Tulare General Plan** The 2030 General Plan Update for the County of Tulare, adopted on August 28, 2018, does not have a specific update to address water usage and supply. However, the Tulare County 2012 General Plan has a Water Resources Element that requires the County to adopt ordinances and measures to:...• Encourage responsible agencies and organizations to install and monitor additional groundwater monitoring wells in areas where ***data gaps*** exist

GSP	Section	Page	Data Gap
MKGSA	2.2	2-2	**Summary List** The following ***data gaps*** were identified for the MKGSA: • Accurate count of wells in MKGSA area, including well type (domestic, irrigation, etc.) and status (active, inactive, abandoned[, destroyed]) • Construction details of wells, especially production/screen interval(s). This was a significant ***data gap*** that prevented a comprehensive understanding of groundwater level and groundwater quality conditions above and below the Corcoran Clay • Groundwater production records from direct measurement and locally generated estimates of groundwater use in rural areas of the MKGSA. This information will improve the water budget. • Lithologic composition of aquifer, including geophysical logs at strategic locations • Hydraulic parameters of principal aquifers such as transmissivity, storativity and porosity based on pumping tests preferably. This information could then help with the interpretation of Aerial Electro-Magnetic (AEM) data recently collected. • Water quality data for small rural community, domestic (rural residential home owners) and agricultural irrigation wells • Understanding of groundwater quality trends with depth (i.e. between upper and lower principal aquifers and vertical changes within each principal aquifer). With this information, an improved understanding is possible regarding depth of base of freshwater throughout the MKGSA as well as the Kaweah subbasin as a whole. • Measurements of subsidence within the MKGSA. The historical record of measured subsidence is incomplete and provides no information to inform an understanding of subsidence with depth. Correlation between subsidence and release of arsenic from clay mineralogy represents a data gap that needs to be filled through improved sampling and subsidence monitoring. • Expanded monitoring of groundwater levels and groundwater quality in small rural communities and disadvantaged communities • The ***data gaps*** will be addressed as MKGSA implements the management actions designed to close such gaps, as described in Section 7.4.
MKGSA	4	4-1	**4. Monitoring Networks** The following chapter describes both the existing groundwater monitoring within the MKGSA area and the representative monitoring required by SGMA. In areas where existing monitoring does not meet the SGMA requirements, this chapter identifies ***data gaps*** and proposed measures to address these ***data gaps*** during the SGMA implementation period so the representative monitoring improves over time. Plan updates will reflect new information regarding improvements to representative monitoring. This Section 4 includes all information in compliance with §354.32 through §354.40 of the Regulations.
MKGSA	4.10.1	4-14	**4.10 Monitoring Network Improvement Plan/ 4.10.1 Data Gaps** The following section describes ***data gaps*** for groundwater elevations and storage, groundwater quality, and land subsidence.

GSP	Section	Page	Data Gap
MKGSA	4.10.1.1	4-15	**4.10.1.1: Groundwater Elevation and Storage Data Gaps** As referenced in Regulation §352.4, "If an Agency relies on wells that lack casing perforations, borehole depth, or total well depth information to monitor groundwater conditions as part of a Plan, the Agency shall describe a schedule for acquiring monitoring wells with the necessary information or demonstrate to the Department that such information is not necessary to understand and manage groundwater in the basin." Well types and construction details will need to be determined to improve the monitoring network. Downhole well surveys and desktop surveys will be utilized for existing wells to fill in the well construction details gap. New dedicated monitoring wells and converted production wells will be utilized to fill in the monitoring network spatial extent and density. Improvement will occur during the initial few years of the implementation period, prior to the first five-year update.
MKGSA	4.10.1.2	4-15	**4.10.1.2: Groundwater Quality Data Gaps** Groundwater quality information is currently collected for public water systems, primarily Visalia and Tulare. The groundwater quality new dedicated monitoring wells and converted production wells will be utilized to fill in the monitoring network spatial extent and density. Improvement will occur during the initial few years of the implementation period, prior to the first 5-year update. DWR will be constructing new multilevel monitoring wells at the locations shown on Figure 4-7 (at the end of this Section) as part of their Technical Support Services program. These wells will be used for both groundwater level and quality monitoring.
			4.10.1.3: Land Subsidence Data Gaps For the preparation of this initial plan, MKGSA lacked sufficient data to effectively correlate changes in groundwater levels within the MKGSA with historical land surface subsidence. This was problematic in developing accurate projections of potential future subsidence that may occur during the implementation period. Additionally, there was not sufficient data to find a good correlation between pumping and land surface subsidence. The implementation of KDWCD's Land Surface Elevation Monitoring Plan will provide additional data for future subsidence monitoring and evaluation of Sustainability Indicators. The MKGSA will explore other options for a secondary data source, especially where surface infrastructure in the southwestern portion of the subbasin could be affected.
MKGSA	4	4-22	Figure 4-7: Proposed New Multilevel Monitoring Wells to Fill ***Data gaps***
MKGSA	5.3.4.1	5-14	In evaluating historic field-measured groundwater elevation data with field-measured subsidence data, an acceptable correlation was not evident. Such a technically defensible correlation was intended for the purpose of estimating the magnitude of future subsidence if groundwater levels were ever to reach minimum thresholds throughout the Subbasin. It was notable that an acceptable correlation did not emerge, since the mechanism for subsidence is declining groundwater levels below historic lows and the associated compaction of clay units in response to the reduction in pore pressure. We believe the inability to establish this correlation stems from a high level of uncertainty due to: • Incomplete subsidence records from existing monitoring stations. • Insufficient number of subsidence monitoring stations. • Complete lack of pumping records by well. In some cases, pumping estimates were available by management area, but in most cases, there was no pumping data by well by year. • Insufficient well construction information to correlate pumping depth with observed subsidence. These causes represent significant ***data gaps*** that will be filled through management actions during Plan implementation.

GSP	Section	Page	Data Gap
MKGSA	8.1.2.1	8-2	Groundwater contour maps submitted during the first five years may reflect a composite of the principal aquifers within the subbasin due to ***data gaps*** as discussed in Section 2 of this Plan. As additional dedicated monitoring wells are installed, and as more knowledge is gained regarding subbasin hydrogeology, groundwater conditions within each separate aquifer will be better understood. The geophysical data collection project described in Section 7 will also aid in this regard.
MKGSA	8.2	8-5	**8.2 Five-Year Assessments** In accordance with §356.4 of the Regulations, the MKGSA will conduct a periodic evaluation of its Plan no less frequently than at five-year intervals and provide a written assessment to DWR of such evaluations. The assessments will include, but not be limited to, the following: • Description of alterations to the monitoring network and its improvements to address ***data gaps***…
MKGSA	8.2.1	8-5	**8.2.1 Monitoring Network Assessment and Improvement** The MKGSA recognizes that its initial monitoring network as described in Section 4 of this Plan includes existing monitoring sites lacking sufficient information such as well depth, screen intervals, and reliable well-log records, thereby reflecting significant ***data gaps***. Assessing these ***data gaps*** is a priority and will be conducted in accordance with §352.2 and §354.38 of the Regulations. Specific elements of such an assessment are to include: • Targeting GSA areas where an insufficient number of monitoring sites exist or where sites are considered unreliable or do not meet monitoring network standards • Identifying data gap locations and reasons for their occurrence and surrounding issues that restrict monitoring and data collection • Actions to be undertaken to close identified ***data gaps***, including the addition and/or installation of new monitoring wells or surface-water measuring facilities, closure of inadequate well density areas, and needed adjustments to monitoring and measurement frequencies
EKGSA	2.2.6.1	2-25	According to DWR's Bulletin 118 (2003), there are no reported groundwater barriers restricting horizontal flow in and out of the Kaweah Subbasin. There is, however, the Rocky Hill fault zone that may affect groundwater flow inside of the Subbasin and potentially cross gradient of flow along the north and south boundaries. Located in the Eastern portion of the Subbasin, the Rocky Hill fault disrupts pre-Eocene deposits and may locally penetrate older alluvial deposits. The linearity of ridges in this area defines the fault line (Refer to Figure 2-4 for the Cross Section Location Map and Figure 2-7 and Figure 2-9 for Cross Sections DD' and gg'). The Rocky Hill fault does not offset younger alluvium based on water level data (Croft, 1968); however, lithology data from boreholes suggest that older alluvium may be offset or varied in thickness at the Rocky Hill fault. In addition, Fugro West (2007), suggested that the hydrologic connection of the oxidized alluvial aquifer may be restricted near the Rocky Hill fault; this represents a ***data gap*** in groundwater flow across the Rocky Hill fault, and should be evaluated in the future, both within the Subbasin and in association with the northern and southern boundaries of the Subbasin.
EKGSA	2.3.3	2-42	**2.3.3 Existing Land Subsidence Monitoring** Past, recent and potential future monitoring of land subsidence in the Kaweah Subbasin are summarized in Table 2-5. Much of the historical data does not cover the EKGSA area. Newer data sets (2015-2017) provide more coverage. The EKGSA will strive to keep these newer data sets active to avoid ***data gaps*** in the future. While land subsidence isn't believed to be a major concern in the EKGSA, it will be monitored to avoid Undesirable Results.

GSP	Section	Page	Data Gap
EKGSA	2.3.4	2-42	**2.3.4 Existing Stream Flow Monitoring** The most useful stream flow gauges monitored within the Subbasin are located outside the EKGSA. The closest water bodies regularly monitored are the Kaweah River, St. Johns River, and Yokohl Creek. The flow gauges are located in the GKGSA Kaweah GSA. Existing stream flow monitoring represents a ***data gap*** for the EKGSA to improve moving forward. Streams of interest for the EKGSA to improve monitoring data are: Cottonwood, Lewis, and Frazier Creeks.
EKGSA	2.4.1.2	2-49	**2.4.1.2 Well Hydrographs** Hydrographs of individual wells in and around the EKGSA are presented in Appendix 2-D. Figure 2-21 is a map showing locations of these wells. These hydrographs depict the span of time between 1981 and 2017. Hydrographs outside the borders of the EKGSA were included to establish boundary conditions. It is difficult to identify wells with records that are complete for the entire base period. The wells depicted often contain ***data gaps*** but represent the most complete information available at this time. The dataset used to create these hydrographs associates water levels with a season/year format (e.g. Spr1990) rather than with a specific date. For the purposes of plotting, spring levels were considered to have been taken on March 1, while fall levels were plotted on October 1. Nevertheless, these hydrographs are a useful tool for tracking water level patterns through time across the EKGSA.
EKGSA	2.4.1.2	2-50	**Intermontane Valleys** – This classification is included to showcase wells on the Eastern border of the EKGSA with significant bedrock outcrop to their west. These wells are located in the small valleys interfingering with the mountain-front and are drilled into shallow alluvium veneering relatively shallow bedrock, with ready access to recharge coming from the mountain-front. They have consistently shallow DTW and low seasonal and hydrological deviation. Typical WSEs within these wells are consistently within 50 ft of the surface. Well 17S26E14L002M is nearly within the Valley proper and likely has deeper alluvium, less-direct recharge, and plentiful irrigation nearby. This well's hydrograph is more akin to wells in the Cottonwood Creek Interfan area as defined above, with GKGSA overall DTW and increased variation between seasons of wet and dry. Average DTW for this grouping of wells was 26.9 ft based on the years with data. There are significant temporal ***data gaps*** for this region, during which time none or only one well provided data. Between fall of 2008 and fall of 2012 no data is recorded for any of these wells.
EKGSA	2.4.1.2	2-54	**Well Depth:** Construction data for wells in the EKGSA was evaluated in a summarized format. Evaluating well logs confidently and accurately to match reports with the actual corresponding well in the field is difficult due to the current nature of the data sets available. This is a ***data gap*** that will be filled going forward. Figure 2-24, Figure 2-25, and Figure 2-26 display the average completed well depths per section for agricultural, domestic, and public wells respectively. Appendix 2-E provides more figures for these three well types, including minimum and maximum completed depths and number of wells per section.

GSP	Section	Page	Data Gap
EKGSA	2.4.3.3.4	2-62	**Nitrate**: Sources and Spatial Distribution in the EKGSA - The historical and current predominate land use in the EKGSA is for commercial irrigated agriculture with some interspersed dairy farms. While Burton et. Al (2012) reports nitrate contaminations correlates to areas of agriculture classified as orchard and vineyard land uses, USGS finds that these regions also have medium to high density septic systems. GKGSA than 50 percent of the land use in hydrogeologic zones 7, 8 and 9 are orchards or vineyards. Septic-system density GKGSA than the Subbasin median value of 5 septic systems in a 500-meter radius around each selected GAMA well occurred hydrogeologic zones 4-9, with very high density of 11.8 septic systems within 500 meters of the selected wells in zones 7, and 11.0 septic systems in zone 9. USGS data was used for this evaluation to develop a clearer understanding of potential sources of nitrate contamination. While previous reports point towards orchard and vineyard land uses, septic system density is an unquantified source of contamination. While the existence of septic systems does not necessarily mean that they are a contributing source of nitrate contamination within the aquifer. However, leaky, poorly maintained septic systems can be a serious source of localized nitrate contamination. It is currently unknown the amount of contamination associated with poorly maintained septic systems. This represents a ***data gap*** that the EKGSA and Subbasin will need to evaluate going forward. Data gathered by USGS (Report 2011-5218) was determined from housing characteristics data from the 1990 U.S. Census. The density of septic systems in each housing census block was calculated from the number of tanks and block area. To more precisely identify the nitrate sources, current data should be compiled and evaluated with proximity to domestic water wells. This effort is being made through the Disadvantaged Community Involvement Program is trying to identify septic system density and condition in the Tulare-Kern Funding Area.
EKGSA	2.4.4.3	2-67	**2.4.4.3 Recent Land Subsidence** Recent subsidence studies of the Central Valley have utilized satellite-based, remote sensing data from the Interferometric Synthetic Aperture Radar (InSAR) and aircraft-based L-band SAR or Unmanned Aerial Vehicle Synthetic Aperture Radar (UAVSAR) programs, led by NASA and Jet Propulsion Laboratory (JPL), as well as other international researchers. These datasets provide a continuous estimate of subsidence over a large portion of the Subbasin. Additionally, subsidence in the Subbasin and in the Tule Subbasin (to the south) can also be observed at point locations through continuous GPS (CGPS) stations and other land surface monitoring stations. Most of these are not located within the EKGA, representing a ***data gap***. These CGPS stations are monitored as a part of UNAVCO's Plate Boundary Observation (PBO), the California Real Time Network (CRTN) and California Spatial Reference Center (CSRC) of the Scripps Orbit and Permanent Array Center (SOPAC). Annual averages of CGPS or future extensometer data may permit a more meaningful comparison and/or calibration with InSAR data in the future. Recent and historical subsidence data is summarized in Table 2-7. The data presented includes a summary of InSAR data published in a subsidence study commissioned by the California Water Foundation (LSCE, 2014) and by JPL (Farr et al., 2015 and 2016). The InSAR data was collected from a group of satellites (Japanese PALSAR, Canadian Radarsat-2, and European Space Agency's (ESA) satellite-borne Sentinel-1A and -1B), from 2006 to 2017, however there is a ***data gap*** for the EKGSA prior to 2015 due to the limit of study and absence of satellite data collection data prior to the ESA Sentinel satellites in 2014 (Farr et. al., 2016).

GSP	Section	Page	Data Gap
EKGSA	2.4.6	2-71	**2.4.6 Groundwater Dependent Ecosystems** Where groundwater and surface water are separated by significant distances, as is the case with the majority of the EKGSA, the groundwater does not interact with the natural streams or manmade ditches, and therefore, no possibility exists for the presence of Groundwater Dependent Ecosystems (GDE). However, there are locations near the foothills of the Sierra Nevada where groundwater levels are closer to the surface. Areas where groundwater is within 30 feet of the ground surface are located along the Kaweah River (primarily in GKGSA), the Stone Corral ID area, and near Lewis Creek in the Lindsay-Strathmore ID area. Figure 2-28 represents areas where groundwater elevations as of the Spring of 2015 were within 30 feet of the ground surface. Wetlands within these areas may be considered GDE, however additional study and data are necessary. This ***data gap*** will be addressed as part of further study going forward.
EKGSA	2.5.3.2	2-82	**2.5.3.2 Inflows to the Groundwater System - Natural Channels:** The EKGSA lacks reliable, long-standing stream gauges on the four major tributaries that flow into the area from the Sierra Nevada foothills. There is a single stream flow gauge on Yokohl Creek, while the other water bodies Cottonwood, Lewis, and Frazier Creeks do not have permanent gauges. In the absence of data, streambed percolation for the EKGSA was determined by an alternate method. The percolation from these creeks was assumed to be included in the mountain-front recharge accounted for in the Subsurface Flow. This is a ***data gap*** that will be further evaluated going forward. In addition to these creeks, a portion of the St. Johns River runs along the boundary between the EKGSA and GKGSA. It is assumed percolation over this stretch enters both the EKGSA and GKGSA. Per these estimates, the average annual natural percolation into the EKGSA is 2,000 AFY as shown in Table 2-10.

GSP	Section	Page	Data Gap
EKGSA	2.6	2-92	**Summary List** **2.6 Identification of *Data gaps*:** Identification of ***data gaps*** will continue to be a work in progress. The principal ***data gaps*** are listed below, which are subject to revision during the course of completion of this GSP. • Geological/hydrogeological information for all areas of the EKGSA. o The SkyTEM effort should assist in filling this data gap o New and/or better well logging for monitoring and production wells can also be informative in locations with little or no data • Well construction information such as: depth of well, perforation intervals, casing diameter, and use o Strongly encourage the Kaweah Subbasin GSAs and Tulare County initiate a well canvas of the area to develop a better data set o Potential Drinking Well Observation Plan can assist with gathering well data for specific drinking water wells in the region • Stream flow monitoring on Cottonwood, Yokohl, Lewis, and Frazier Creeks o Gauges are proposed to be constructed, especially for the creeks potentially to be used for recharge activities o Specific watershed studies for these creek watersheds can be performed to better inform the estimations of creek flows and seepage • Consistent subsidence monitoring o Likely remedied with more consistent InSAR data o Specific infrastructure to be surveyed for subsidence impacts • Presence of GDE o Likely linked with the added stream flow monitoring o More consistent groundwater level monitoring in the intermontane valleys • Water Budget Components o Further development of subsurface inflows and outflows from the mountain front and neighboring subbasins o Improved understanding of surface water deliveries within district boundaries o Retention/Recharge basin data collection and tracking as more recharge is developed o Improved understanding of irrigation demand and method for crop and soil types within the Subbasin and EKGSA o Improved tracking of M&I demands
EKGSA	3.4.2.2.1	3-28	**Description of Minimum Thresholds:** Well monitoring data from Geotracker, and other sources, is currently not available at a granular enough level to allow for the mapping of specific contaminant plumes. Given these ***data gaps***, the current level of water quality monitoring for the identified COCs needs to be enhanced by a network to track regional trends and to serve as a warning system for changes in water quality. More details on the EKGSA's monitoring network is provided in Chapter 4.
EKGSA	4.3.1	4-4	**4.3 Groundwater Levels: 4.3.1 Monitoring Network Description** Groundwater-level monitoring has been carried out for most of the past century. Existing groundwater wells with long monitoring histories make the best targets for continued monitoring. These wells are rare, and when they exist, their usefulness is often degraded by poor data quality. Most wells have incomplete temporal histories and lack consistent measurements for consecutive years throughout their operational lives. There is no recourse for historic temporal ***data gaps***, but the temporal quality of future measurements in these wells can be ensured.

GSP	Section	Page	Data Gap
EKGSA	4.3.1	4-5	**4.3 Groundwater Levels: 4.3.1 Monitoring Network Description:** Private wells: In several parts of the EKGSA there are gaps in the current monitoring well coverage, therefore, records from private wells may be used to initially satisfy the monitoring network needs. Use of these wells would require landowners to execute agreements with the EKGSA to allow access and conduct and oversee the monitoring. This process is anticipated to be time intensive, so this option is not the most preferred method.
EKGSA	4.3.1	4-5	Figure 4-1 shows the proposed locations for the initial groundwater level monitoring network for the EGKSA, and the different types of wells to be utilized. The two wells notated with stars in the northern portion of the EKGSA are proposed dedicated monitoring wells that are anticipated to receive Technical Support Services (TSS) assistance through DWR. The seven locations notated with large circles are locations with ***data gaps***. The EKGSA will aim to obtain data from these regions (within half a mile) through agreement on private wells or through drilling dedicated monitoring wells during the first year(s) of implementation. It is understood that over the course of implementation the EKGSA will gradually convert the entire Monitoring Network to dedicated monitoring wells.
EKGSA	4.3.3	4-9	**4.3.3 Review and Evaluation of Monitoring Network:** The monitoring network will be assessed and reviewed for adherence to SGMA requirements at the end of each five-year period, with the first period beginning in 2020 and concluding in 2025. As the monitoring network currently stands there are a few ***data gaps*** that may affect the interim monitoring of the overall sustainability goal of the basin, however, these will be addressed within the first five years of monitoring.
EKGSA	4.3.3.3	4-10	**4.3 Groundwater Levels/Monitoring Network - Identification of Data Gaps:** Existing groundwater-level monitoring has provided data to prepare groundwater contour maps and identify groundwater level trends over the decades. The existing monitoring system relies heavily on the member irrigation districts, but this only provides data for a portion of the EKGSA. To better represent hydraulic gradient and flow direction within the EKGSA, about seven wells should be strategically placed for regular monitoring in the EKGSA. Figure 4-1 shows the approximate locations where additional monitoring wells are believed to be useful in accomplishing this goal and meeting the monitoring well density requirements set forth in the GSP. The EKGSA will try to fill these locations either through agreements with private landowners or by drilling new dedicated monitoring wells. Other ***data gaps*** exist in the fact that most of the proposed monitoring network wells are privately owned production wells that are used for monitoring. Specific well construction information, including depth and perforated interval, are not known for many of the wells. Also, depending on how and when the data was collected, data points in some (or all) years may be skewed. Utilizing a production well as a monitoring well runs the risk of potential influence from recent pumping that may affect the 'static' reading aimed to be captured. It is believed that much of the recorded well data within the EKGSA is credible, however the EKGSA will continue to improve this data set going forward.

GSP	Section	Page	Data Gap
EKGSA	4.3.3.4	4-10	**4.3 Groundwater Levels/Monitoring Network - 4.3.3.4 Plans to Fill Data Gaps** The EKGSA will oversee the groundwater level monitoring network, including filling areas with data gaps. This will be especially useful for the regions that are not currently monitored, such as outside irrigation district boundaries. As previously stated, Figure 4-1 depicts the wells intended to fill spatial data gaps for initial implementation. The EKGSA will need to locate accessible private wells or drill new wells in the seven locations shown. Over time the EKGSA will transition to utilizing dedicated monitoring wells in its monitoring network. To address data quality gaps related to unknown construction information, the EKGSA will utilize the following options: • **Collect well completion reports.** Accurate well Completion Reports (WCRs) can potentially provide missing well construction and completion information. These records could be collected from landowners or DWR. Due to the way that data is collected and dispersed, it is often difficult to correlate WCRs with actual wells. Locations of wells as reported on WCRs are often subjective, as they are based on the drillers' ability to convey spatial location. Multiple wells may exist within the area a well's log leads to. In some cases, wells have been destroyed or lost without documentation. Obtaining well logs directly from owners bypasses this confusion, though this is not a perfect solution. Private well owners may be unable or unwilling to provide logs for their wells. • **Perform a video inspection of each well to obtain construction information.** In the absence of verified well logs a video inspection can be performed on wells to determine the total completed depth and perforated interval(s). Each video inspection currently ranges in costs between $2,500 and as much as $15,000 if required to lift and reinstall a pump to obtain access in production wells. There would also be additional costs for administration and outreach to landowners. The EKGSA would need to enter into private agreements with individual well owners for the use of these wells; as an incentive for participation the EKGSA would cover the cost of the well video assessment. • **Abandoned Wells.** The EKGSA will assess the likelihood of monitoring former wells that have been abandoned. Use of these wells will potentially bolster the density of the monitoring network in areas with minimal coverage, likely involve less stringent access requirements, and are cheaper than drilling new wells. Additionally, since these wells are no longer in production, the monitoring of abandoned wells allows for better potential in gaining a static water level reading and better fulfill the requirements of Sub-Article 4. • **Replace monitoring point with a dedicated monitoring well.** Dedicated monitoring wells could be installed and used in place of private wells. The construction information would be known and since the EKGSA would locate these wells, access issues would not be an issue. Dedicated monitoring wells are expensive to construct, and their installation will depend on available funding. Replace monitoring point with another private well. Private wells without documented construction information may potentially be replaced with other private wells that have verified well completion information. This option may be simpler and less costly than using video inspection and would be substantially less expensive than drilling new dedicated monitoring wells. This method of network repair would side-step the expense of drilling new wells but would still be subject to availability and limitations arising from the missing historical record.
EKGSA	4.4.3.3	4-12	**Groundwater Storage/Monitoring Network - 4.4.3.3 Identification of Data Gaps** Gaps in current groundwater level monitoring networks have created corresponding inadequacies in the ability to calculate change in storage. ***Data gaps*** associated with aquifer characteristics, such as specific yield values used for storage estimates, are anticipated to be improved through the completion of different projects and studies undertaken by the Kaweah Sub-basin and the EKGSA (i.e. SkyTEM).

GSP	Section	Page	Data Gap
EKGSA	4.4.3.4	4-12	**Groundwater Storage/Monitoring Network - 4.4.3.4 Plans to Fill Data Gaps** Significant data gaps will be filled using the same methods used to address data gaps in the groundwater level network, as spatial data coverage is a critical component in the change in storage calculations. Aquifer evaluation at a Sub-basin scale was performed through a SkyTEM electromagnetic analysis. The results from this analysis were not ready in time for this initial GSP but will be available for future updates and modeling to improve the general knowledge of the aquifer characteristics moving forward.
EKGSA	4.5.2	4-15	**Water Quality/Monitoring Network - 4.5.2 Quantitative Values** Threshold values for COCs are presented in Chapter 3. These values use MCL and prevalence data to provide minimum thresholds, measurable objectives, and interim milestones for each COC. Table 4-3 repeats the monitoring network wells table, but this time shows the baseline 10-year (2008-2017) COC averages for the wells in the network with water quality data available. By comparison, only 15 of the approximately 70 wells to be monitored for water quality have data for establishing a baseline. This represents a significant ***data gap***, however the intent of the EKGSA monitoring will strive to remedy this gap over the first years of implementation. Water quality degradation will be evaluated by determining if the actions of the EKGSA degrade the beneficial use of water in the Subbasin.
EKGSA	4.5.3.3	4-16	**Water Quality/Review of Monitoring Network - 4.5.3.3 Identification of Data Gaps** The absence of groundwater level data across the entirety of the EKGSA is a ***data gap***. Future monitoring will need to address this ***data gap*** so the EKGSA can properly evaluate how groundwater management actions are impacting groundwater quality.
EKGSA	4.5.3.4	4-16	**Water Quality/Review of Monitoring Network - 4.5.3.4 Plans to Fill Data Gaps** The EKGSA's proposal to monitor COCs across the groundwater level monitoring network intends to fill some of the significant data gaps with respect to groundwater quality data. Monitoring over the first five years of implementation should provide more insight on groundwater quality (location, trends, etc.) in the EKGSA. The EKGSA will also collaborate, where appropriate and feasible, with other agencies tasked with tracking and/or improving groundwater quality for additional assistance with data gaps.
EKGSA	4.6.3.3	4-20	**Land Subsidence/Monitoring Network - 4.6.3.3 Identification of Data Gaps** Beyond the specific proposed monitoring points, no other ***data gaps*** were identified for the land subsidence monitoring network for the EKGSA. Subsidence has been an ongoing issue in portions of the Central Valley, thus monitoring systems have been put in place to evaluate the impacts. Over time these tools and data have improved and become more widespread.
EKGSA	4.6.3.3	4-20	**Land Subsidence/Monitoring Network - 4.6.3.4 Plans to Fill Data Gaps** With the addition of survey points to critical infrastructure, and utilizing the InSAR data set as a backstop, the current subsidence monitoring network is believed to sufficiently cover the EKGSA.
EKGSA	4.7.3.3	4-23	**Depletion of Interconnected Surface Water/Monitoring Network - 4.7.3.3 Identification of Data Gaps** Due to the absence of historic monitoring specifically related to groundwater-surface water connection, there are ***data gaps*** beyond that of local experience. The new proposed monitoring effort laid out in this GSP will likely shed light on the areas considered to be 'gaining' streams or connected due to perched groundwater. The new monitoring network may indicate other areas to have possible connection. In these instances, the EKGSA will adapt the monitoring to allow for further evaluation.

GSP	Section	Page	Data Gap
EKGSA	4.7.3.3	4-23	**Depletion of Interconnected Surface Water/Monitoring Network - 4.7.3.4 Plans to Fill Data Gaps** The proposed additions to the groundwater level monitoring network is expected to be a benefit to the understanding of interconnected surface water. This will be especially beneficial in the portions of the EKGSA adjacent the foothills and ephemeral streams.
EKGSA	5.2	5-3	**5.2 Projects:** Implementation through this first GSP will focus on bolstering data sets to fill ***data gaps***, and then projects fully developed based on current and projected conditions.
EKGSA	5.3.2.6	5-36	**5.3.2. Wellhead Requirements Management Actions - 5.3.2.6 Benefit Realization and Evaluation WH1 - WH-5 (Sec. 354.44.b.5)** - The expected benefits of water quality sample ports and analytical testing would fill ***data gaps*** and provide extractors with useful information.
EKGSA	5.3.3	5-41	**Groundwater Allocation Management Actions: GA-3 Groundwater Allocation "Adaptive Management" Approach** The EKGSA may adopt a policy which states an adaptive management approach, whereby the groundwater allocation may be reviewed, changed, and reestablished periodically or during extreme drought as necessary to achieve long term sustainability. It is prudent for the EKGSA to acknowledge the current level of uncertainty in the available data and existing ***data gaps*** by providing flexibility in initial groundwater allocations as more data is gathered and analyzed in the upcoming years. Adaptive management is an approach to resource management that "promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a 'trial and error' process, but rather emphasizes "learning while doing" (Environmental Defense Fund et al., 2017).
EKGSA	6.1	6-1	**Plan Implementation/6.1 Estimate of GSP Implementation Costs - Plan to Fill Data Gaps (One-Time Cost)** Proper implementation of this GSP, especially as it relates to execution of projects and management actions, is contingent upon filling current ***data gaps***. This process will require determining which measures are necessary to build and maintain a comprehensive assessment of the water budget and ultimately verify groundwater sustainability. This plan to fill ***data gaps*** includes, but is not limited to, installing stream gauges, dedicated monitoring wells, and conducting a Proposition 218 vote. Costs are estimated to be approximately $1,230,000.
EKGSA	6.2	6-3	**6.2 Identify Funding Alternatives**: The EKGSA and/or its member agencies or other Kaweah Subbasin GSAs will apply for various grant funding opportunities to offset some of the capital costs associated with implementation of the GSP, whether it be a water supply project or to fill an existing **data gap**. The EKGSA will explore federal and state grant funding opportunities and low interest loans to help finance the initial steps of plan implementation.

GSP	Section	Page	Data Gap
Kaweah Subbasin Basin Setting	2.3.1.1	Q	**2.3.1.1 Key Wells:** The key wells were chosen as a subset of the entire water level monitoring database to adequately represent the Subbasin both laterally and vertically. These key wells were used along with the other monitored wells for the creation of water level contour maps and water level hydrographs. Most of the known wells in the Subbasin are either missing or have limited well construction information. Therefore, the **data gap** will be addressed with the following the steps below. 1. Further review of acquired well logs; 2. Conducting down-hole video surveys of wells; and 3. Installing additional monitoring wells as funds become available. While there are limitations associated with using water level data from wells without construction information, we have performed an initial assessment of many of the available wells with a long period of record. This process allowed for the selection of wells that were used for developing an initial understanding of groundwater level variations throughout the Subbasin. It is understood that this snapshot of groundwater conditions is limited based on the unknown completion information about the wells and may change as construction data is obtained in the future.
Kaweah Subbasin Basin Setting	2.3.4	50	**2.3.4 Existing Stream Flow Monitoring:** The records of the stream groups impacting the facilities and stockholders of the ditch companies that they manage were acquired. Although ***data gaps*** exist, these may represent relatively small quantities of contributory flows. The records of the USGS are, for the most part, supplemental to the records of the Association and local agencies. The information that is published by the USGS, however, does fill some of the ***data gaps*** that exist in the information related to the local stream groups. Figure 20 shows the locations of stream flow gauges monitored within the Subbasin.
Kaweah Subbasin Basin Setting	2.8.4	141	**2.8.4 Recent Land Subsidence:** Recent and historical subsidence data are summarized in Table 43. It includes a summary of InSAR data published in a subsidence study commissioned by the California Water Foundation (LSCE, 2014), and by JPL. The InSAR data were collected from a group of satellites (Japanese PALSAR, Canadian Radarsat-2, and ESA's satellite-borne Sentinel-1A and -1B), from 2006 to 2017, with a ***data gap*** from 2011 to 2014 because there was a gap in satellite data collection until the ESA Sentinel satellites were launched in 2014.

Appendix 6
Sustainability Goal and Undesirable Results

SUSTAINABILITY GOAL AND UNDESIRABLE RESULTS

Appendix 6 to Kaweah Subbasin Coordination Agreement

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Appendix

6. Sustainability Goal and Undesirable Results

6.1 Introduction

This Appendix provides location-specific significant and unreasonable conditions as well as undesirable results for five of the six sustainability indicators to guide and support the Kaweah Subbasin Groundwater Sustainability Agencies (GSAs) in developing sustainable management criteria (SMC) in their individual groundwater sustainability plans (GSP). This Appendix includes the Subbasin-scale SMC guidance as required by 23 Cal. Code Regs. §§354.22-.26, i.e., the sustainability goal and a complete listing of undesirable results, including their causes, criteria and effects on beneficial uses and users. Pursuant to 23 Cal. Code Regs §354.26(d) no sustainable management criteria need to be set at this time for the undesirable results of Seawater Intrusion. Thus, pursuant to 23 Cal. Code Regs §354.26(e)[1], undesirable results associated with Seawater Intrusion will not be discussed herein.

6.2 General Approach

As described later in this Appendix, the Subbasin identified minimum thresholds, based on declining groundwater levels (hereinafter "water level" or "level") that result in significant and unreasonable results to the beneficial uses and users of groundwater within the Kaweah Subbasin. Measurable objectives are similarly based on using a trend line approach to afford the ability to provide a buffer for drought years prior to encountering minimum thresholds. The relationship of these measurable objectives and the long-term success in achieving the objectives is discussed in the context of neighboring GSAs in the Subbasin and their respective actions undertaken during GSP implementation.

The Kaweah Subbasin GSAs developed SMC within a framework of data, which currently has gaps. Every effort was made to coordinate SMC between the three GSAs. If SMCs (such as minimum thresholds and measurable objectives) vary substantially between adjacent GSAs, then the GSAs will endeavor to adjust the particular SMC as additional data becomes available so that the GSAs eliminate any substantial variance which could inhibit a GSA from implementing its GSP and achieving sustainability within its jurisdictional area.

The metrics and approaches to be employed by the Subbasin for the six sustainability indicators are shown in **Table 6-1**.

[1] 23 Cal. Code Regs §354.26(e) provides "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 minimum thresholds related to those sustainability indicators.

6.3 Sustainability Goal

23 Cal. Code Regs. § 354.24. *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 and 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.*

Table 6-1: Sustainable Management Criteria by Sustainability Indicator

SMC Summary for Kaweah Subbasin			
Sustainability Indicators		**Basis for Minimum Threshold**	**Basis for Measurable Objective**
	Chronic Lowering of Groundwater Levels	Protection of greater than the 90th percentile of all beneficial uses and users without allowing a greater rate of historical level decline[1]	Flexibility for at least 5 years of drought storage
	Reduction in Storage	Calculated based on groundwater levels[2]	Calculated based on groundwater levels[2]
	Land Surface Subsidence	Total subsidence of no more than 9 feet, and a subsidence rate of no more than 0.67 feet/year	Zero Subsidence
	Water Quality	Reference to other regulators [3]	Reference to other regulators [3]
	Seawater Intrusion	Not Applicable	Not Applicable
	Interconnected Surface Waters	50% of channel losses in selected waterways[4]	30% of channel losses in selected waterways[4]

[1] Determined by representative monitoring sites in Analysis Zones
[2] Storage volume changes and associated SMC determined as function of water level changes
[3] e.g. SWRCB Division of Drinking Water requirements for public supply wells, RWQCB Irrigated Lands Regulatory Program
[4] This indicator applies to the East Kaweah and Greater Kaweah GSAs. The two GSAs will be implementing a Work Plan to fill data gaps and better refine understanding of location and impacts caused by groundwater pumping

The broadly stated sustainability goal for the Kaweah Subbasin is for each GSA to manage groundwater resources to preserve the viability of existing agricultural enterprises of the region, domestic wells, and the smaller communities that provide much of their job base in the Sub-basin, including the school districts serving these communities. The goal will also strive to fulfill the water needs of existing and amended county and city general plans that commit to continued economic and population growth within Tulare County and portions of Kings County.

This goal statement complies with §354.24 of the Regulations. This Goal will be achieved by:

- The implementation of the EKGSA, GKGSA and MKGSA GSPs, each designed to identify phased implementation of measures (projects and management actions) targeted to ensure that the Kaweah Subbasin is managed

to avoid undesirable results and achieve measurable objectives by 2040 or as may be otherwise extended by DWR.

- Collaboration with other agencies and entities to arrest chronic groundwater-level and groundwater storage declines, reduce or minimize land subsidence where significant and unreasonable, decelerate ongoing water quality degradation where feasible, and protect the local beneficial uses and users.
- Assessments at each interim milestone of implemented projects and management actions and their achievements towards avoiding undesirable results as defined herein.
- Continuance of projects and management actions implementation by the three GSAs, as appropriate, through the planning and implementation horizon to maintain this sustainability goal.

6.4 Groundwater Levels

23 Cal. Code Regs § 354.26*(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.*

The terms "significant and unreasonable" are not defined by SGMA, and are left to GSAs to define within their GSPs. The process to define "significant and unreasonable" began with stakeholder and landowner discussions. In the view of the Kaweah Subbasin GSAs and its stakeholders, the following impacts from lowering groundwater levels are viewed as "significant and unreasonable" as they would directly impact the long-term viability of beneficial uses/users (domestic, agricultural, municipal, etc.) to meet their reasonable water demands through groundwater:

- Inability of the groundwater aquifer to recover in periods of average/above average precipitation following multi-year drought periods
- Dewatering of a subset of existing wells below the bottom of the well
- Substantial increase in costs for pumping groundwater, well development, well construction, etc. that impact the economic viability of the area
- Adverse effects on health and safety
- Interfere with other sustainability indicators

6.4.1 Causes leading to Undesirable Results

23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*

The primary cause of groundwater conditions that would lead to chronic lowering of groundwater levels is groundwater pumping in excess of natural and artificial recharge over a multi-year period

that includes both wetter than average and drier than average conditions. A transition to permanent crops and development of large dairies have both hardened water demand in all years. In addition to natural drought-cycles, the increase in groundwater pumping may also be the result of restricted access to imported supplies due to a variety of factors, including but not limited to, increased restrictions in the Delta, which may increase the likelihood imported supplies from Millerton Lake will be delivered outside the Kaweah Subbasin. The restriction of imported supplies may return the Kaweah Subbasin to a state it existed in prior to the development of the Friant Division of the Central Valley Project. Climate change may also affect the availability and rate upon which natural and artificial recharge is available.

6.4.2 Criteria to Define Undesirable results

23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (2) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

The GSAs within the Kaweah Subbasin have determined that undesirable results for groundwater levels may be significant and unreasonable when a subset of existing and active wells is dewatered. This is being described this way because the Subbasin has a significant data gap related to where all active wells are, how the active wells are constructed and how much the active wells are pumping. The Subbasin GSAs have plans to obtain this information from local landowners in the future. As this data gap is addressed, the description of an Undesirable Result for the Kaweah Subbasin will be further refined based on the more complete and accurate information.

Groundwater elevations shall serve as the sustainability indicator and metric for chronic lowering of groundwater levels and, by proxy, for groundwater storage. An Undesirable Result occurs when one-third of the monitoring sites exceed the respective minimum threshold groundwater elevation.

It is the preliminary determination, after consideration of all users and uses, that the values identified herein represent a sufficient number of monitoring sites in the Subbasin such that their exceedance would represent an undesirable result for water-level declines and reduction in groundwater storage. Total completion depth data for all beneficial users (agricultural, municipal, and domestic wells), as identified in the technical Appendix 6-1 and 6-2 attached to this Appendix, has been evaluated and undesirable results are defined by the quantity of wells completely dewatered by 2040 if Minimum Thresholds are met or exceeded. However, the Kaweah Subbasin GSAs are committing to implementing a Mitigation Program to mitigate certain impacts to active wells as groundwater levels transition to a more sustainable long-term condition (see Appendix 6-3). Based on future observed groundwater levels and not less frequently than at each five-year assessment, the GSAs will evaluate whether these values need to be changed.

6.4.3 Evaluation of Multiple Minimum Thresholds

> 23 Cal. Code Regs § 354.26 *(c). The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

The Kaweah Subbasin GSAs will utilize multiple wells to monitor and manage the GSAs and Subbasin. A detailed description of each GSA's monitoring network are included in the Monitoring Network Section of their respective GSPs.

6.4.4 Potential Effects on Beneficial Uses and Users

Using the above-described criteria, the GSAs evaluated potential undesirable results to agricultural, domestic, industrial, and municipal beneficial uses. Overall, based on the best available data, the projects and management actions to be implemented by each GSA are predicted to decelerate and arrest chronic lowering of groundwater levels by 2040. Potential impacts to wells associated with groundwater level declines in the transition period between 2020 and 2040 were evaluated through an analysis of well completed depths (see Appendix 6-1). Potential effects of lowered groundwater levels on the various beneficial uses of groundwater in the Kaweah Subbasin are as follows:

Agricultural – Potential effects to agricultural beneficial uses and users from lowered groundwater levels include financial impacts to lower pumps, repair/replace wells, and increased pumping costs. Analysis of well depths that could be affected by lowering groundwater levels to the minimum thresholds has been completed (see Appendix 6-2).

Domestic – Some domestic uses and users of groundwater may be impacted by continued lowering of groundwater levels during the transition period from January 2020 to December 2040. Analysis of well depths that could be affected by lowering groundwater levels to the minimum thresholds has been completed (see Appendix 6-2). Lowering groundwater levels below the total depth of shallow domestic wells could lead to added costs to haul in water supplies, tie into other available supplies, consolidation with existing water service providers, or requiring other form of mitigation

Industrial & Municipal – Potential effects to industrial beneficial uses and users from lowered groundwater levels include financial impacts to lower pumps, repair/replace wells, and increased pumping costs. Analysis of well depths that could be affected by lowering groundwater levels to the minimum thresholds has been completed (see Appendix 6-2).

To address potential effects on agricultural, domestic and industrial beneficial uses and ensure access to water until the Subbasin reaches a sustainable groundwater level condition, each GSA will adopt a Mitigation Program or Programs consistent with the framework described further in the next section. Because of this mitigation, the resulting impacts as described herein during the implementation period are not considered significant and unreasonable.

6.4.5 Mitigation Program

The Subbasin is committing to developing a Mitigation Program that evaluates and protects beneficial users from lowering groundwater levels and subsidence. The core tenants of well mitigation are coordinated here; however, each GSA will develop and implement GSA-specific programs based on the localized needs of their jurisdictions. The GSAs will take appropriate action to implement the Program no later than June 30, 2023. The key factors to be included are listed below. A draft well mitigation plan template is included in Appendix 6-3.

- Identification of the priority wells to be mitigated, with approximate quantification
- An investigation and vetting process to confirm well priority and impacts
- A listing of the mitigation methods, including both short and long-term options
- Estimated costs of mitigation methods and funding mechanism(s)
- Implementation schedule

6.5 Groundwater Storage

> 23 Cal. Code Regs § 354.26*(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.*

The Groundwater Storage minimum thresholds are the same as groundwater levels and groundwater elevations across the GSA and Subbasin and were used to calculate the amount of groundwater in storage below the Minimum Thresholds to the base of the aquifer. An undesirable result in groundwater storage may be significant and unreasonable if the total amount of water in storage was less than the estimated amount of groundwater in storage below the Minimum Threshold or other factors identified in section 6.4 occur.

6.5.1 Causes leading to Undesirable Results

> 23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*

Undesirable results associated with groundwater storage are caused by the same factors as those contributing to groundwater level declines. Given assumed hydrogeologic parameters of the Subbasin, direct correlations exist between changes in water levels and estimated changes in groundwater storage.

6.5.2 Criteria to Define Undesirable results

23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (2) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

The water-level sustainability indicator is used as the driver for calculated changes in groundwater storage. Given assumed hydrogeologic parameters of the Subbasin, direct correlations exist between changes in water levels and estimated changes in groundwater storage, and water levels are to serve as a metric for groundwater storage reductions as well. As such, when one-third of the Subbasin representative monitoring sites for water levels exceed their respective minimum thresholds, an undesirable result for storage will be deemed to occur. The current estimated volume of groundwater in storage in the Subbasin of 15 to 30 MAF is sufficient such that further depletion over the implementation period is not of a level of concern such that an undesirable result would emerge during the GSP implementation period.

6.5.3 Potential Effects on Beneficial Uses and Users

23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interest, and other potential effects that may occur or are occurring from undesirable results.*

The potential effects to beneficial uses and users of reductions in groundwater storage are essentially the same as for declines in water levels. In most cases, the direct correlation is with declines in levels; however, some beneficial uses may be tied more specifically to loss of groundwater in storage.

6.6 Land Subsidence

23 Cal. Code Regs § 354.26*(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.*

Land subsidence may be considered significant and unreasonable if there is a loss of a functionality of a structure or a facility to the point that, due to subsidence, the structure or facility cannot reasonably operate without either significant repair or replacement.

6.6.1 Causes leading to Undesirable Results

23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*

Geology - The geology of the Subbasin appears to have greater potential for subsidence the further west you go. Generally, it is understood that the multi-aquifer area has the greatest potential for subsidence due to the presence of the deep confined aquifer. However, even in the single aquifer area, there are disconnected clays that appear to be deposited similarly to the Corcoran Clay. These clays also have the potential to subside, but do not seem to have the high potential of other areas because the aquifer is not fully confined. This speaks to why there is still subsidence in eastern portions of the Subbasin, east of the Corcoran Clay.

Deep Aquifer - The Subbasin understands that deep pumping from pressurized aquifer zones is primarily related to subsidence. In the Kaweah Subbasin this would generally be below the Corcoran Clay. However, the specific zone below the Corcoran Clay that is subsiding is not currently known. It is also understood that some small component of subsidence is related to water level declines in the upper aquifer.

Declining Levels & Drilling Deeper - The Subbasin understands that the chronic lowering of groundwater levels is related to the triggers for subsidence. As groundwater levels decline, landowners choose to drill deeper wells to restore their access to available groundwater supplies. When new deeper wells are drilled, the geology below the previous well and above the base of the new well is subjected to new impacts from the new well. Generally, the Subbasin views the effort to stabilize groundwater levels as critical to future success in dealing with subsidence. As groundwater pumping is reduced across the Subbasin, groundwater level declines will diminish, and fewer wells will be drilled deeper which will reduce the development of subsidence across the Subbasin.

Undesirable results associated with subsidence are caused groundwater pumping from deep wells that tap pressurized zones with fine grained deposits that experience declining groundwater levels. Some GSA Management Areas experience greater adverse impacts than others. Over-pumping during drought periods, which may result in new lows in terms of groundwater elevations, is of particular concern based on current scientific understanding of subsidence trends in this region.

6.6.2 Criteria to Define Undesirable results

23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (2) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

The Kaweah Subbasin GSAs understand that impacts from subsidence have been occurring in the Kaweah Subbasin for many years. However, the rate of subsidence has seemed to increase significantly around 2007. Deep wells have collapsed with compression failures, the ground surface has slowly changed elevations over time, and some linear systems dependent on grade have experienced capacity reductions. Also, during the same period many other facilities have not experienced those negative impacts, and why some have versus others not is still very difficult to understand. Shallow wells are generally not viewed as being at risk of subsidence impacts. The

Kaweah Subbasin GSAs have attempted to consider all local infrastructure, land uses and groundwater users relative to current and potential subsidence impacts and develop a view of groundwater conditions (Minimum Threshold elevations) that would avoid Undesirable Results in the Subbasin.

The Kaweah Subbasin GSAs understand that groundwater wells are very important infrastructure for all landowners across the Subbasin. For this reason, the Kaweah Subbasin GSAs view that an Undesirable Result (UR) would occur if a significant portion of the existing deep wells in the Kaweah Subbasin became inoperable (collapsed) due to subsidence. The Kaweah Subbasin GSAs understand that the Friant-Kern Canal is a facility of statewide importance (critical infrastructure) that delivers San Joaquin River surface water to parties in the Kaweah Subbasin and beyond. For that reason, the Kaweah Subbasin GSAs also view that a UR would occur if the capacity of the Friant-Kern Canal was significantly impacted by subsidence. The Kaweah Subbasin GSAs understands that local flood control channels are very important infrastructure for all landowners across the Kaweah Subbasin. For that reason, the Kaweah Subbasin GSAs view that a UR would occur if the capacity of flood control channels in the Subbasin are significantly impacted by subsidence. And lastly, the Kaweah Subbasin GSAs understand that certain main canals are very important for landowners across the Kaweah Subbasin because their function is critical to continued use of surface water in Subbasin, which reduces demand for groundwater and provides the ability to recharge aquifers in wet years. For that reason, the Kaweah Subbasin GSAs view that a UR would occur if the capacity of certain main canals in the Subbasin are significantly impacted by subsidence.

Subsidence RMS sites will be monitored for ground surface elevation annually each fall. The primary criteria for evaluation will be the reduction in land surface elevation from the beginning of the Implementation Period (if that data is available). There will be two methods of identifying an Undesirable Result (UR) for the Subbasin. For the area outside of the Friant-Kern Canal alignment, when one-third of the Subbasin RMSs outside the Friant-Kern Canal band decline below their respective MT elevations, that will be viewed as a UR. For a one-mile band on either side of the Friant-Kern Canal, if any of the MT elevations in that band reach an MT elevation that will be viewed as a UR.

The primary criteria and metric the GSAs will monitor will be the total amount of reduction in land surface elevation and areal extent of such elevation changes.

For many of the impacts listed above, subsidence is only a problem when it is differential in nature i.e., elevation shifts across the areal extent of infrastructure deemed of high importance. For example, subsidence linearly along a major highway is manageable if gradual in its occurrence. In contrast, localized subsidence traversing across a highway, if sizable, would cause major cracking of the pavement surface and become a significant hazard to travelers. The same comparisons may be made for other infrastructure as well.

If an exceedance of a minimum threshold at a monitoring site occurs, the applicable GSA will reach out to the County, cities, water districts, and others, both public and private, and inquire as to any infrastructure that has been damaged which may require a corrective course of action if

deemed necessary. A broad areal extent of land subsidence thus may not be of major concern, with the exception of the associated loss of aquifer system water storage capacity.

6.6.3 Potential Effects on Beneficial Uses and Users

> 23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interest, and other potential effects that may occur or are occurring from undesirable results.*

The Kaweah Subbasin GSAs understand that impacts from subsidence have been occurring in the Kaweah Subbasin for many years. Some of the understood impacts are briefly discussed below:

Flood Channels - Rivers and creeks generally begin in watersheds in the foothills and mountains east of the Subbasin and flow downhill to the southwest toward the historic Tulare Lake. Part of the Kaweah Subbasin's history involves regular floods, and that is why dams were built on local rivers and streams to protect communities and farmlands from regular flood events. However, even though the dams exist, they only provide protection up to a certain magnitude flooding event. Subsidence has not been observed to diminish the capacity of local flood channels, but it theoretically could impact capacity under the right circumstances. Also, subsidence could cause a change to the amount of sediment that is moved by the system. However, there are parties responsible for the maintenance of these channels and incremental impacts are likely being addressed through maintenance.

Local Flooding - Ground surface changes can affect flood zones as well as flood control levees. Local flood control levees are maintained by agencies responsible for maintaining their effectiveness. In 2017 a local flood control levee was raised by several feet to address subsidence concerns, but that was the first such project on that levee in decades and it was completed in just a few months. The planned development of new recharge projects and the increased use of wet year surface water should more than mitigate potential modifications to existing flood zones.

Local Canals - These linear facilities are very important related to GSA Management Strategies. If their capacity is significantly impacted, it may require GSAs to shift to greater pumping reductions.

Regional Canals - These linear facilities, like the Friant-Kern Canal, usually have regional significance and have users across large sections of the Southern San Joaquin Valley. The cost of repairing subsidence impacts on these facilities are too expensive for the Kaweah Subbasin to bear. For that reason, other management strategies like pumping restrictions to stabilize groundwater levels will be imposed instead.

Shallow Wells - Shallow wells that do not have significant exposure to the confined aquifer below the Corcoran Clay do not appear to be at risk from subsidence.

Deep Wells - Wells that have significant exposure to the confined aquifer below the Corcoran Clay are at risk of collapse due to subsidence that is mostly linked to that zone. A preliminary estimate of significant and unreasonable impacts can be established by looking at well construction practices. Subsidence mainly occurs in the deeper aquifers, and therefore well collapse due to subsidence typically only affects deeper wells. Conversations with local well drillers and suppliers

indicates that deeper wells are now commonly outfitted with compression sleeves (personal communication). These compression sleeves allow well casings to telescope in response to subsidence, preventing casing collapse (Turnbull, 2022). Each compression sleeve allows 6 feet of compression, and often wells are equipped with 1 or 2 sleeves (personal communication). This allows for 6 to 12 feet of subsidence without causing collapse.

Railroads - There are several railroads throughout the Subbasin that convey goods along predefined routes and the facilities also have flood control structures, like culverts, along their alignments. The observed grade changes that have occurred from subsidence do not appear to be significant for local railroads and their culverts appear to be staying stable with adjacent properties. However, steep localized subsidence can be a significant issue in terms of the cost of repairs.

Natural Gas Pipelines - Along Highway 99 there is a significant natural gas pipeline. Over the past several years this facility has been worked on at various points, but it appears the efforts related to issues other than subsidence.

Differential land subsidence may impact surface infrastructure such as building foundations, paved streets/highways, and water conveyance systems.

The Kaweah Subbasin GSAs have attempted to consider all local infrastructure, land uses and groundwater users relative to current and potential subsidence impacts and develop a view of groundwater conditions (MT elevations) that would avoid Undesirable Results in the Subbasin. Again, the Kaweah Subbasin GSAs view that stabilized groundwater levels as critical to the future success of dealing with subsidence. As groundwater pumping is reduced across the Subbasin, groundwater level declines will diminish, and fewer wells will be drilled deeper which will reduce the development of subsidence across the Subbasin.

6.6.4 Evaluation of Multiple Minimum Thresholds

> 23 Cal. Code Regs § 354.26 *(c). The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

The Kaweah Subbasin GSAs will use measurements taken at multiple subsidence benchmarks and Interferometric Synthetic Aperture Radar (InSAR) data to monitor and manage subsidence in the GSA and Subbasin. A detailed description of each GSA's monitoring networks are included in the Monitoring Networks Section of their respective GSPs.

6.6.5 Mitigation Program

The Subbasin is committing to developing a Mitigation Program that evaluates and protects beneficial users from certain land subsidence impacts. The core tenants of subsidence mitigation are coordinated in the Mitigation Program through this Coordination Agreement; however each GSA will develop and implement GSA-specific programs based on the localized needs of their jurisdictions. The GSAs will

take appropriate action to implement the Program no later than June 30, 2023. The key factors to be included below. A draft well mitigation plan template is included in Appendix 6-3.

- Identification of the priority land surface infrastructure to be mitigated, with approximate quantification
- An investigation and vetting process to confirm priority and impacts
- A listing of the mitigation methods, both short and long-term options
- Estimated costs of mitigation methods and funding mechanism(s)
- Implementation schedule

6.7 Degraded Water Quality

> 23 Cal. Code Regs § 354.26*(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.*

An undesirable result may be significant and unreasonable if groundwater quality is adversely impacted by groundwater pumping and recharge projects and these impacts result in groundwater no longer being generally suitable for agricultural irrigation and/or domestic use.

6.7.1 Causes leading to Undesirable Results

> 23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*

Undesirable results associated with water quality degradation can result from pumping localities and rates, as well as other induced effects by implementation of a GSP, such that known plumes and contaminant migration could threaten production well quality. Well production depths too may draw out contaminated groundwater, both from naturally occurring and man-made constituents which, if MCLs are exceeded, may engender undesirable results. Declining groundwater levels may or may not be a cause, depending on location. In areas where shallow groundwater can threaten the health of certain agricultural crops, rising water levels may be of concern as well.

6.7.2 Criteria to Define Undesirable results

> 23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (2) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

Should one-third of all Subbasin designated water quality monitoring sites exhibit a minimum threshold exceedance, and those exceedances are all associated with GSA actions, an undesirable result will be deemed to occur. Groundwater quality degradation will be evaluated relative to established MCLs or other agricultural constituents of concern set by applicable regulatory agencies. The metrics for degraded water quality shall be measured by MCL compliance or by other constituent content measurements where appropriate. These metrics will include measurements for the following constituents where applicable:

- Arsenic
- Nitrate
- Chromium-6
- DBCP
- TCP
- PCE
- Sodium
- Chloride
- Perchlorate
- TDS

As explained in Section 5.3.4, in regions where agriculture represents the dominant use of groundwater, Agricultural Water Quality Objectives will serve as the metric as opposed to drinking water MCLs within public water supply jurisdictions. An exceedance of any of the MCL or Agricultural Water Quality Objectives as defined herein at any representative monitoring sites will trigger a management action within the applicable Management Area or GSA, subject to determination that the exceedance was caused by actions of the GSA. MCLs and water quality objectives are listed in each of the Kaweah Subbasin GSPs and these are subject to changes as new water quality objectives are promulgated by the State of California and the Federal EPA. The Subbasin will provide updates in our annual reports and GSP Updates throughout the implementation periods of 2020 to 2040.

6.7.3 Potential Effects on Beneficial Uses and Users

> 23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interest, and other potential effects that may occur or are occurring from undesirable results.*

The potential effects of degraded water quality from migrating plumes or other induced effects of GSA actions include those upon municipal, small community and domestic well sites rendered unfit for potable supplies and associated uses, and/or the costs to treat groundwater supplies at the well head or point of use so that they are compliant with state and federal regulations. Potential

effects also include those upon irrigated agricultural industries, as certain mineral constituents and salt build-up can impact field productivity and crop yields.

6.7.4 Evaluation of Multiple Minimum Thresholds

> 23 Cal. Code Regs § 354.26 *(c). The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

The Subbasin, in coordination with other GSAs in the basin will utilize multiple wells to monitor water quality and manage the GSA and basin. A detailed description of the GSA's monitoring network is included in the Monitoring Networks Section of their respective GSPs.

6.8 Interconnected Surface Waters

Interconnected surface waters within the Kaweah Subbasin are a significant data gap that needs more development through collection of additional data and further studied through the development of a technical analysis tool. The East Kaweah and Greater Kaweah GSAs are developing a work plan to collect data and analyze interconnected surface water presence and potential impacts from groundwater pumping (see Management Action Section of each respective GSP for more detail on these work plans.

6.8.1 Causes Leading to Undesirable Results

> 23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*

Undesirable results associated with interconnected surface waters are understood to be caused by several factors. Some of these factors may include groundwater pumping, drier hydrology, and changes within the upper watershed, or some combination of those factors. Within the Kaweah Subbasin, there are currently significant data gaps related to understanding the potential locations of interconnected surface waters and their nexus to depletions caused by groundwater pumping. More information is intended to be developed and shared through a work plan being coordinated and implemented by the East and Greater Kaweah GSAs. The preliminary schedule for the work plan is in Table 6-2. Pending data gathered and/or timing of such data, there may be shifts or re-ordering of phases/tasks to better adapt and facilitate completion.

Table 6-2 Anticipated Interconnected Surface Water Work Plan Schedule

Phase	Description	Estimated Timeline
1	Additional research; data gap filling (monitoring well installation, stream gauge installation, etc.); data collection	October 2022 – June 2024
2	Analytical Tool Development – the type of tool will be determined with additional data and research	March 2023 – December 2023
3	Interconnection Analysis and Determination	January 2024 – July 2024
4	SMC Development and Incorporation into 2025 GSP	July 2024 – January 2025

6.8.2 Criteria to Define Undesirable results

23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (2) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

The Kaweah Subbasin (East Kaweah and Greater Kaweah GSAs specifically) are implementing a work plan that is intended to provide a clearer definition of where potentially interconnected surface waters are located and to what extent adverse impacts related to groundwater pumping are present and can be defined and quantified. At the current time (July 2022), the primary criteria and metric for defining and quantifying adverse impacts and undesirable results will be the estimated percentage of losses within potentially interconnected channels, measured as a rate or volume of depletion of surface water, until the work plan provides more information. Currently, there is not sufficient data to definitively set rate of depletions on other data. Increased channel losses reduce the amount of surface water that can be delivered throughout the Kaweah Subbasin. Delivery of surface water is a critically important part of sustainably managing the Kaweah Subbasin, thus impacts that reduce the ability to deliver surface water can become significant and unreasonable and ultimately lead to an undesirable result. The initial percentages being used for SMC are 50% losses due to groundwater pumping for the MT and 30% losses due to groundwater pumping for the MO. The East Kaweah and Greater Kaweah GSS will implement a work plan intended to fill data gaps by the 2025 GSP Update. Better definition and criteria for significant and unreasonable impacts and, ultimately, undesirable results in the locations identified as having interconnected surface waters are envisioned to be available from the proposed work plan.

6.8.3 Potential Effects on Beneficial Uses and Users

> 23 Cal. Code Regs § 354.26 *(b). The description of undesirable results shall include the following: (3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interest, and other potential effects that may occur or are occurring from undesirable results.*

Currently identified potential beneficial uses/users related to interconnected surface water within the East and Greater Kaweah GSA regions of the Kaweah Subbasin are surface water users, riparian and/or groundwater dependent ecosystems, and water rights holders. As more data becomes available, the Work Plan may add or subtract to these uses/users in whole or part of the reaches of the selected waterways. The potential effects of depletions to interconnected surface water, when approaching or exceeding minimum thresholds and thus becoming an undesirable result include:

- Increased losses in interconnected surface waterways used for surface water conveyance, reducing water supply reliability and volumes.
- Negatively and significantly impacting the health of riparian and/or groundwater dependent ecosystems.
- Violating laws and doctrines governing California's surface water rights.

6.8.4 Evaluation of Multiple Minimum Thresholds

> 23 Cal. Code Regs § 354.26 *(c). The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

The Kaweah Subbasin GSAs will utilize a variety of methods, to be determined based on data gained through the implementation of the work plan, to monitor and manage interconnected surface waters in the GSA and Subbasin. Further detail necessary for properly evaluating interconnected surface water and the potential relationship to groundwater pumping in the Kaweah Subbasin is anticipated to be gained through implementation of the work plan.

6.9 Seawater Intrusion

6.9.1 Undesirable results

> 23 Cal. Code Regs § 354.26 *(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.*

There is no potential for seawater intrusion to occur in the Kaweah Subbasin as described more thoroughly in the basin setting. Thus, no criteria need to be established.

Appendix 6-1 of the Coordination Agreement

Technical Approach for Developing Chronic Lowering of Groundwater Levels Sustainable Management Criteria in the Kaweah Subbasin

MONTGOMERY & ASSOCIATES
Water Resource Consultants

July 27, 2022

Technical Approach for Developing Chronic Lowering of Groundwater Levels Sustainable Management Criteria in the Kaweah Subbasin

Prepared for:

East Kaweah Groundwater Sustainability Agency
Greater Kaweah Groundwater Sustainability Agency
Mid-Kaweah Groundwater Sustainability Agency

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ACRONYMS & ABBREVIATIONS

DWR .....California Department of Water Resources
EKGSA .....East Kaweah Groundwater Sustainability Agency
GKGSA.....Greater Kaweah Groundwater Sustainability Agency
GSA.....Groundwater Sustainability Agency
GSP .....Groundwater Sustainability Plan
MKGSA .....Mid-Kaweah Groundwater Sustainability Agency
MO .....measurable objective
MT.....minimum threshold
SGMA .....Sustainable Groundwater Management Act
SMC .....Sustainable Management Criteria
Subbasin.....Kaweah Subbasin
WCR .....Well Completion Report

1 INTRODUCTION

This technical report describes the methodology applied to a revision of the chronic lowering of groundwater level sustainable management criteria (SMC) for the San Joaquin Valley - Kaweah Subbasin (Subbasin). The revisions are in response to the California Department of Water Resources (DWR) incomplete determination of the three Groundwater Sustainability Plans (GSPs) submitted in January 2020. The three GSPs are being implemented by three Groundwater Sustainability Agencies (GSAs) covering the entirety of the Subbasin: East Kaweah GSA, Greater Kaweah GSA, and Mid-Kaweah GSA (Figure 1).

DWR provided a staff report with a statement of findings explaining the incomplete determination for the Subbasin GSPs. The staff report states, "The Plan does not define sustainable management criteria for chronic lowering of groundwater levels in the manner required by Sustainable Groundwater Management Act (SGMA) and the GSP Regulations." DWR's findings specified the following:

1. *The GSPs do not define metrics for undesirable results and minimum thresholds based on avoiding a significant and unreasonable depletion of groundwater supply, informed by, and considering, the relevant and applicable beneficial uses and users in their Subbasin.*
2. *The GSPs do not describe specific potential effects from the chronic lowering of groundwater levels and depletion of supply that would be significant and unreasonable to beneficial uses and users of groundwater, on land uses and property interests, and other potential effects and, therefore, constitute an undesirable result.*
3. *The GSPs do not consider how minimum thresholds developed for one sustainability indicator will affect other related sustainability indicators."*

The GSAs are given up to 180 days from the receipt of DWR's staff report to address the deficiencies for chronic lowering of groundwater levels SMC. This report provides the technical support to fulfill that purpose.

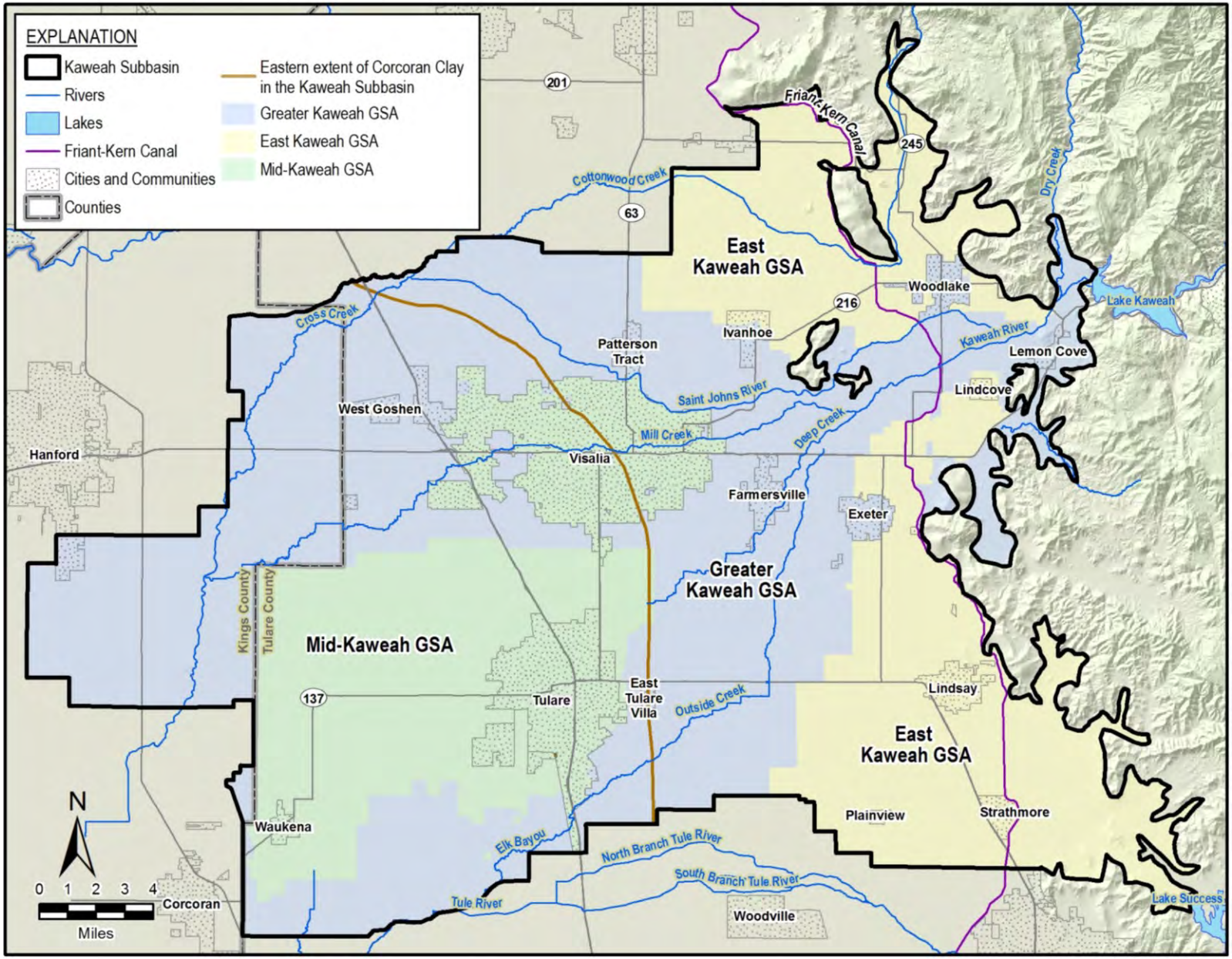

Figure 1. Groundwater Sustainability Agencies in the Kaweah Subbasin

1.1 General Approach Used to Develop Sustainable Management Criteria

Chronic lowering of groundwater levels SMC are developed to protect relevant and applicable beneficial uses and users of groundwater in the Subbasin. Beneficial users of groundwater are domestic pumpers, disadvantaged communities, small water systems (2 to 14 connections), municipal water systems (>14 connections), agricultural pumpers, California Native American Tribes, environmental users, and entities engaged in monitoring and reporting groundwater elevations. Understanding the types of users and their access to groundwater is the first step taken to inform what the GSAs and their stakeholder groups consider significant and unreasonable impacts to those users.

Since wells are how users access groundwater, the approach used to develop SMC is based on water supply well depths. The depth of wells across the Subbasin varies by depth to groundwater and beneficial user type. Because of well depth variability, the Subbasin is subdivided into analysis zones based on GSP management area boundaries, clusters of beneficial user types, aquifers, and completed well depths. Completed well depth statistics inform significant and unreasonable groundwater levels, with the SMC being based on protecting at least 90% of all water supply wells in the Subbasin.

1.2 Data Sources and Quality Control

Information used for establishing the chronic lowering of groundwater levels SMC include:

- Completed depths, screen depths, and locations of wells installed since January 1, 2002, and included in DWR's Well Completion Report (WCR) dataset (Figure 2). Only well records drilled since 2002 are used for analysis to filter out wells that may have been abandoned or no longer represent typical modern depths for active wells and current groundwater elevations. Data download date was March 1, 2022.
- Historical groundwater elevation data from DWR's California Statewide Groundwater Elevation Monitoring Program, SGMA Portal Monitoring Network Module, and individual water agencies.
- Maps of current and historical groundwater elevation contours.

The WCR dataset does not contain a complete accurate dataset, however, it is the best public source of data available. Approximately one-third of the wells drilled from 2002 on did not have well completion depths and could not be used in the analysis. For purposes of well depth analyses, we assumed the available wells with depth information are typical of depths in the Subbasin.

Well logs were reviewed for wells with completion depths less than 100 feet. This review generally found that either 1) the planned well use field was incorrectly classified as a water supply well when it was supposed to be a destroyed or remediation well, or 2) the completed well depth field was the depth of the conductor casing (often 50 feet) and not the bottom of the completed well. These inaccuracies were corrected. Furthermore, where coordinates of wells are unavailable, DWR locates the well in the middle of the Public Land Survey System section.

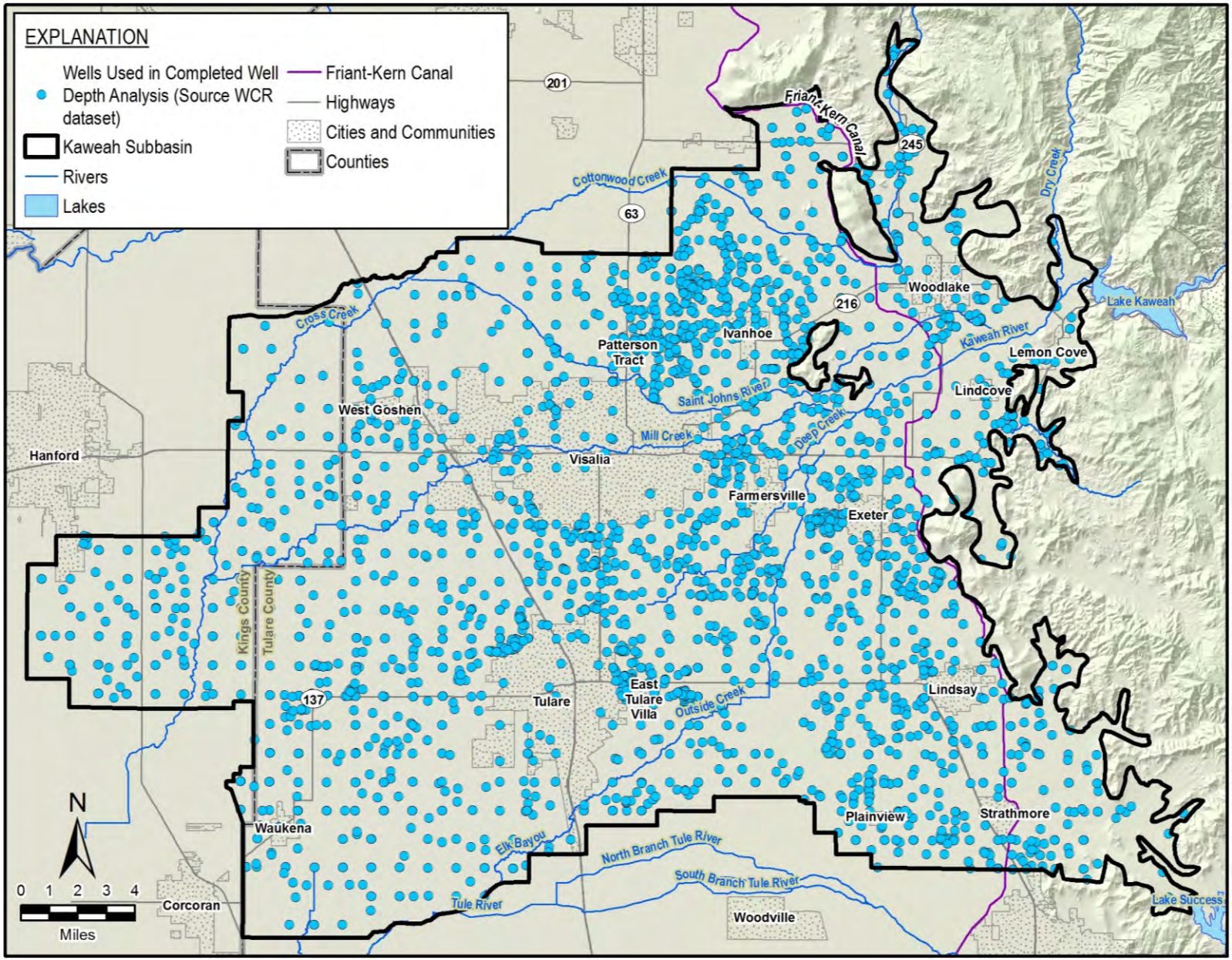

Figure 2. Location of WCR Water Supply Wells Used for Completed Well Depth Analysis

2 PROCESS USED TO ESTABLISH MINIMUM THRESHOLDS

Minimum thresholds (MTs) are derived from groundwater elevations that protect at least 90% of all water supply wells drilled since January 1, 2002, in each analysis zone, and that do not result in a greater rate of decline over water years 2020 to 2040 than experienced over a specific historical time period. Groundwater elevations representing MTs are set at representative monitoring sites identified in the Monitoring Network section of the GSPs.

The process for developing MTs is based on a comparison of three methodologies. The process is generally to:

1. Develop analysis zones based on GSP management areas, aquifer type, beneficial user types, and similar completed well depths (described in Section 2.1.1).
2. Identify water supply wells drilled since January 1, 2002, with well screen depth information or a completed well depth.
3. Designate water supply wells to either the Upper, Lower, or Single Aquifer System based on a set of assumptions (described in Section 2.1.2).
4. Designate representative monitoring sites to either the Upper, Lower, or Single Aquifer System (described in Section 2.1.2).
5. Estimate MT depths through Methodology 1 by calculating the 90th percentile well completion depth for water supply wells in each analysis zone and aquifer (described in Section 2.1.3).
6. Apply the 90th percentile protective depth corresponding to the representative monitoring sites' aquifer designation and analysis zone (described in Section 2.1.4).
7. Estimate MT depths through Methodology 2 by projecting relevant base period groundwater level trends to 2040 for each representative monitoring site (described in Section 2.1).
8. Compare elevations resultant from protective depths (Step 6) and projecting a groundwater levels trend out to 2040 (Step 7). The initial MT for the representative monitoring site is the higher elevation of the two methods (Figure 3).
9. Contour the representative monitoring site MTs obtained in Step 8 for the unconfined aquifers (Single and Upper Aquifer Systems) to determine if the MT surface is relatively smooth. If there are anomalous MTs, remove the anomalous points and interpolate the final MT elevations at these points from MT contours generated by excluding the anomalous sites. This is shown as Method 3 in Figure 3.

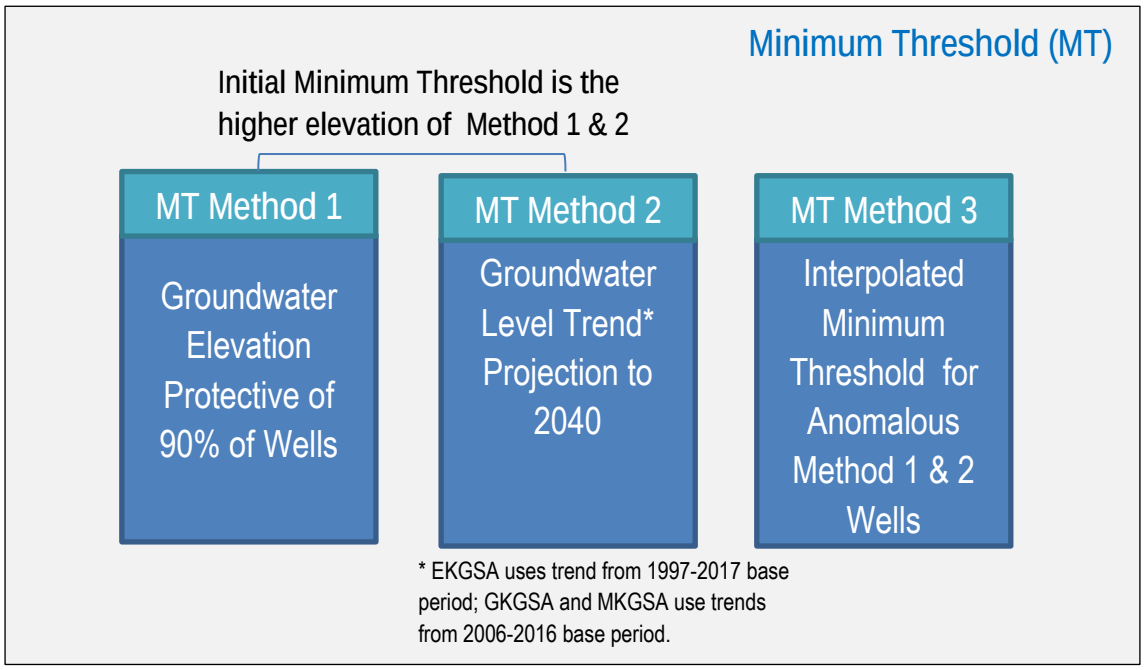

Figure 3. Minimum Threshold Methodologies

2.1 Methodology 1, Protective Elevations

The primary methodology for establishing MTs is designed to protect at least 90% of all wells in the Subbasin. This approach is protective of most beneficial uses and users of groundwater. The 90% threshold was chosen in acknowledgment that it is impractical to manage groundwater to protect the shallowest wells. More importantly, the GSAs wanted to set elevations based on well records of active wells, and not wells that may be destroyed or replaced. Because there is no active well registry to provide more accurate records, there is uncertainty regarding which wells are active. For example, the 2012-2016 drought was a period when approximately 480 wells in the Subbasin were reported dry according to the DWR's Dry Well Reporting System and a record number of wells were drilled in the Subbasin (Figure 4). Wells replaced by new deeper wells during this time are those that are presumed part of the shallowest 10% of wells in the dataset used to determine protective elevations. In consideration of the abovementioned factors, the GSA Managers selected 90% so that the dataset used to establish minimum thresholds contained well records reflective of current active wells.

Given approximately 10% of wells are shallower than the protected elevations, the GSAs in the Subbasin are in the process of establishing a Well Mitigation Program to assist impacted well owners.

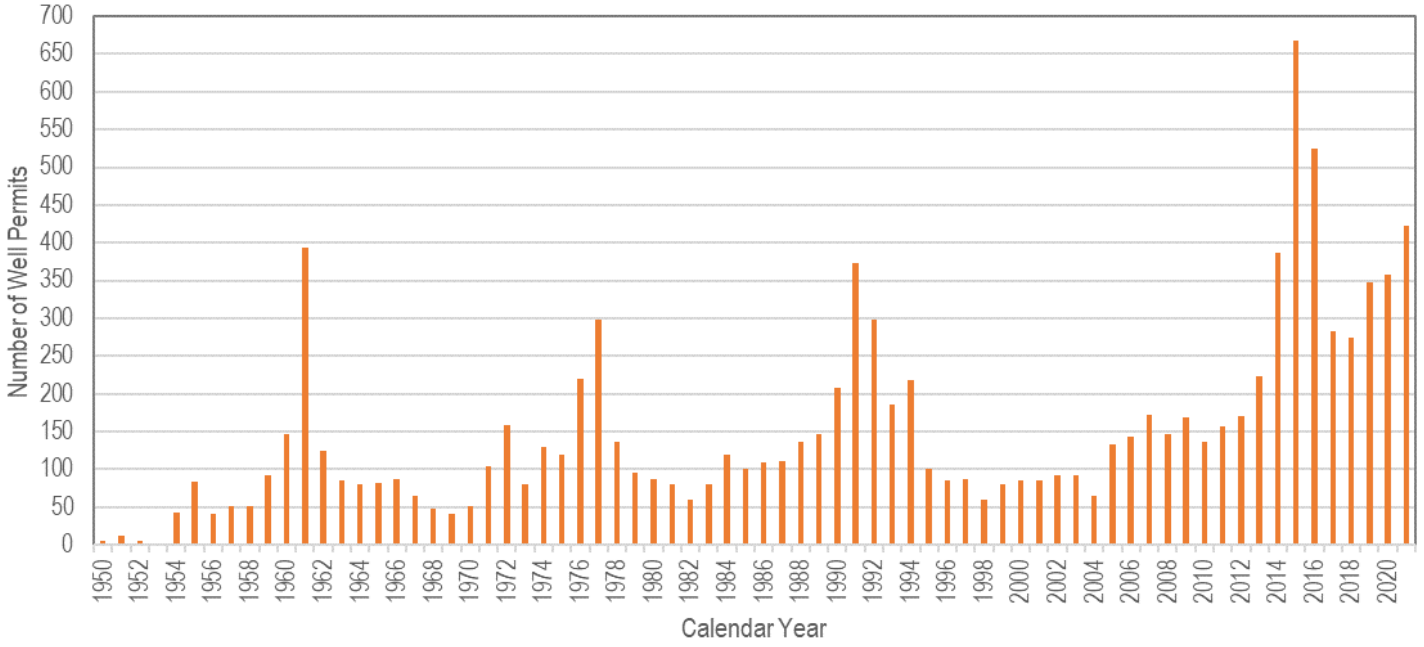

Figure 4. Annual Number of Water Supply Wells Drilled in the Kaweah Subbasin from 1950 to 2021

A total of 3,353 water supply well records from the WCR dataset are used for identifying significant and unreasonable groundwater elevations for beneficial groundwater users and uses. Criteria used to select well records from the WCR dataset include:

- The wells are drilled after January 1, 2002
- The wells are water supply wells with a planned purpose of domestic supply (includes DACs and private domestic wells), agricultural use, industrial use, or public supply (includes small water systems and municipal wells), and
- The wells have completed well depth data.

2.1.1 Analysis Zones

Because well depths vary with location, unique protective elevations are set for analysis zones that divide the Subbasin. The analysis zones are intended to group wells that would experience similar impacts by accounting for GSP management areas, groundwater elevations, base of aquifer, aquifer type, beneficial user type, land use, and similar completed well depths. A total of 39 spatial analysis zones are delineated (Figure 5). Twenty-three zones (analysis zones 1-23) cover the Single Aquifer System east of the limit of the Corcoran Clay shown on Figure 5. Sixteen zones (analysis zones 24-39) underlain by Corcoran Clay are split into an Upper and Lower Aquifer System based on the depth of the Corcoran Clay (described in Section 2.1.2). The Corcoran Clay is delineated vertically and spatially from recent airborne electromagnetic data acquired in the Subbasin by Stanford University (Kang *et al*., 2022).

2.1.2 Aquifer Designations

Aquifer designations are assigned to wells in the WCR dataset and the GSAs' representative monitoring sites based on available construction information and Corcoran Clay extent, depth, and thickness. As shown on Figure 6, the Corcoran Clay is a prominent confining geologic unit that underlies the western portion of the Subbasin and pinches out below the eastern portion of the Subbasin. The clay surface dips slightly with shallower occurrence to the east than the west. The Corcoran Clay is between 290 and 490 feet deep and up to 80 feet thick in the Subbasin.

All wells located east of the Corcoran Clay extent are designated as in the Single Aquifer System (Figure 6). Where the Corcoran Clay is present, wells are designated as Upper Aquifer System if the bottom of the well is above the bottom of the Corcoran Clay, and Likely Upper if the bottom of the well is within 50 feet of the bottom of the Corcoran Clay. Wells are designated as Lower Aquifer System if the top of its screen is within or below the Corcoran Clay. Wells are designated as Likely Lower if the total depth of the well with unknown screen depth is more than

50 feet below the bottom of the Corcoran Clay, or it is screened from less than 50 feet below the Corcoran Clay to more than 50 feet below the Corcoran Clay.

For wells without construction information that are underlain by the Corcoran Clay, groundwater level hydrographs are compared with hydrographs of other wells with construction information in the same analysis zone to determine in which aquifer the well is likely screened. Wells are designated as assumed Upper or assumed Lower Aquifer System based on similarities in seasonal and long-term groundwater level trends. Groundwater level hydrographs for representative monitoring sites are grouped by analysis zone and aquifer in Appendix A.

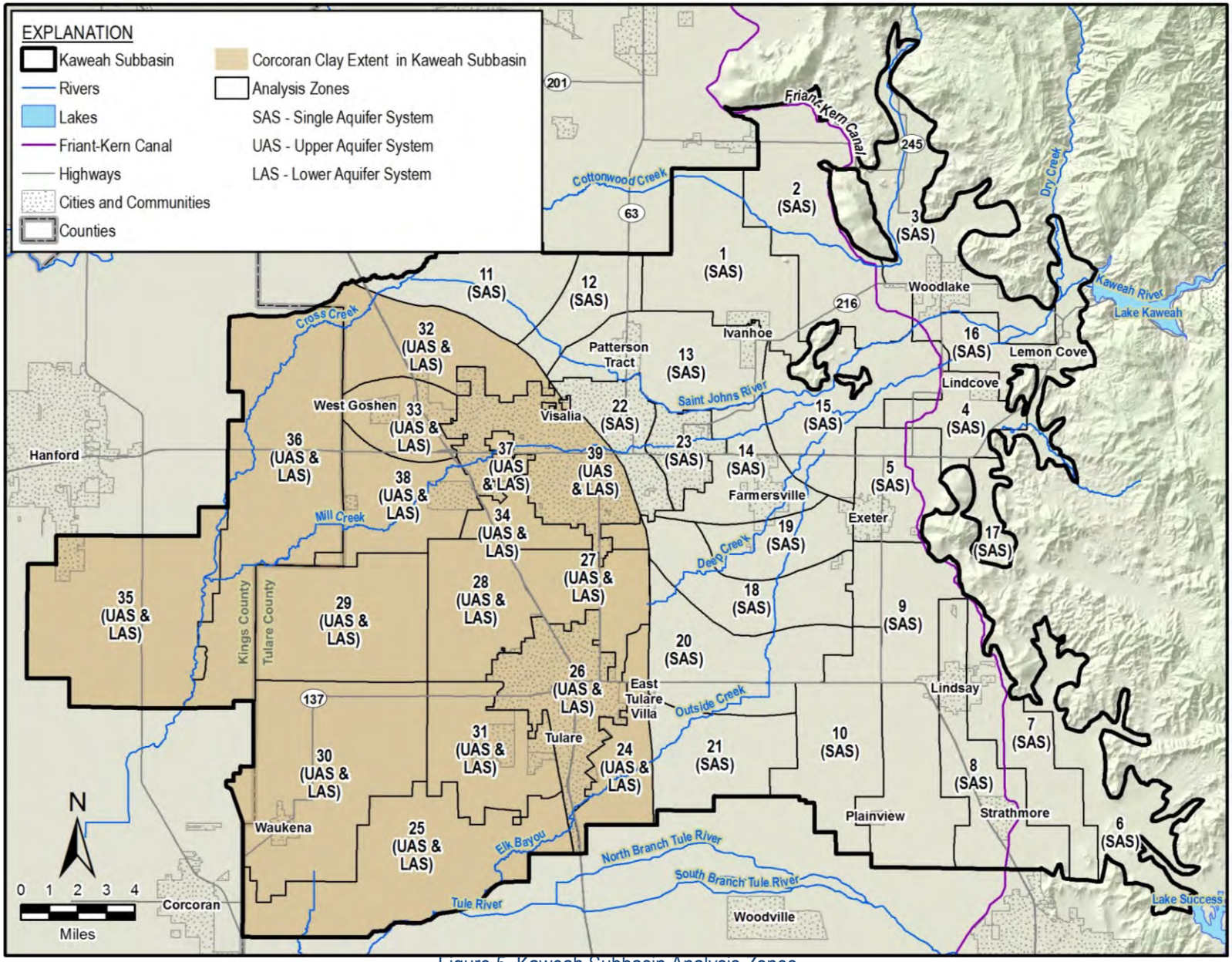

Figure 5. Kaweah Subbasin Analysis Zones

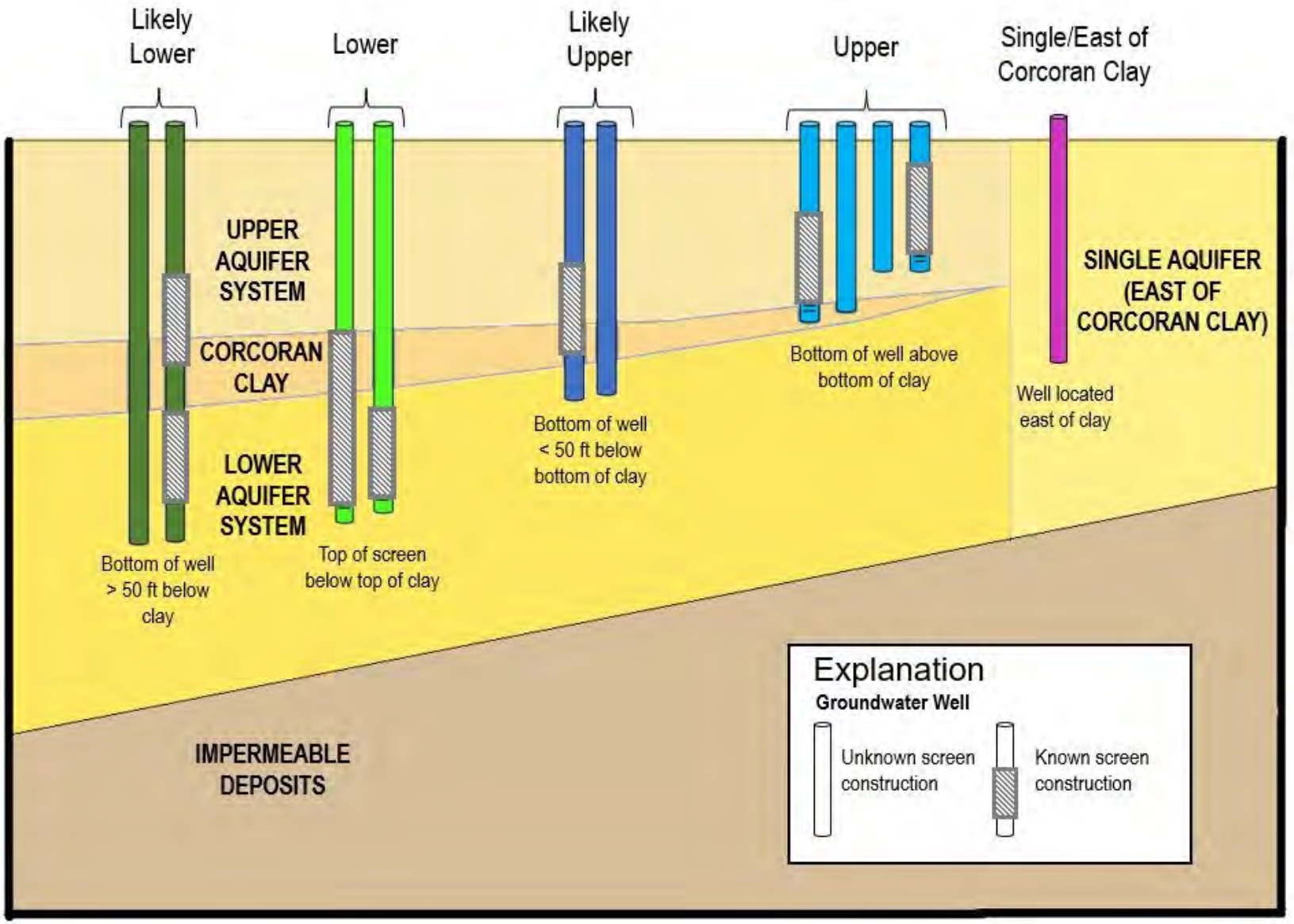

Figure 6. Kaweah Subbasin Aquifer Designation Assumptions

2.1.3 Completed Well Depth Analysis

Completed well depth is analyzed rather than total depth or depth of screens for the following reasons.

- Total depth drilled is typically deeper than the completed depth. Sometimes the difference can be quite large if the bottom portion of the well is not considered water bearing enough by the driller and is backfilled up to where the well is to be screened.
- More wells in the WCR dataset have completed depth information than well screen information. Of the wells with completed well depth information, 80% of those wells have screen depths. Since it is typical that wells are screened near the bottom of the completed well, more wells could be used in the analysis if completed well depth is used rather than screen depth.

Completed well depths vary by well use type, depth to groundwater, and aquifer. Figure 7 though Figure 13 depict the distribution of well use type and completed well depths across the Subbasin. Figure 7 shows a histogram of completed well depths across the entire Subbasin. Wells used in analysis are designated an aquifer system according to the assumptions outlined in Section 2.1.2.

Most wells in the Subbasin are completed to depths between 100 and 700 feet. The most common completed well depth is 350 to 400 feet, with about 700 total wells drilled to this depth. Well depth by type and aquifer is reviewed to assess which beneficial users would be impacted by lower groundwater levels. Figure 8 through Figure 10 are aquifer-specific histograms of completed well depth by well use type. Most supply wells in the Subbasin are either used for agricultural or domestic water supply. Agricultural wells are more numerous than other types of water supply wells and also cover the widest range of depths, including the deepest depths of all wells. Overall, the shallowest wells tend to be domestic supply wells with few domestic wells installed deeper than 450 feet. There are relatively fewer public supply wells, with the majority less than 450 feet deep, although there are some that are deeper than 800 feet.

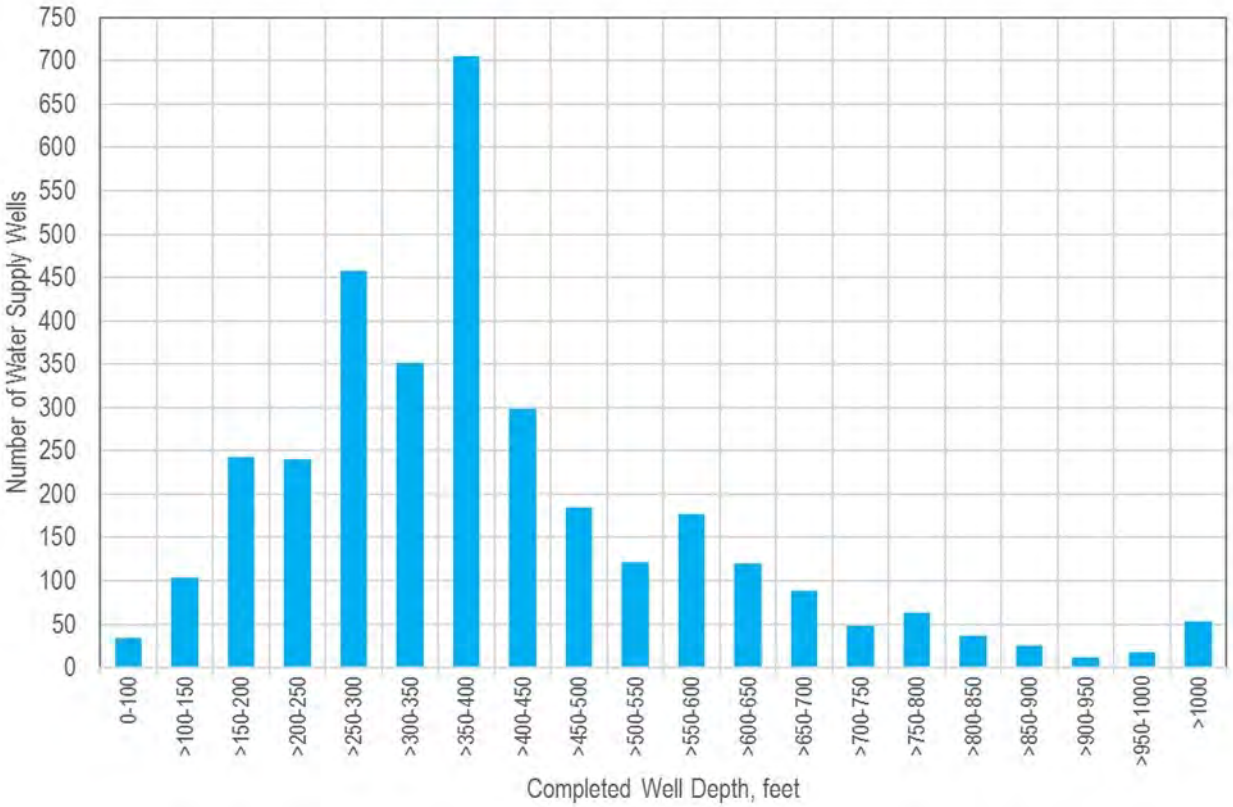

Figure 7. Histogram of Completed Wells Depths for Water Supply Wells in the Kaweah Subabsin

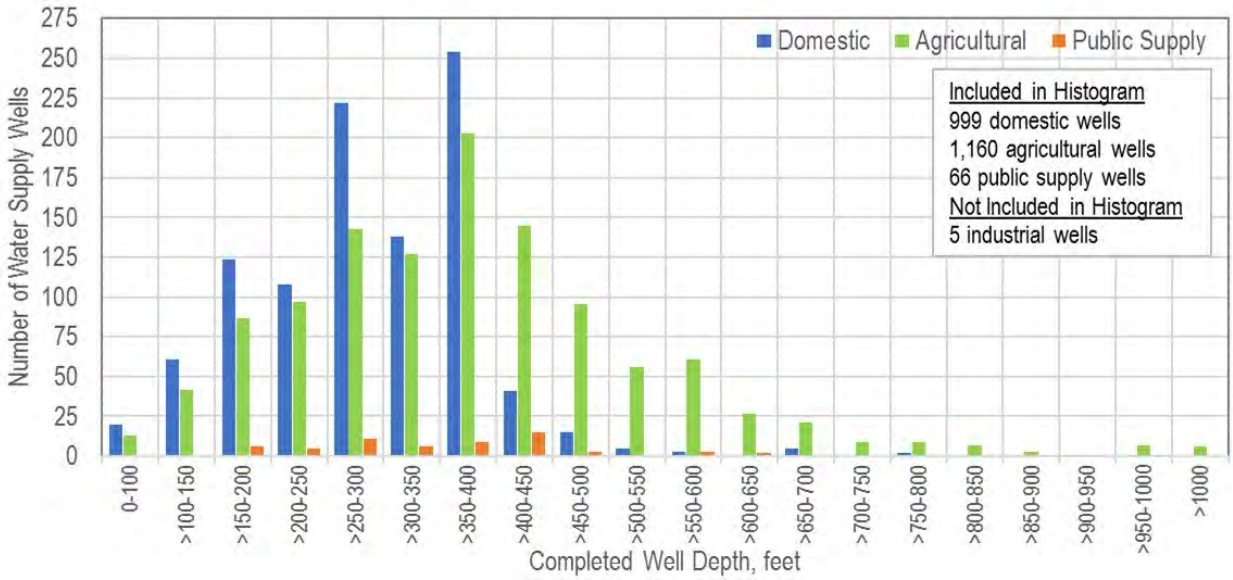

Figure 8. Histogram of Completed Well Depths for Single Aquifer System Water Supply Wells

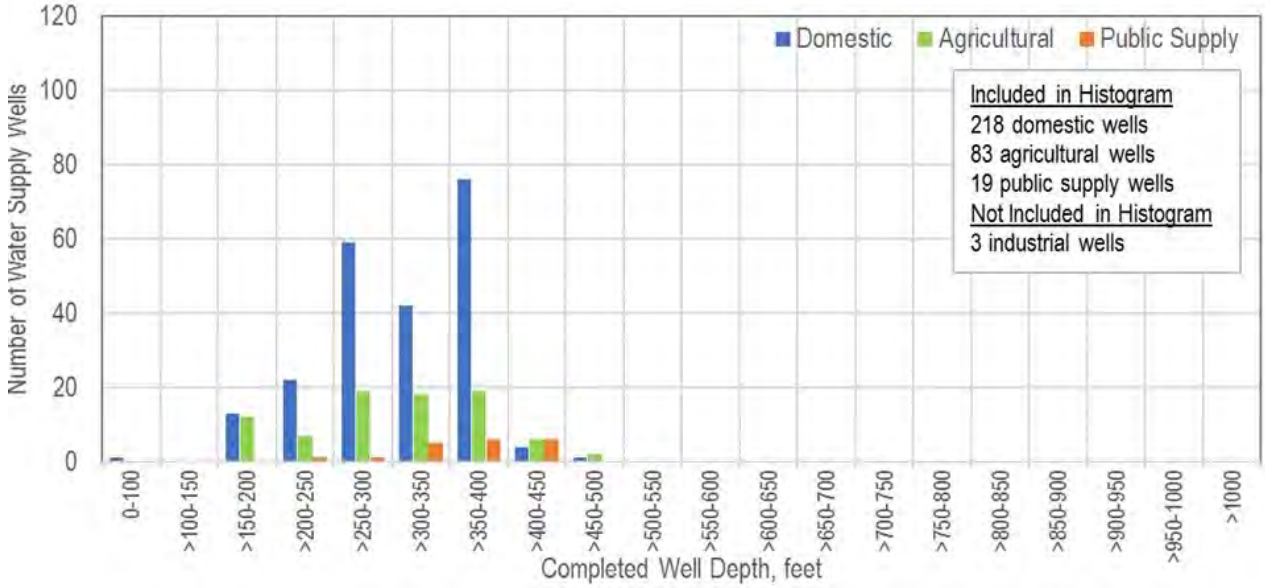

Figure 9. Histogram of Completed Well Depths for Upper Aquifer System Water Supply Wells

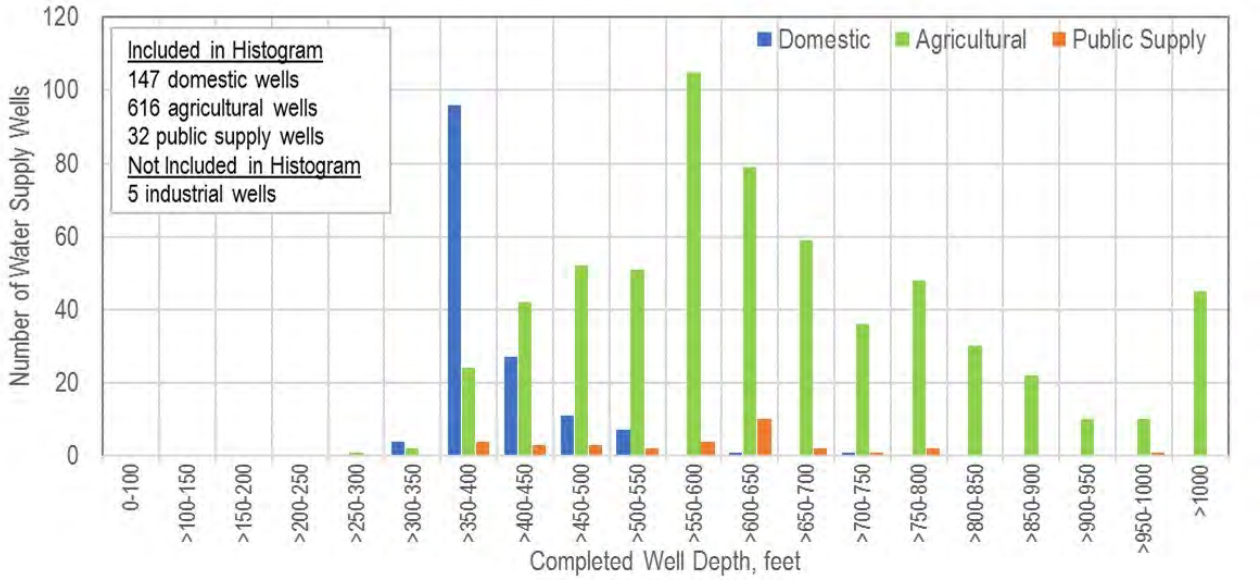

Figure 10. Histogram of Completed Well Depths for Lower Aquifer System Water Supply Wells

The number, depth, and type of water supply wells completed in each of the three aquifer systems are summarized below:

- The Single Aquifer System contains the most wells (2,232) and greatest well density (6.1 wells per square mile) of the three aquifer systems. It also has some of the shallowest wells in the Subbasin, with depths less than 100 feet (Figure 8). It has similar numbers of domestic (999) and agricultural wells (1,160), though overall domestic wells are shallower. About 60% of wells shallower than 200 feet in the Single Aquifer System are domestic wells and about 40% are agricultural wells.
- The Upper Aquifer System has the fewest total wells of the three aquifers (323) and has a well density of about 1 well per square mile. About 2.5 times as many domestic wells (218) as agriculture supply wells (83) are completed in the Upper Aquifer System, as shown on Figure 9. The shallowest wells in the Upper Aquifer System are between 150 and 200 feet, which is slightly deeper than the Single Aquifer System. This is because groundwater levels are deeper in the western portion of the Subbasin underlain by the Corcoran Clay. About 60% of wells in the top 100 feet of the saturated Upper Aquifer System (from 150 to 250 feet) are domestic wells and 40% are agricultural wells.
- The Lower Aquifer System wells are screened mostly below the Corcoran Clay and are generally deeper than 300 feet (Figure 10). The dataset analyzed has 803 wells and a well density of about 2.5 wells per square mile. About 77% of wells screened in the Upper Aquifer System are agricultural wells (616). However, since most domestic wells are installed shallower than 450 feet and most agricultural wells are installed deeper than 450 feet, there are more domestic wells than agricultural wells in the shallower portions of the Lower Aquifer System. In total, about 65% of wells that are less than 450 feet deep are domestic wells and 35% are agricultural wells.

Completion well depths are evaluated by analysis zone because their depths vary spatially due to different groundwater depths across the Subbasin. Appendix B contains histograms of completed well depth by water use type and analysis zone. Figure 11 through Figure 13 show the proportions of well use types distributed across the Subbasin by analysis zone. By grouping wells in analysis zones, the predominant well use depths in the zone influence statistics used to determine protective groundwater elevations. For example, analysis zone 19 on Figure 11 has more domestic wells than other well use types which means the completed depth statistics derived from wells in the zone are influenced more by domestic wells than other use types.

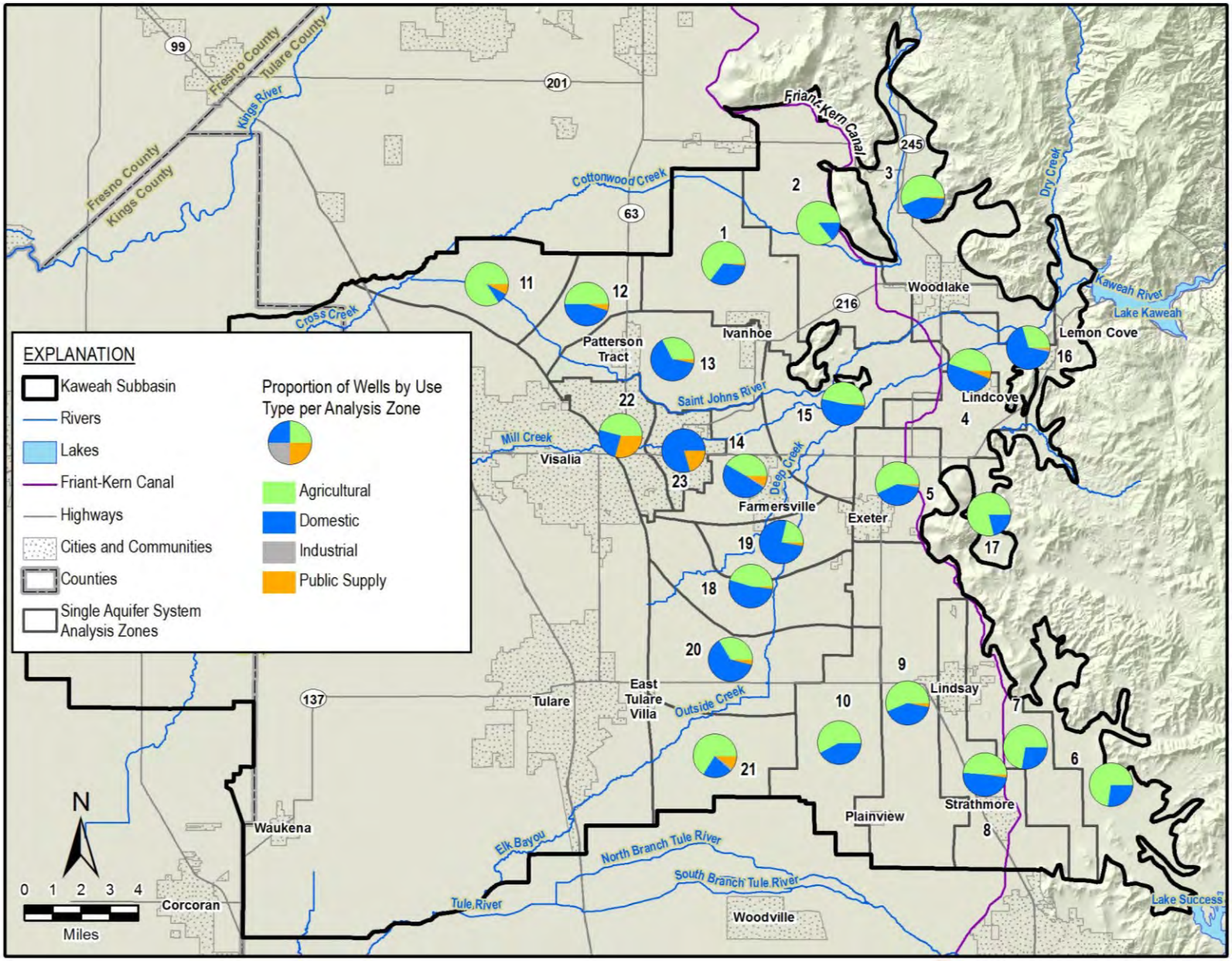

Figure 11. Single Aquifer System Well Use Types by Analysis Zone

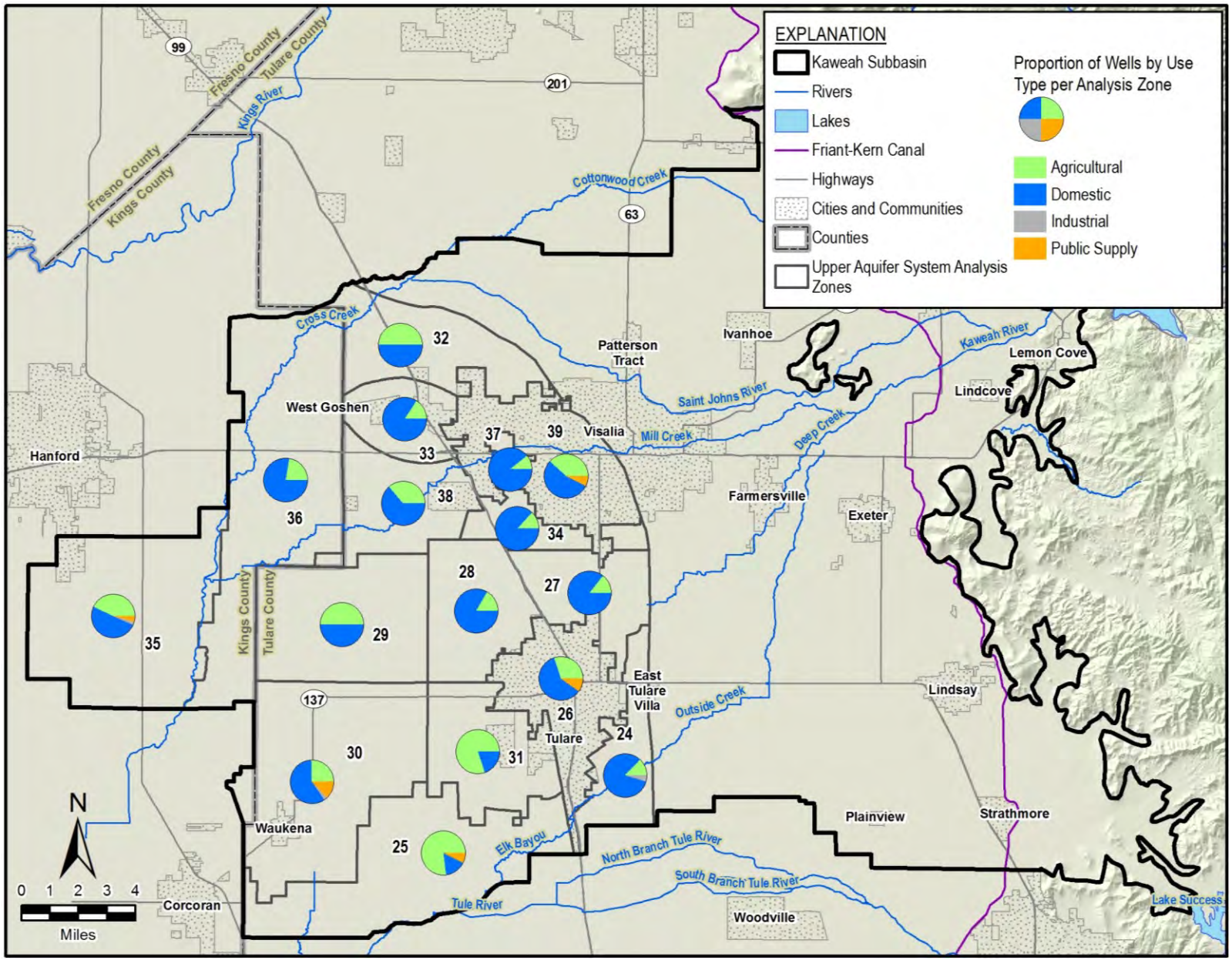

Figure 12. Upper Aquifer System Well Use Types by Analysis Zone

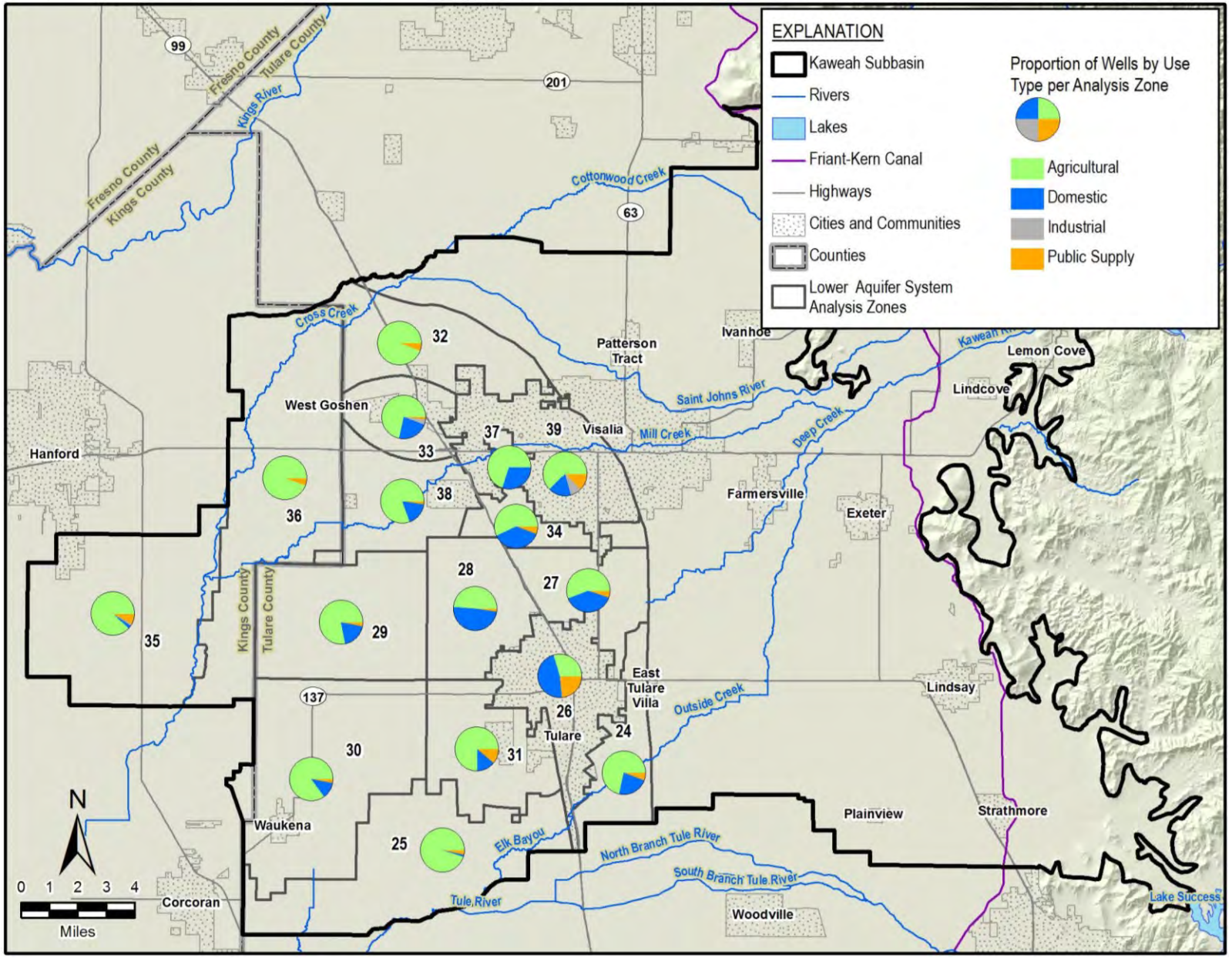

Figure 13. Lower Aquifer System Well Use Types by Analysis Zone

Well type spatial variability within the various aquifer systems is described below:

- The Single Aquifer System wells are relatively evenly split between domestic and agricultural use as shown on Figure 11. Wells around the margins of the Subbasin, including analysis zones 1, 2, 3, 11, and 17 are predominantly used for agriculture, while wells near the Kaweah River distributaries in the middle of the Subbasin such as zones 16, 19, 20, and 23 are predominantly used for domestic purposes. Visalia is the only area with greater than 20% public supply wells (analysis zones 22 and 23).

- The Upper Aquifer System is predominantly pumped by domestic wells as shown on Figure 12. However, there are parts of the Subbasin that are not heavily populated and nearly all wells are used for agriculture (analysis zones 25 and 31). Other areas with a relatively even number of domestic and agricultural supply wells include analysis zones 29 and 35 to the west and 32 to the north. Public supply wells make up less than 20% of all wells in each analysis zone, with the most concentrated distribution near Waukena (analysis zone 30).

- The Lower Aquifer System is primarily pumped by agricultural wells but there are a few areas near Tulare and Visalia where domestic wells make up between 25% to 50% of all wells (Zones 26, 27, 28, 34, and 37). Areas with the greatest number of public supply or industrial wells are in Tulare (analysis zone 26) and Visalia (analysis zone 39).

2.1.4 Protective Elevations

To calculate a groundwater elevation minimum threshold based on protection of active water supply wells, a statistical approach using percentiles was taken to develop a realistic view of active wells given well status uncertainties. A percentile well depth, or percentage of wells that would be deeper than a particular depth, was calculated for each analysis zone and aquifer. For example, the 90th percentile well depth (for wells ranked from deepest to shallowest), is the depth that 90% of wells are deeper than or equal to. This means 10% of wells are shallower than the 90th percentile depth. The 10% shallowest completed well depth are not used in the analysis as it is likely they are no longer active.

Selecting the 90th percentile recognizes the uncertainty in the accuracy and completeness of the DWR WCR dataset and accounts for destroyed or replaced shallower wells. The impracticability of managing the Subbasin to the shallowest wells is an additional factor leading to consensus amongst the three GSAs to, at a minimum, protect 90% of all water supply wells.

The 90th percentile completed well depths are calculated for each of the analysis zones by aquifers using the data described in Section 1.2. The analysis was not performed on a particular

well use type but for all water supply wells within each analysis zone. Figure 14 shows the protective elevation depths for the three aquifer systems by analysis zone.

Protective well depths follow similar trends as the well completion statistics. The protective well depths are generally shallowest for the Single Aquifer System (Table 1), followed by the Upper Aquifer System, with the deepest protective depths in the Lower Aquifer System. The median protective well depth is 200 feet for the Single Aquifer System, 241 feet for the Upper Aquifer System, and 400 feet for the Lower Aquifer System. The range of protective depths are 100 to 378 feet for the Single Aquifer System, 168 to 300 feet for the Upper Aquifer System, and 380 to 606 feet for the Lower Aquifer System.

Table 1. Summary of Protective Elevations Statistics by Aquifer

Aquifer	90th Percentile Protective Depth (feet below ground surface)		
	Minimum	Median	Maximum
Single Aquifer System	100	200	378
Upper Aquifer System	168	241	300
Lower Aquifer System	380	400	606

The number of well records in the WCR dataset with construction information, above or below the protective elevation are summarized in Table 2. As mentioned previously, some of these shallow wells are likely destroyed and replaced with deeper wells, Domestic well depths tend to be shallower than wells used for other purposes, so a slightly higher number and percentage of domestic wells are potentially impacted by groundwater declines compared to other wells. Of the 297 wells shallower than the 90th percentile well depth, 58% are domestic wells, 39% are agricultural wells, and 3% are public supply wells. However, in total, 90% of all well types installed since January 2002 are deeper than protective well depths, including 88% of domestic wells, 94% of agricultural wells, and 92% of public supply wells. Although the full set of WCR wells lacks construction information for many wells, if it is assumed the percentages of well use type and depth are the same for the full set of WCR wells as the subset of wells with construction information, the subset percentages may be used to scale up the number of potentially impacted wells to the full set of WCR wells.

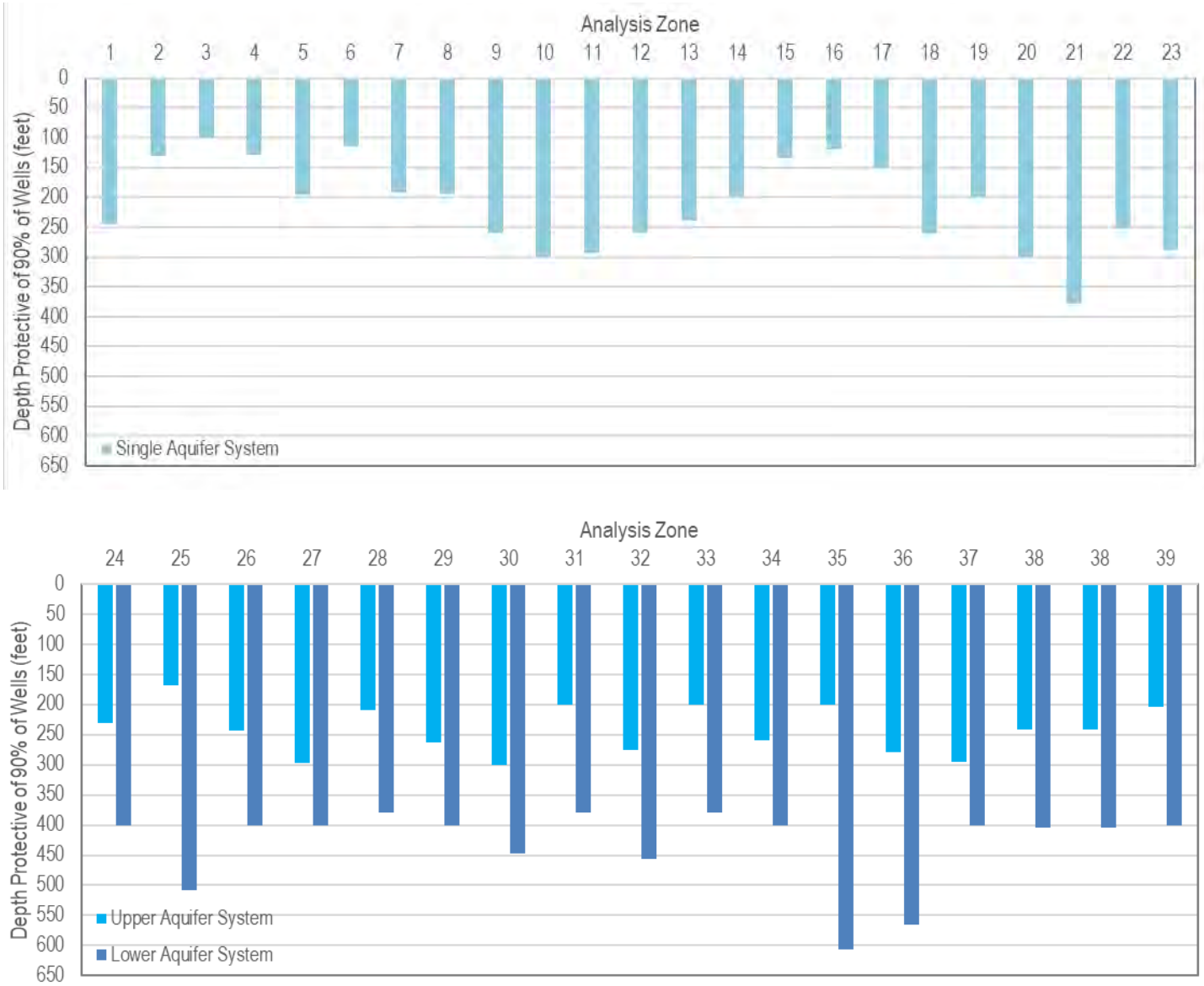

Figure 14. Analysis Zone Depths Protective of 90% of Water Supply Wells in the Kaweah Subbasin

Table 2. Summary of Basinwide Potential Well Impacts of Groundwater Levels at 90% Protective Depths Using WCR Well Records with Construction Information

Well Use Type	Deeper than 90% Protective Depth		Shallower than 90% Protective Depth		Total Number
	Number of Wells Deeper than the Protective Depth	Well Use Type Percentage	Number of Potentially Impacted Wells	Well Use Type Percentage	
Domestic	1,193	39%	171	58%	1,364
Agricultural	1,742	57%	117	39%	1,859
Public Supply	108	4%	9	3%	117
Industrial	13	0%	0	0%	13
Total	3,056		297		3,353

The number of well records in the WCR dataset of wells with construction information, potentially impacted at the 90% protective depth for each of the three aquifer systems are summarized in Table 4. Domestic wells in the Single Aquifer System will be the most impacted if groundwater levels fall to the protective elevation, followed by agricultural wells. Lower Aquifer System agricultural wells will be impacted more than domestic wells because of the greater number of agricultural wells in the Lower Aquifer System (Figure 10). The Upper Aquifer System has the least potentially impacted wells, with more domestic wells than agricultural wells potentially impacted.

Table 3. Summary of Potential Well Impacts of Groundwater Levels at 90% Protective Depths by Aquifer Using WCR Well Records with Construction Information

Well Use Type	Single Aquifer System		Upper Aquifer System		Lower Aquifer System		Total
	Number of Potentially Impacted Wells	Well Use Type Percentage	Number of Potentially Impacted Wells	Well Use Type Percentage	Number of Potentially Impacted Wells	Well Use Type Percentage	
Domestic	135	63%	19	68%	17	30%	171
Agricultural	74	35%	9	32%	34	61%	117
Public Supply	4	2%	0	0%	5	9%	9
Industrial	0	0%	0	0%	0	0%	0
Total	213		28		56		297

The East Kaweah Groundwater Sustainability Agency (EKGSA) and Greater Kaweah Groundwater Sustainability Agency (GKGSA) areas are those with the greatest number of wells shallower than the 90% protective depth (Table 4). This is because the Single Aquifer System underlies all of the EKGSA and a portion of the GKGSA, and it is the aquifer with the largest number of potentially impacted wells above the 90% protective depth. The GKGSA has the greatest total number of potentially impacted wells and the Mid-Kaweah Groundwater Sustainability Agency (MKGSA) has the fewest. The GSA areas are shown on Figure 1. Table 4 also summarizes the density of potentially unprotected wells within each GSA area. The EKGSA has the greatest overall density at 0.63 wells per square mile, GKGSA has 0.42 wells per square mile, and MKGSA the lowest density at 0.22 wells per square mile.

The protective elevation for each representative monitoring site is calculated by subtracting the analysis zone-specific 90th percentile protective depth from the representative monitoring site's surface elevation. Appendix C lists the 90% protective elevations for all the representative monitoring sites.

Table 4. Summary of Potential Well Impacts with Groundwater Levels at 90% Protective Depths by GSA Using WCR Well Records with Construction Information

Well Use Type	East Kaweah GSA			Greater Kaweah GSA			Mid-Kaweah GSA			Total
	Potentially Impacted Wells		Well Use Type Percentage in GSA	Potentially Impacted Wells		Well Use Type Percentage in GSA	Potentially Impacted Wells		Well Use Type Percentage in GSA	
	Number	Wells per Square Mile		Number	Wells per Square Mile		Number	Wells per Square Mile		
Domestic	58	0.32	52%	93	0.27	64%	17	0.10	49%	171
Agricultural	50	0.27	45%	47	0.14	32%	18	0.11	51%	117
Public Supply	3	0.02	3%	6	0.02	4%	0	0	0%	9
Industrial	0	0	0%	0	0	0%	0	0	0%	0
Total	111	0.61		151	0.43		35	0.22		297

2.2 Methodology 2, Groundwater Level Trend

This method extrapolates groundwater level trends for individual representative monitoring sites over a selected base period out to 2040. In all cases the trend is a decline with a rate that varies across the Subbasin. The EKGSA used a different base period than the GKGSA and MKGSA base period as described below. If the MT is derived from this method, it means groundwater levels are set to protect more than 90% of wells in the analysis zone while not allowing groundwater levels to decline at a greater rate than the base period.

In the EKGSA, groundwater level trends over a historical 21-year base period (1997-2017) are projected to 2040. EKGSA critically analyzed the projected 2040 groundwater levels and determined the magnitude of potential impacts likely to occur due to the current pumping and recharge regime. In cases where projected groundwater levels mirror the condition of the basin before the 1950s, when Central Valley Project brought in surface water supplies, or were not sufficiently protective of aquifer storage capacity it was determined that returning groundwater conditions similar to pre-1950 is undesirable. In EKGSA's eastern analysis zones (also called threshold regions), some initial MT elevations were increased due to the shallow depth to the bottom of the aquifer. Groundwater level MTs are established for each of the EKGSA's 10 analysis zones based on available groundwater level trend data for wells within each analysis zone. EKGSA representative monitoring sites within an analysis zone are therefore assigned the same MT groundwater elevations.

For representative monitoring sites in the GKGSA and MKGSA, the groundwater level trend base period projected to 2040 is the 11-year period from 2006 to 2016. The 2006-2016 base period represents a more recent period that reflects recent pumping patterns and includes the effects of the 2012-2016 drought. Unlike EKGSA which assigns a single MT to all representative monitoring sites within an analysis zone, GKGSA and MKGSA representative monitoring sites all have unique MTs based upon the 11-year groundwater level trend.

2.3 Methodology 3, Interpolated Minimum Threshold

After estimating MTs using methodologies 1 and 2, some GKGSA and MKGSA representative monitoring site MTs were determined to be anomalously low compared to neighboring monitoring sites because the wells' 2006-2016 groundwater level trend are much steeper than adjacent representative monitoring sites. There are four sites in the Single Aquifer System and three sites in the Upper Aquifer System where this occurs.

For representative monitoring sites with anomalously low MTs derived from the higher of Methodology 1 and 2 elevations, MTs were raised to an elevation determined by interpolating

from MT contours. The contours are generated from the representative monitoring site MTs without the seven sites as control points. Figure 15 identifies the resultant MT contours and identifies the seven sites with pre-adjusted and adjusted MTs labeled. The result of using Methodology 3 is that MTs were interpolated into a smooth surface of MTs without any significant level change ("cliffs") between representative monitoring sites.

2.4 Selection of Method to Use for Minimum Threshold

For each representative monitoring site, the elevations based on the 90% protective depth (Method 1) and groundwater levels trend (Method 2) are compared. The higher of the two elevations is selected as the MT. If the groundwater level trend elevation is higher than the protective elevation, more than 90% of wells in the analysis zone are protected. Appendix C includes the elevations for both methods and highlights the elevation of the method used for MTs.

Even though multiple methods are used by the GSAs to establish MTs, contours of MTs for the Single and Upper Aquifer Systems (unconfined) and the Lower Aquifer System (confined) onFigure 15 and Figure 16, respectively, demonstrate MTs across the Subbasin do not show abnormal differences between RMS and MTs decrease in elevation from east to west similar to groundwater elevations.

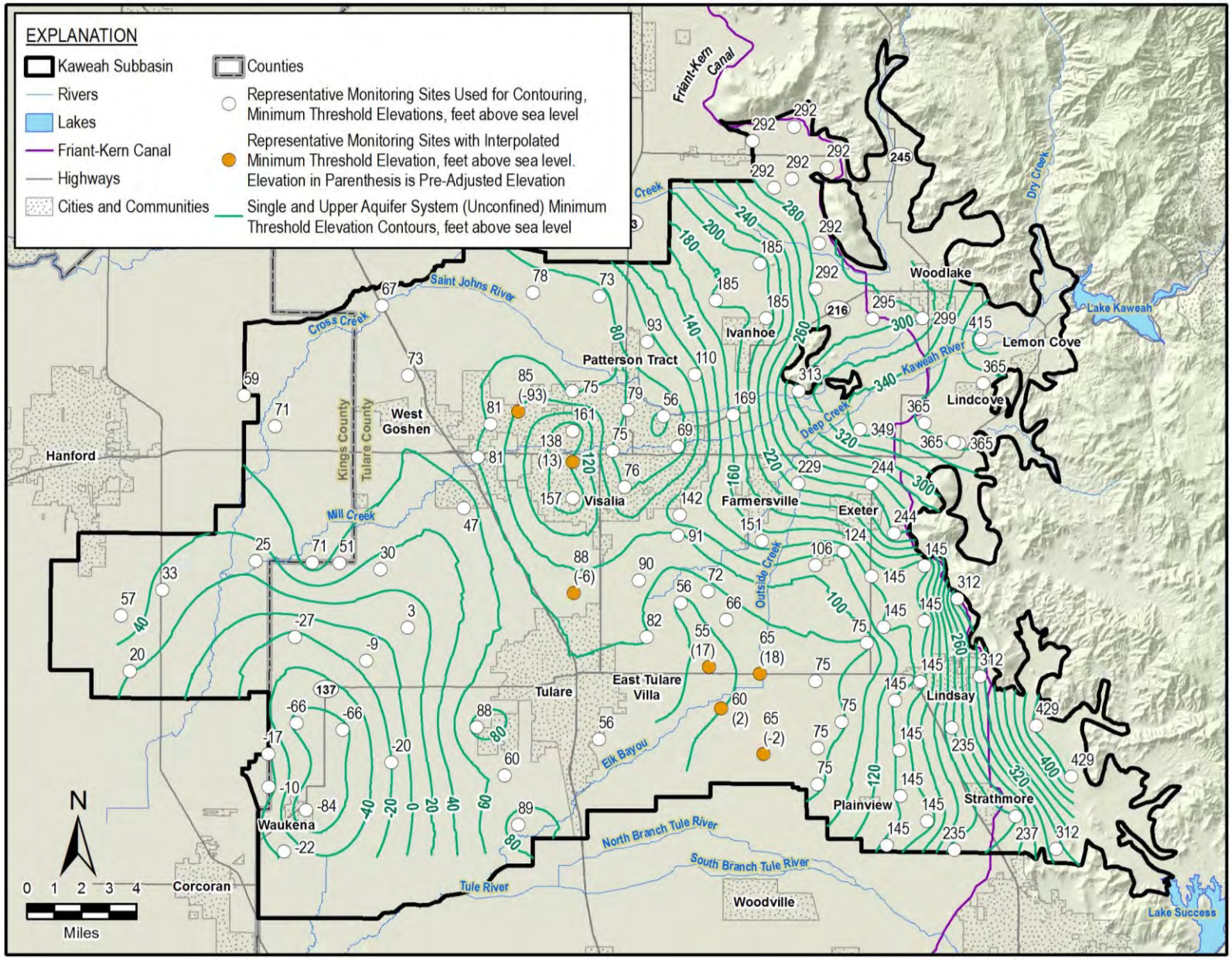

Figure 15. Single and Upper (Unconfined) Aquifer System Minimum Threshold Contours Across the Kaweah Subbasin