Luhdorff & Scalmanini
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TECHNICAL MEMORANDUM

DATE: April 4, 2025 Project No. 24-1-161

TO: Sean Geivet, General Manager, Saucelito Irrigation District

FROM: Andrew Francis, PG

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SUBJECT: Saucelito Irrigation District Water Budget

1 INTRODUCTION

The Saucelito Irrigation District (SID), previously part of the Eastern Tule Groundwater Sustainability Agency (ETGSA), is transitioning to operate as an independent Groundwater Sustainability Agency (GSA) following its establishment on February 27, 2025. This shift comes in response to the Tule Subbasin's probationary designation by the State Water Resources Control Board (State Board) on September 17, 2024, prompted by deficiencies identified in the ETGSA Groundwater Sustainability Plan (GSP) by the Department of Water Resources (DWR) and the State Board. Under probationary status, the State Board assumes oversight of groundwater monitoring and management, potentially imposing extraction fees and pumping restrictions through an interim plan. To circumvent these measures and leverage the "good actor" clause, SID is developing its own GSP to demonstrate proactive compliance with the Sustainable Groundwater Management Act (SGMA). As part of this effort, SID has tasked Luhdorff & Scalmanini, Consulting Engineers with an analysis of its water budget to inform decision-making and ensure sustainable groundwater management within its boundaries.

This technical memorandum (TM) evaluates SID's water budget extracted from the existing Tule Subbasin Groundwater Model. Results are compared to available groundwater level and subsidence data to assess historical and projected trends, providing a foundation for SID's independent GSP development and its pursuit of sustainability by 2040.

2 BACKGROUND

2.1 Tule Subbasin

The Tule Subbasin (Subbasin), located in the southern San Joaquin Valley within the Tulare Lake Hydrologic Region of California, is designated as Basin Number 5-22.13 by the California Department of Water Resources (DWR) and spans approximately 744 square miles (475,895 acres). The Subbasin is managed under the SGMA by seven exclusive GSAs: ETGSA, Tri-County Water Authority GSA (TCWA GSA), Pixley Irrigation District GSA (PIXID GSA), Lower Tule River Irrigation District GSA (LTGSA), Delano-Earlimart

Irrigation District GSA (DEID GSA), Alpaugh GSA, and Kern-Tulare Water District GSA (KTWD GSA). These GSAs, formalized through the Tule Subbasin Coordination Agreement - Revised Final (dated August 7, 2024), are tasked with developing and implementing individual GSPs to achieve a collective sustainability goal by 2040. Due to jurisdictional agreements with Tulare County GSA, six GSPs cover the Subbasin.

The Coordination Agreement incorporates eight attachments that collectively support the requirements of the SGMA by providing detailed technical frameworks, data, and plans essential for developing, implementing, and monitoring GSPs across the Subbasin. Below is a description of how each attachment contributes to meeting these SGMA requirements.

Attachment 1 (Tule Subbasin Monitoring Plan) establishes a monitoring network for groundwater levels, quality, surface water, and subsidence, ensuring data meets SGMA's quality and monitoring frequency standards (§§ 352.2, 354.32-354.38), while Attachment 2 (Tule Subbasin Setting) and Attachment 3 (Groundwater Flow Model) detail the hydrogeologic setting and model historical water budgets fulfilling basin setting requirements (§§ 354.12-354.20). Attachments 4-7 address agency feedback (§ 355.2) by defining sustainable management criteria (SMC) for groundwater levels, quality, subsidence, and interconnected surface water (§§ 354.22-354.30), with Attachment 8 (Mitigation Program) mitigating impacts (e.g., well failures) to avoid undesirable results (§ 354.44). Together, these attachments support a science-based water budget, integrating surface and groundwater components, and enable coordinated GSP implementation (§ 357.4(c)) to track progress via annual reports and five-year evaluations, ensuring SGMA's sustainability goals are met by 2040.

The six individual GSPs that cover the Subbasin provide site-specific data, detailing localized projects and management actions, refining SMC with GSA-specific goals, fulfilling public engagement and compliance obligations, and assessing local beneficial uses and impacts.

2.2 Eastern Tule Groundwater Sustainability Agency

The ETGSA formed as an exclusive GSA on June 6, 2017. Prior to SID forming its own GSA, the ETGSA included seven member agencies: City of Porterville, County of Tulare, Porterville Irrigation District, SID, Teapot Dome Water District, Terra Bella Irrigation District, and Vandalia Water District. Groundwater management in the GSA is governed by the ETGSA GSP, revised August 1, 2024. The ETGSA GSP, in coordination with the five other Subbasin GSPs, describes the location conditions for the ETGSA including the SMCs, specific projects and management actions tailored to the local agencies needs. The GSP identifies SMCs for the Chronic Lowering of Groundwater Levels, Reduction of Groundwater Storage, Degraded Groundwater Quality, and Land Subsidence. Interconnected Surface Waters are identified as a data gap and development of SMCs will require additional data collection and analysis. Sea Water Intrusion is not applicable to the Subbasin.

The ETGSA GSP relies on a groundwater model developed for the entire Subbasin. The GSP does not present a water budget for the ETGSA but refers to the water budget included in Attachment 2 (Basin Settings) of the Tule Subbasin Coordination Agreement.

The following provides a more detailed picture of hydrogeologic conditions within SID and an evaluation of its water budget for the historical and projected period.

3 HYDROGEOLOGIC CONDITIONS

SID is located on the eastern side of the Subbasin within the Tulare Lake Hydrologic Region. Five geologic formation are identified in the Tule Subbasin. The five generalized geologic units within the Subbasin include Unconsolidated Continental Deposits, Pliocene Marine Deposits, the Santa Margarita Formation, Tertiary Sedimentary Deposits, and Granitic Crystalline Basement. Three of which are present in the SID area: Pliocene Marine Deposits, the Santa Margarita Formation, and Tertiary Sedimentary Deposits.

The principal aquifers identified in the SID area include the Upper Aquifer, and Lower Aquifer (which make up the Unconsolidated Continental Deposits), Pliocene Marine Deposits (generally considered an aquitard), and the Santa Margarita. These units are significantly thinner moving from west to east. The Corcoran Clay, the primary confining unit throughout the San Joaquin Valley, is not present in the SID area.

3.1 Groundwater Flow Model of the Tule Subbasin

The Tule Subbasin Groundwater Model (TSGM) was developed by Thomas Harder & Company Groundwater Consulting (THC). Model documentation is included Attachment 3 to the Tule Subbasin Coordination Agreement (THC, 2020). The modeling objectives include developing water budgets, estimating sustainable yield, and projecting future groundwater levels and subsidence under various climate and management scenarios. It incorporates detailed hydrogeologic data, agricultural water use, and climate projections developed by DWR (DWR, 2017). TSGM was updated in 2021 to extend the calibration period from WY2017 to WY2019, incorporate new groundwater pumping and recharge data, and refine additional model components (THC, 2021). Results from the 2021 TSGM update are presented herein.

TSGM Development

TSGM was developed using the MODFLOW One Water Hydrologic Model (One Water) platform developed by the U.S. Geological Survey (Boyce, et al., 2020; Boyce, 2022). One-Water integrates various processes and packages to enable the robust and dynamic simulation of supply-and-demand agricultural water budgets, surface water, groundwater flow, and land subsidence.

The model domain encompasses approximately 1,500 square miles and includes the entire Subbasin. Temporally, the historical period was discretized into monthly stress periods where irrigation demand and other model stresses where specified. The model domain was discretized horizontally into a 1,000-foot rectilinear finite difference grid to calculate groundwater flow. The subsurface was discretized vertically into five layers, representing key aquifers and aquitards including:

- the Upper Aquifer (Layer 1)
- the Corcoran Clay (Layer 2)
- Lower Aquifer (Layer 3)
- Pliocene Marine Deposits (Layer 4)
- and the Santa Margarita Formation (Layer 5)

The Corcoran Clay is not present under SID, therefore water budget results are presented for Upper Aquifer (Layers 1 & 2), Lower Aquifer (Layer 3), Pliocene Marine Deposits (Layer 4), and the Santa Margarita Formation (Layer 5).

In this application, METRIC was used externally to compute evapotranspiration from crops. Irrigation demand for agricultural and other irrigated land use types was calculated externally based on the estimated evapotranspiration minus precipitation and uptake of stored soil moisture (Ben Lewis, personal communication, March 11, 2025). Agricultural irrigation demand for SID was specified in the MODFLOW Farm Process and met through a combination of surface water and groundwater extraction. Agricultural irrigation demand is met first by surface water and supplemented by groundwater pumping demand computed by the One-Water model platform.

Groundwater recharge from deep percolation of precipitation, stream seepage, and mountain front recharge was calculated externally and applied as direct recharge using the MODFLOW Recharge package (McDonald and Harbaugh, 1988) and is output to the groundwater flow model output. Deep percolation from irrigation inefficiency was calculated internally by TSGM and reported in the landscape budget produced by the Farm Process.

The model was calibrated to measured data from WY 1987–2019, achieving correlation coefficients of 0.95 for groundwater levels and 0.94 for land subsidence, with normalized RMSEs below 7%.

TSGM Projections

The projected water budget period spans from WY2020 through WY2070. The projected water budget is divided into three periods to reflect transitional pumping, sustainability goals, and long-term climate adjustments.

- 2020-2040 Transitional Pumping Period
- 2040-2050 Initial Sustainability Period
- 2050-2070 Sustainability with Extended Climate Adjustments

Projected surface water flows and surface water deliveries are based on a 20-year average during the historical period (WY1990 through WY2010). The future hydrology is adjusted using climate change values from the CalSim-II and the 2015 Climate change Technical Advisory Group. 2030 Central Tendency were applied from 2025 through 2049 which changed factors ranging from 98% to 101% of baseline conditions. 2070 Central Tendency was applied from 2050 to 2070 with change factors ranging from 95% to 105% of baseline conditions. The projected period was discretized temporally into 1-year stress periods where irrigation demand and other model stresses were specified.

TSGM Water Budget Results

The following describes the water budget results from the TSGM for the entire Subbasin. Over the historical water budget period, groundwater storage decline of 2.53 million AF[1] from WY 1987-2019,

[1] Terra Bella Water Budget Tech Memo reported a cumulative storage change for the historical period of -2.66 million AF with an average change of -74,000 AF as described in section 5.2 of THC, 2021 Upon further QAQC, the correct cumulative change in storage is -2.53 million AF.

averaging -74,000 AF/year. Single year change in storage ranged from an increase of 523,000 AF in WY 2011 to a decrease of 429,000 AF in WY2007.

For the projected water budget period losses in storage ranging from -163,000 AF in 2020 WY to -16,000 AF, and by 2040 WY, and thereafter the change in storage was consistently at -20,000 AF/year from WY 2040 through 2050. From 2050 through 2070, which accounts for extended climate adjustments, storage change was on average -30,000 AF/year. The average change in storage over the projected period is -50,000 AF/year with a cumulative change in storage of -2.5 million AF.

4 TSGM WATER BUDGET RESULTS

Water budget results for the SID GSA presented in this TM were extracted from the TGSM without modification. The information presented herein represents the land surface and groundwater budgets for the SID (**Figure 1**).

4.1 TSGM Historical Water Budget Period (WY1987-WY2019)

Land Surface Budget

A summary of the average land surface budget for the historical period is provided in **Table 1.** The individual components for each water year during the historical period is presented in **Figure 2**. Based on the application of the MODFLOW Farm Process, water budget terms included in the landscape budget pertains solely to irrigation from agriculture. This includes:

- *Applied Surface Water for Irrigation* - imported surface water for irrigation which is measured and reported.
- *Applied Groundwater for Irrigation* - estimated based on the difference between irrigation demand and reported applied surface water.
- *Evapotranspiration from Irrigation* - calculated based on evapotranspiration estimated using METRIC minus precipitation and uptake of stored soil moisture.
- *Deep Percolation from Irrigation* – this is deep percolation which occurs due to irrigation efficiency.

Table 1. Historical Land Surface Budget (WY 1987-2019)

Applied Surface Water for Irrigation (AFY)	Applied Groundwater for Irrigation (AFY)	Evapo-transpiration from Irrigation (AFY)	Deep Percolation from Irrigation (AFY)
22,200	28,600	-40,100	10,700

Groundwater Budget

Water budget terms are broken into the following categories:

- *Other Recharge* – this includes subsurface inflows in the alluvial channel of the Tule River, stream bed infiltration, canal losses, and artificial recharge in spreading basins.
- *Mountain Block Recharge* – lateral subsurface recharge from the Sierra Nevada
- *Agricultural Recharge* – deep percolation of applied irrigation water.
- *Agricultural Pumping* - includes pumping for agricultural purposes. Negative values indicate extraction from aquifer, positive values are possible when inter-borehole flow occurs (i.e. flow from one model layer to another if the screen interval extends beyond multiple model layers). Agricultural pumping is based on remotely sensed ET data.
- *Municipal pumping* – measured or estimated municipal pumping specified directly in the model.
- *Lateral Flows* – net lateral subsurface inflows and outflows from adjacent areas.
- *Flow from Layer Above* – net inflows and outflows through the top of individual model layers
- *Flow from Layer Below* – net inflows and outflows through the bottom of individual model layers.
- *Storage Change* – net change in groundwater storage within SID.

Water budget results are presented for each inflow and out flow component for all five model layers. The results are the average value over the historical and projected period.

Historical groundwater budget results are presented in **Table 2**. A graphical representation of each inflow and outflow is presented in **Figure 3**. Overall, there was a decline in groundwater storage with an average change in storage of -10,300 Af/year with a cumulative loss in storage of 329,000 AF. In contrast, the entire subbasin experienced an average storage change of -74,000 AF/year with a cumulative loss in storage of 2.44 million AF[1]. The largest inflow component was *Recharge*. No *Mountain Block Recharge* occurred for SID. Groundwater pumping was the largest outflow component, a majority of which came from Upper Aquifer. There was no simulated municipal pumping in SID. *Lateral Flows* were negative meaning that more water is flowing out of SID than in. This can be driven by natural groundwater level gradients or higher rates of pumping outside of SID. It should be noted that the discrepancy between groundwater pumping in the groundwater budget and applied groundwater in the land surface budget is due to some wells associated with SID that are located outside the SID GSA boundaries. This minor difference will be addressed in the SID GSP. A complete water budget table with each year of the historical period is presented in **Appendix A**.

Table 2. Historical Groundwater Budget WY (1987- 2019)							
Aquifer	Volume (AFY)						
	Other Recharge	Recharge Irrigation	Agricultural Pumping[1]	Net Lateral Flow	Top	Bottom	Change in Storage
Upper Aquifer	13,000	10,700	-26,600	2,600	0	-26,700	-6,700
Lower Aquifer	0	0	2,300	-12,000	26,700	700	-2,600
Pliocene Marine Deposits	0	0	-3,300	2,600	-700	400	-1,000
Santa Margarita Formation	0	0	-900	1,300	-400	0	0
Total	**13,000**	**10,700**	**-28,500**	**-5,500**	**25,600**	**-25,600**	**-10,300**

4.2 TSGM Projected Water Budget Period (WY 2020-2070)

Land Surface Budget

A summary of the average land surface budget for the projected period is provided in **Table 3.** The individual components for each water year during the projected period are presented in **Figure 4.** As previously described, the projected water budget period represents conditions from WY2020 through WY2070 and is based on the average hydrology over the historical period from WY 1990 through WY 2010. Because an average hydrology is used for each year during the projected period, minimal variation is shown throughout the projected period. The only observed changes are the result of climate change factors and implementation of projects and management actions.

Table 3. Projected Land Surface Budget (WY 2020-2070)			
Applied Surface Water for Irrigation (AFY)	Applied Groundwater for Irrigation (AFY)	Evapo-transpiration from Irrigation (AFY)	Deep Percolation from Irrigation (AFY)
22,100	26,300	-39,600	-8,900

Groundwater Budget

Projected water budget results are presented in **Table 4**. A graphical representation of each inflow and outflow component is presented in **Figure 5**. The projected water budget period showed less storage declines. Average change in storage was approximately -200 AF/year and a cumulative loss in storage of 10,000 AF. In contrast, the average change in storage for the entire subbasin is -50,000 AF/year with a

cumulative loss in storage of 2.5 million AF. Given model uncertainty and the magnitude of the primary recharge and discharge groundwater budget components, the change in storage indicates sustainable conditions with minimal change in storage during the implementation and sustainability period of 2020 through 2070 for SID. The projected water budget continued declines in storage over the first 11 years of the projected period with positive storage change occurring starting in the early 2030s. Declines in groundwater storage are associated with an increase in other recharge, a decrease in pumping, and a decrease in the net lateral flow. Increases in recharge are associated with projects identified in the ETGSA GSP for SID. These include the Conway Bank which may contribute of 1,100 AF/year of recharge, and the on-farm recharge policy that could contribute 2,000 af/year of recharge. A decrease in groundwater pumping will result in less storage declines. A decrease in lateral flows out of the GSA are likely associated with a decreases in pumping and increasing water levels in the surrounding GSAs. A complete water budget table for the projected period is presented in **Appendix A**.

Table 4. Projected Groundwater Budget WY (2020- 2070)

Aquifer	Volume (AFY)						
	Other Recharge	Recharge Irrigation	Agricultural Pumping	Net Lateral Flow	Top	Bottom	Change in Storage
Upper Aquifer	17,700	8,900	-21,400	500	12,400	-18,400	-300
Lower Aquifer	0	0	200	-7,000	6,000	900	100
Pliocene Marine Deposits	0	0	-3,800	4,100	-900	600	0
Santa Margarita Formation	0	0	-1,300	1,300	-600	0	0
Total	**17,700**	**8,900**	**-26,300**	**-1,100**	**16,900**	**-16,900**	**-200**

5 GROUNWATER LEVELS AND SUBSIDENCE

Groundwater Levels and subsidence data were compared with TSGM results.

5.1 Groundwater Levels

Figure 6 presents a map of wells with available historical data. Four wells with groundwater level data are located within the SID. Hydrographs for the wells within SID are shown in **Figure 7**. Shallower monitoring wells with completions in the upper 300 feet show groundwater elevations between 200 and 300 feet above mean sea level (feet msl). Wells with deeper completions between 600 and 1,300 feet show groundwater levels between 100 and 0 feet msl.

One well (22S26E13R010M) within SID has a long historical record with water level measurements going back to the early 1960's. Minimal groundwater elevation decline has been observed over this time period

(1960 to 2024) with a decline of 6 feet. Over the historical water budget period starting in 1987 when water levels were near historically high levels, groundwater levels have declined 60 feet from 322 feet above mean sea level (feet msl) to a level of 262 feet msl in 2024. In recent years, groundwater levels have recovered 30 feet. The observed decline in water levels over the historical period supports the simulated declines in storage.

Groundwater level data is also available at four additional sites with data collection beginning in the last five years. One site is a triple completion monitoring well (TSMW) with completions between 200 feet and 1,300 feet. These more recent groundwater level measurements show seasonal variation with no significant decline observed over the past five years. Seasonal high and seasonal low measurements have varied as much as 80 feet.

5.2 Land Subsidence

Land subsidence was assessed using TRE Altamira InSAR data (**Figure 8**). SID has experienced less subsidence compared to the western portions of the Subbasin but more subsidence than areas to its east. Area's west of SID have recorded subsidence as high as 5.7 feet since 2015. SID saw subsidence as high as 4.7 feet with an average value of 3.4. feet across the GSA over this same time period. The historical occurrence of subsidence within the GSA is consistent with the simulated decline in aquifer storage in the simulated historical water budget and also the observed decline in groundwater levels during some portion of the historical water budget period.

Projected total land subsidence for the period between 2020 and 2040 is presented in **Figure 9**. Based on the current modeling work, the projected land subsidence for SID is substantially less than what has occurred historically. The anticipated level of subsidence between 2020 and 2040 is estimated to be between 1 and 2 feet. Most of the projected subsidence for this period is projected to occur in the western portion of the SID GSA. Along the eastern boundary of the SID GSA, where the Friant-Kern Canal is located, there is expected to be less than 1 foot of subsidence, with some areas seeing less than 0.5 feet.

Projected total land subsidence between 2040 and 2050 is estimated to be less than 0.5 feet for the entire GSA (**Figure 10**). Projected land subsidence between 2050 and 2070 is estimated to be less than 0.5 feet for most of the GSA. Part of the northwest corner of the GSA may experience subsidence between 1 and 2 feet (**Figure 11**). Both **Figure 10** and **Figure 11** show less than 0.5 feet of subsidence along the FKC.

6 CONCLUSIONS

The analysis of the SID water budget, derived from the TSGM, provides a foundation for the development of SID's Groundwater Sustainability Plan. The historical water budget indicates an average annual storage decline of -10,300 AF/year, totaling a cumulative loss of 329,000 AF. The projected water budget shows a significant improvement with an average annual storage change of -200 AF/year with a cumulative loss of 10,000 AF. In contrast, the entire subbasin is projected to have an annual change in storage of -50,000 AF/year with a cumulative change in storage of -2.5 million AF. The improvements in groundwater storage are attributed to projects such as the Conway Bank and the on-farm recharge policies adopted by SID. Also, reduced groundwater pumping—both within and outside of SID's boundaries—and a decrease in lateral outflows contribute to the improved water budget.

Historical groundwater levels within SID show a moderate decline of 60 feet since 1987, with recent recovery of 30 feet, while deeper wells exhibit seasonal stability. Subsidence, averaging 3.4 feet historically (2015–2024), is projected to decrease substantially, with estimates of 1–2 feet by 2040 and less than 0.5 feet thereafter across most of the GSA.

Overall, the water budget analysis suggests that SID can achieve groundwater sustainability by 2040 provided the planned management actions and projects are implemented effectively. This TM equips SID with the data-driven insights necessary to refine its GSP, ensuring long-term resilience against chronic groundwater depletion and subsidence while supporting the needs of the GSA. Continued monitoring and adaptive management will be critical to sustaining these outcomes through 2070 under evolving climatic conditions.

7 REFERENCES

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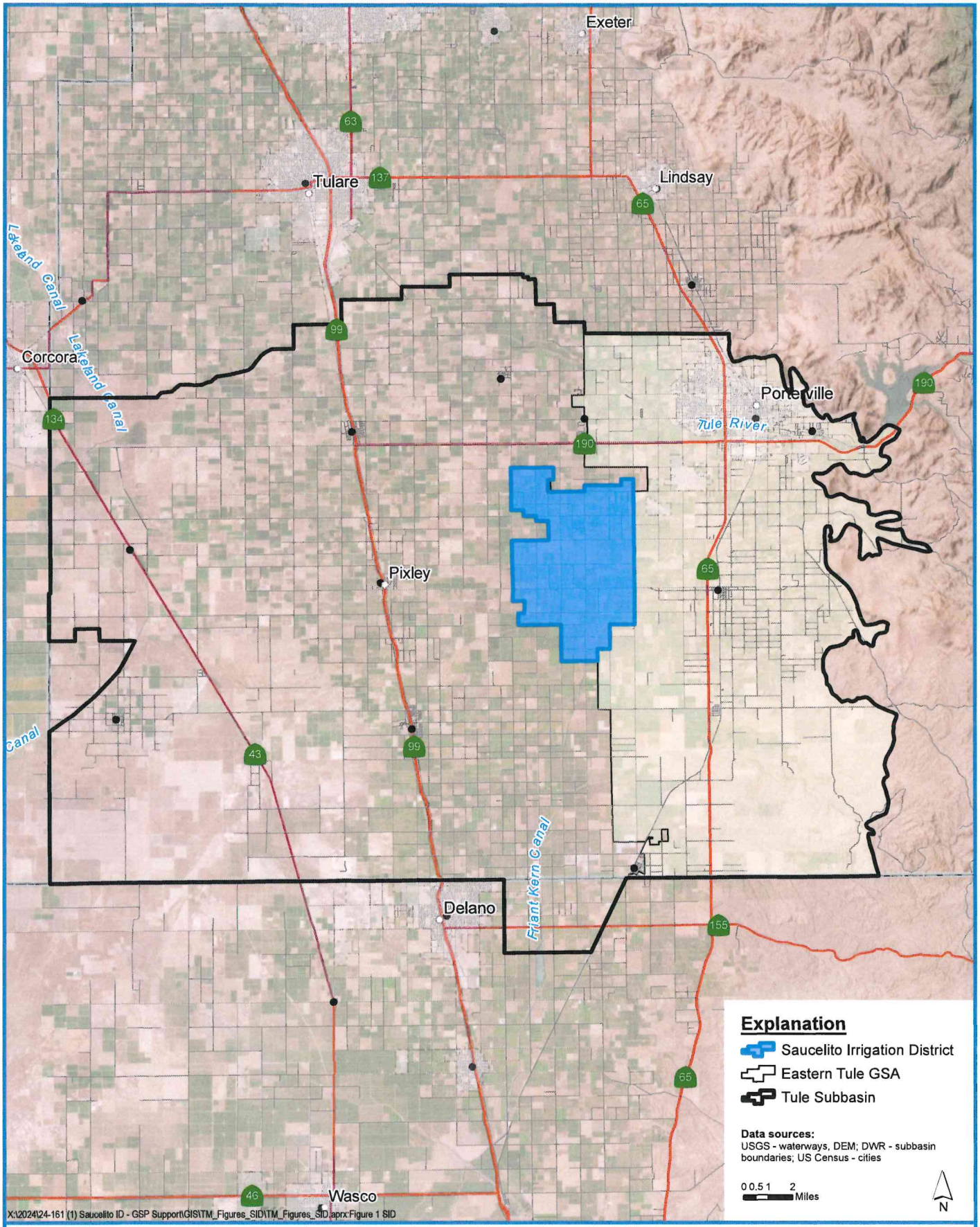
Appendix A. SID Water Budget Historical and Projected

Water Budget Period	Water Year	Mountain-Block Recharge	Recharge (Deep Percolation, Streambed Infiltration, Artifical Recharge)	Agricultural Return Flows	Municpal Pumping	Agricultural Wells	Lateral Subsurface Flow	Vertical Flows (Top)	Vertical Flows (bottom)	IN	OUT	Total Pumping	Storage Change
Historical Period	1987	0	9,800	12,100	0	-34,000	-400	25,600	-25,600	83,900	-84,000	-34,000	-12,500
	1988	0	8,200	12,500	0	-39,500	800	28,400	-28,400	94,900	-94,900	-39,500	-17,900
	1989	0	5,700	13,200	0	-36,600	0	27,900	-27,900	90,600	-90,500	-36,600	-17,800
	1990	0	5,400	12,700	0	-41,100	2,100	28,800	-28,800	94,400	-94,300	-41,100	-20,900
	1991	0	6,700	10,600	0	-27,900	2,000	24,300	-24,300	79,500	-79,400	-27,900	-8,700
	1992	0	2,700	14,300	0	-40,600	-2,100	29,600	-29,600	99,800	-99,700	-40,600	-25,800
	1993	0	20,300	12,200	0	-22,200	-2,300	25,700	-25,700	91,600	-91,500	-22,200	8,100
	1994	0	3,600	13,700	0	-37,800	-5,400	31,100	-31,100	99,400	-99,400	-37,800	-25,900
	1995	0	23,000	11,300	0	-19,300	-3,900	27,400	-27,400	94,300	-94,200	-19,300	10,900
	1996	0	15,100	14,300	0	-22,300	-9,000	28,800	-28,800	97,100	-97,000	-22,300	-1,900
	1997	0	25,500	11,600	0	-18,000	-10,900	29,300	-29,300	104,900	-104,900	-18,000	8,200
	1998	0	20,800	8,700	0	-12,000	-4,100	21,200	-21,200	77,800	-77,800	-12,000	13,300
	1999	0	9,700	12,100	0	-20,600	-8,500	25,700	-25,700	85,700	-85,700	-20,600	-7,300
	2000	0	15,100	12,200	0	-23,700	-7,200	29,300	-29,300	96,800	-96,800	-23,700	-3,600
	2001	0	5,300	11,900	0	-28,800	-7,400	28,700	-28,700	91,700	-91,600	-28,800	-19,100
	2002	0	6,600	13,800	0	-36,600	-8,400	32,500	-32,500	105,100	-105,100	-36,600	-24,500
	2003	0	10,600	9,800	0	-24,700	-8,100	28,400	-28,400	92,000	-91,900	-24,700	-12,400
	2004	0	6,100	11,700	0	-41,200	-10,500	30,000	-30,000	110,200	-110,200	-41,200	-33,900
	2005	0	22,800	7,600	0	-11,700	-9,000	24,100	-24,100	90,300	-90,300	-11,700	9,700
	2006	0	25,900	6,300	0	-6,400	-11,500	21,900	-21,900	85,800	-85,800	-6,400	14,300
	2007	0	4,000	10,200	0	-41,300	-12,000	29,300	-29,300	102,200	-102,200	-41,300	-39,000
	2008	0	6,500	9,700	0	-32,500	-10,200	28,600	-28,600	102,800	-102,700	-32,500	-26,500
	2009	0	2,900	9,400	0	-21,300	-11,000	24,400	-24,400	89,000	-89,000	-21,300	-20,000
	2010	0	19,800	6,800	0	-8,400	-11,200	19,000	-19,000	82,600	-82,500	-8,400	7,000
	2011	0	37,200	6,200	0	-9,000	-8,800	19,200	-19,200	90,800	-90,800	-9,000	25,500
	2012	0	10,400	7,000	0	-24,800	-7,700	21,000	-21,000	78,900	-78,900	-24,800	-15,100
	2013	0	2,000	10,900	0	-45,300	-7,000	25,900	-25,900	104,800	-104,700	-45,300	-39,600
	2014	0	2,500	11,700	0	-59,100	-3,900	24,200	-24,200	117,600	-117,700	-59,100	-48,800
	2015	0	500	9,600	0	-50,000	2,500	21,800	-21,800	114,200	-114,100	-50,000	-37,500
	2016	0	8,600	8,900	0	-31,900	3,600	19,000	-19,000	102,100	-102,000	-31,900	-10,900
	2017	0	37,000	10,000	0	-20,200	-1,500	21,000	-21,000	113,800	-113,800	-20,200	25,300
	2018	0	8,200	10,300	0	-32,700	-9,200	19,400	-19,400	96,900	-96,800	-32,700	-23,400
	2019	0	39,100	8,600	0	-16,900	-2,100	20,400	-20,400	116,500	-116,400	-16,900	28,600
	2020	0	18,000	8,900	0	-31,300	-2,900	23,300	-23,300	76,700	-76,300	-31,300	-7,800
	2021	0	17,900	8,900	0	-30,100	-4,400	22,000	-22,000	68,900	-68,800	-30,100	-7,800
	2022	0	17,900	8,900	0	-30,200	-4,100	21,900	-21,900	68,000	-68,000	-30,200	-7,400
	2023	0	17,900	8,900	0	-30,100	-3,800	21,600	-21,600	67,300	-67,200	-30,100	-7,100
	2024	0	17,900	8,900	0	-30,200	1,300	20,200	-20,200	59,400	-59,400	-30,200	-2,100
	2025	0	17,900	8,900	0	-29,300	700	19,700	-19,700	58,400	-58,300	-29,300	-1,900
	2026	0	17,900	8,900	0	-28,500	-200	19,400	-19,400	57,800	-57,800	-28,500	-1,800
	2027	0	17,900	8,900	0	-27,600	-1,000	19,400	-19,400	57,600	-57,600	-27,600	-1,800
	2028	0	17,800	8,900	0	-26,700	-1,900	19,400	-19,400	57,600	-57,700	-26,700	-1,800
	2029	0	17,800	8,900	0	-25,800	-2,800	19,300	-19,300	58,100	-58,100	-25,800	-1,700
	2030	0	17,700	8,900	0	-24,900	-2,100	18,700	-18,700	57,700	-57,700	-24,900	-400
	2031	0	17,700	8,900	0	-24,900	-1,800	18,300	-18,300	56,800	-56,800	-24,900	-100
	2032	0	17,700	8,900	0	-24,800	-1,600	18,100	-18,100	56,300	-56,300	-24,800	200
	2033	0	17,700	8,900	0	-24,800	-1,200	17,900	-17,900	55,500	-55,400	-24,800	500
	2034	0	17,700	8,900	0	-24,900	-900	17,700	-17,700	54,800	-54,800	-24,900	800
	2035	0	17,700	8,900	0	-24,800	-200	17,200	-17,200	54,500	-54,500	-24,800	1,600

Appendix A. SID Water Budget Historical and Projected

Water Budget Period	Water Year	Mountain-Block Recharge	Recharge (Deep Percolation, Streambed Infiltration, Artifical Recharge)	Agricultural Return Flows	Municpal Pumping	Agricultural Wells	Lateral Subsurface Flow	Vertical Flows (Top)	Vertical Flows (bottom)	IN	OUT	Total Pumping	Storage Change
Projected Period	2036	0	17,700	8,900	0	-24,900	0	16,900	-16,900	54,200	-54,200	-24,900	1,800
	2037	0	17,700	8,900	0	-24,900	200	16,700	-16,700	53,900	-53,800	-24,900	1,900
	2038	0	17,700	8,900	0	-24,900	200	16,500	-16,500	53,700	-53,700	-24,900	2,000
	2039	0	17,700	8,900	0	-25,000	400	16,200	-16,200	53,400	-53,500	-25,000	2,100
	2040	0	17,700	8,900	0	-24,900	600	16,000	-16,000	53,100	-53,200	-24,900	2,300
	2041	0	17,700	8,900	0	-24,900	500	15,900	-15,900	53,000	-53,000	-24,900	2,200
	2042	0	17,700	8,900	0	-24,900	300	15,800	-15,800	52,900	-52,900	-24,900	2,100
	2043	0	17,700	8,900	0	-25,000	200	15,700	-15,700	52,800	-52,900	-25,000	1,900
	2044	0	17,700	8,900	0	-24,900	-100	15,700	-15,700	53,000	-53,100	-24,900	1,700
	2045	0	17,700	8,900	0	-24,900	-100	15,500	-15,500	53,100	-53,000	-24,900	1,600
	2046	0	17,700	8,900	0	-24,900	-300	15,500	-15,500	53,100	-53,100	-24,900	1,500
	2047	0	17,700	8,900	0	-24,900	-300	15,500	-15,500	53,300	-53,200	-24,900	1,400
	2048	0	17,700	8,900	0	-24,900	-400	15,400	-15,400	53,400	-53,400	-24,900	1,300
	2049	0	17,700	8,900	0	-24,800	-500	15,400	-15,400	53,400	-53,500	-24,800	1,300
	2050	0	17,700	8,900	0	-24,900	-500	15,300	-15,300	53,500	-53,400	-24,900	1,300
	2051	0	17,600	8,900	0	-26,500	500	15,300	-15,300	52,600	-52,500	-26,500	500
	2052	0	17,600	8,900	0	-26,500	400	15,400	-15,400	52,600	-52,600	-26,500	400
	2053	0	17,600	8,900	0	-26,500	400	15,400	-15,400	52,500	-52,500	-26,500	400
	2054	0	17,600	8,900	0	-26,600	300	15,400	-15,400	52,600	-52,700	-26,600	300
	2055	0	17,600	8,900	0	-26,500	200	15,400	-15,400	52,600	-52,500	-26,500	200
	2056	0	17,600	8,900	0	-26,500	100	15,500	-15,500	52,700	-52,700	-26,500	200
	2057	0	17,600	8,900	0	-26,500	100	15,400	-15,400	52,700	-52,600	-26,500	200
	2058	0	17,600	8,900	0	-26,500	100	15,400	-15,400	52,700	-52,600	-26,500	100
	2059	0	17,600	8,900	0	-26,600	100	15,400	-15,400	52,700	-52,800	-26,600	100
	2060	0	17,600	8,900	0	-26,500	100	15,500	-15,500	52,800	-52,800	-26,500	100
	2061	0	17,600	8,900	0	-26,500	0	15,400	-15,400	52,800	-52,800	-26,500	100
	2062	0	17,600	8,900	0	-26,500	0	15,400	-15,400	52,800	-52,800	-26,500	0
	2063	0	17,600	8,900	0	-26,500	0	15,500	-15,500	52,900	-52,800	-26,500	0
	2064	0	17,600	8,900	0	-26,600	0	15,500	-15,500	52,900	-53,000	-26,600	0
	2065	0	17,600	8,900	0	-26,500	-100	15,400	-15,400	52,900	-52,900	-26,500	0
	2066	0	17,600	8,900	0	-26,500	0	15,500	-15,500	52,900	-52,800	-26,500	0
	2067	0	17,600	8,900	0	-26,500	0	15,400	-15,400	52,900	-52,900	-26,500	0
	2068	0	17,600	8,900	0	-26,600	0	15,500	-15,500	53,000	-53,000	-26,600	0
	2069	0	17,600	8,900	0	-26,500	0	15,400	-15,400	52,900	-52,900	-26,500	0
	2070	0	17,600	8,900	0	-26,500	-100	15,400	-15,400	53,000	-53,100	-26,500	0
Historical Average		**0**	**13,000**	**10,700**	**0**	**-28,400**	**-5,500**	**25,500**	**-25,500**	**96,300**	**-96,300**	**-28,400**	**-10,400**
Projected Average		**0**	**17,700**	**8,900**	**0**	**-26,300**	**-500**	**16,900**	**-16,900**	**55,300**	**-55,300**	**-26,300**	**-200**



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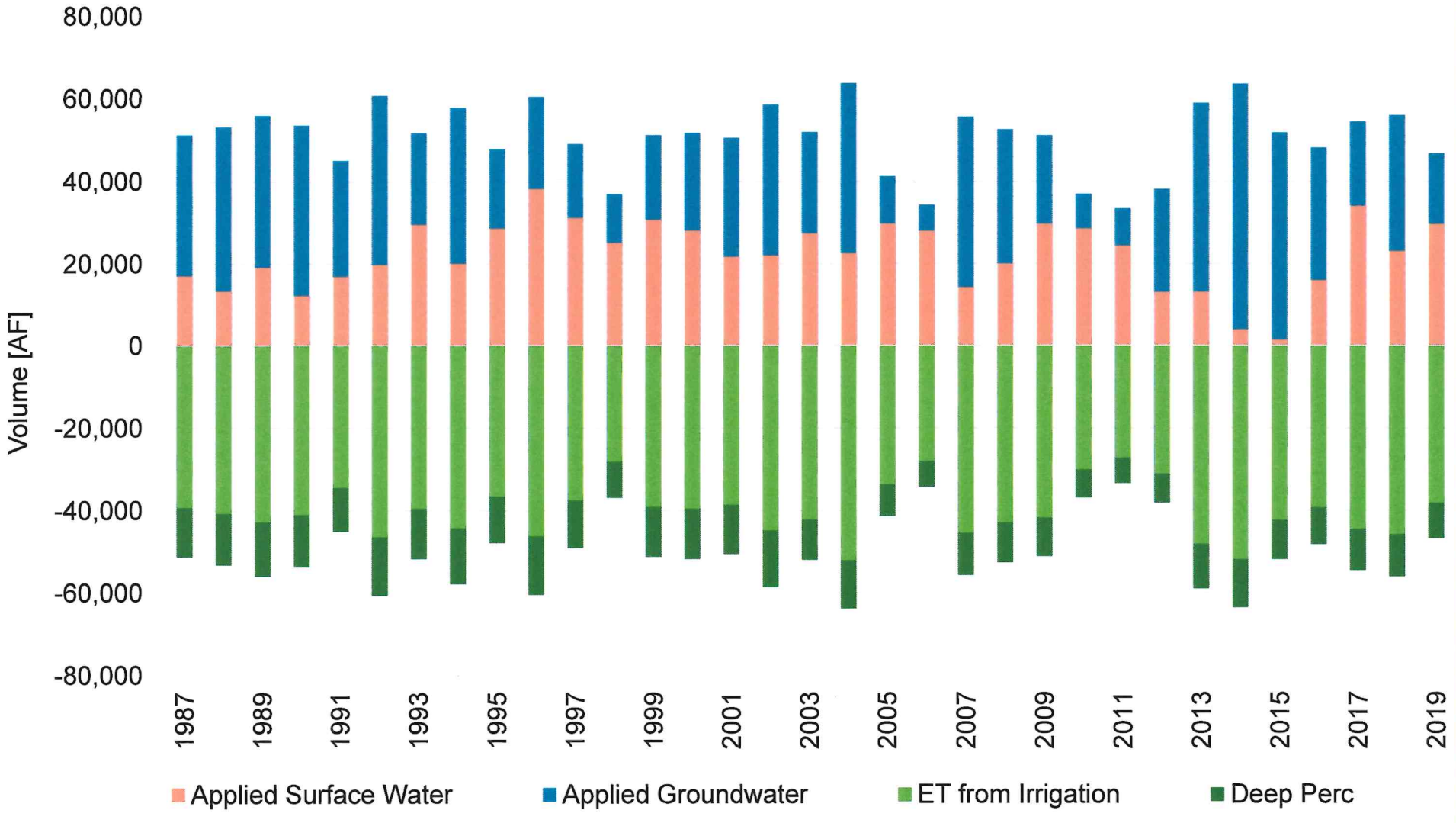
Saucelito Irrigation District

Saucelito Irrigation District
Tule Subbasin
Water Budget Results

Figure 1



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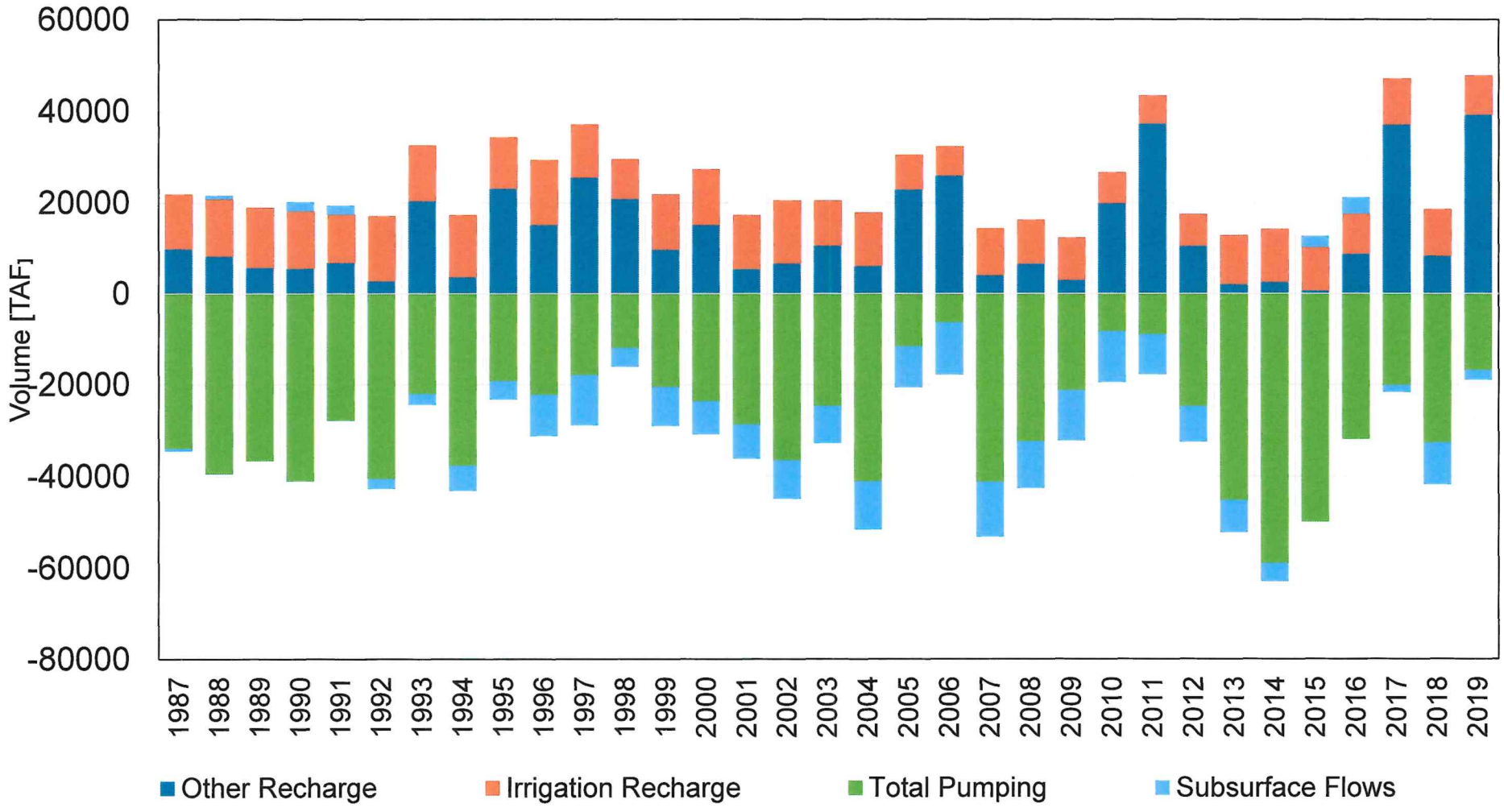
Historical Land Surface Budget

Saucelito Irrigation District
Tule Subbasin
Water Budget Results

Figure 2



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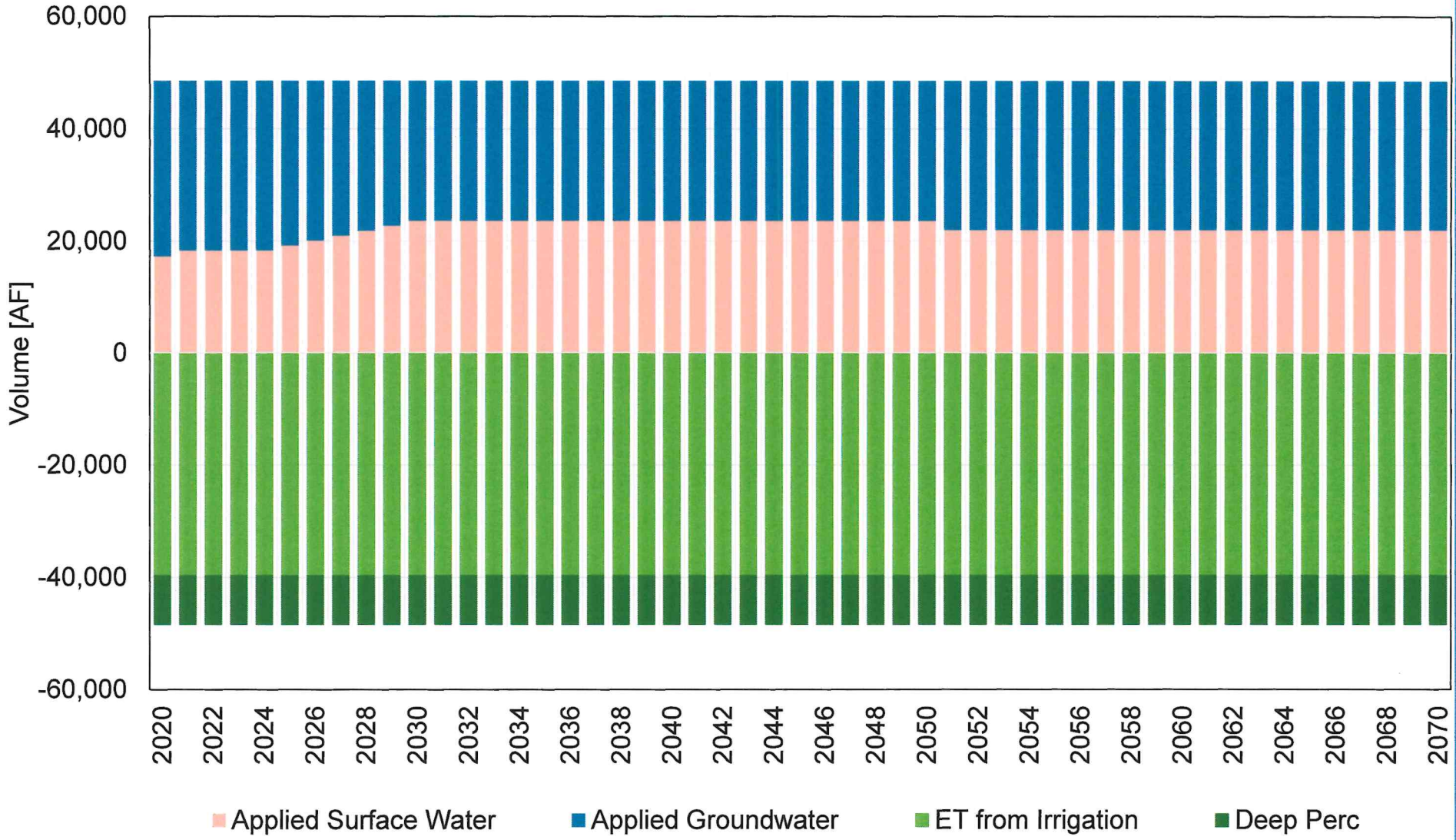
Historical Groundwater Budgets

Saucelito Irrigation District
Tule Subbasin
Water Budget Results

Figure 3



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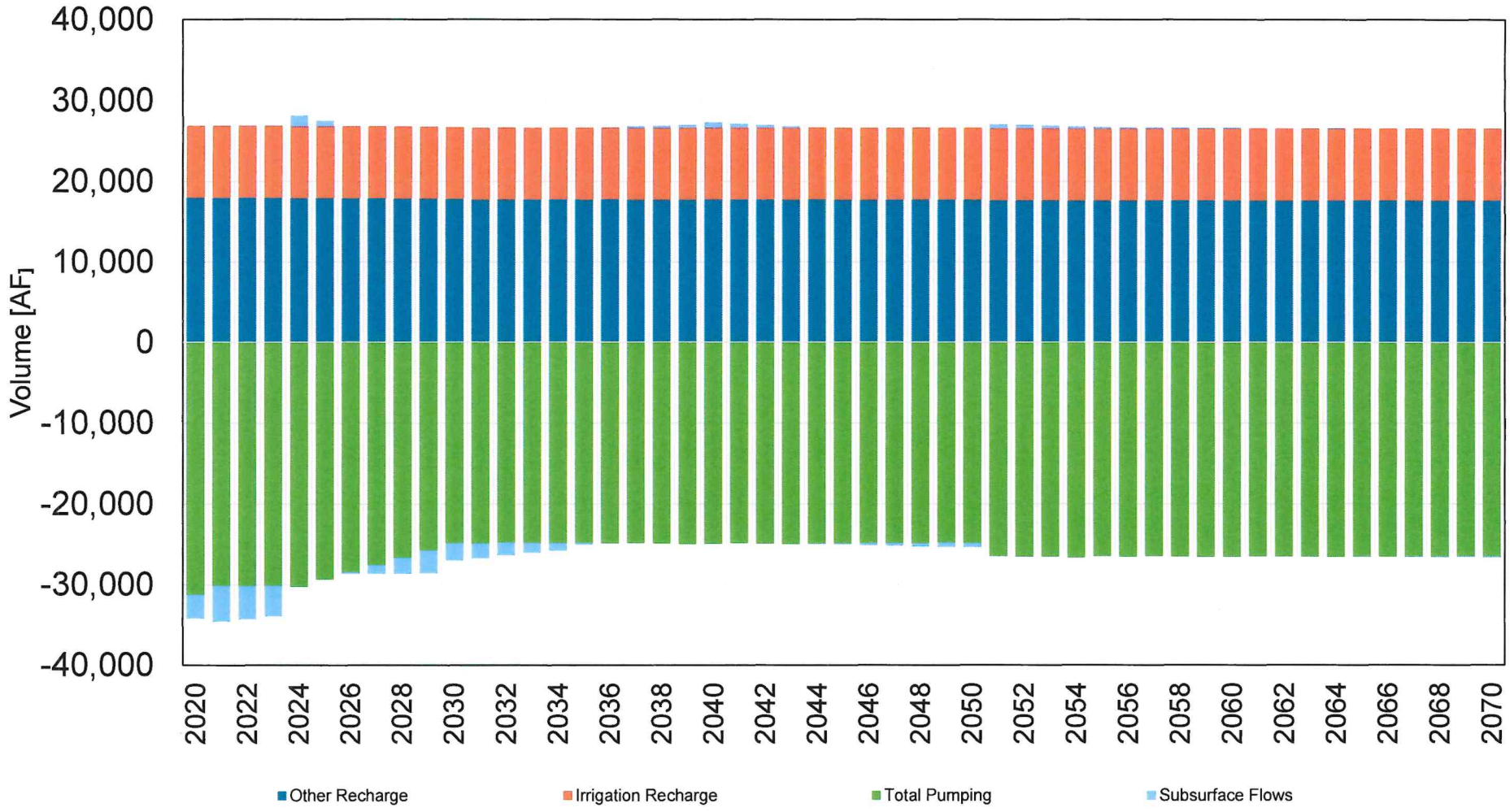
Projected Land Surface Budget

Saucelito Irrigation District
Tule Subbasin
Water Budget Results

Figure 4



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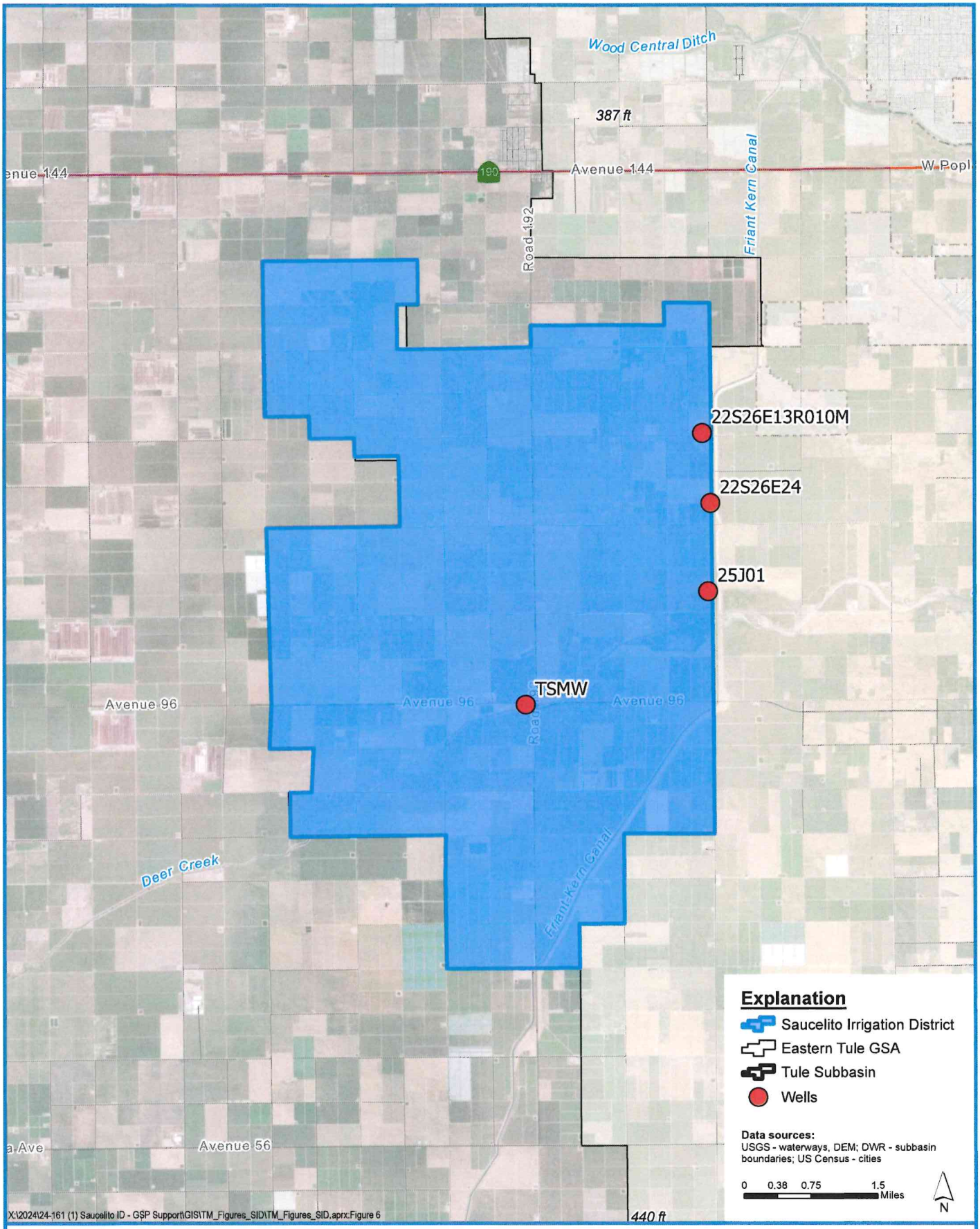
Projected Groundwater Budgets

Saucelito Irrigation District
Tule Subbasin
Water Budget Results

Figure 5



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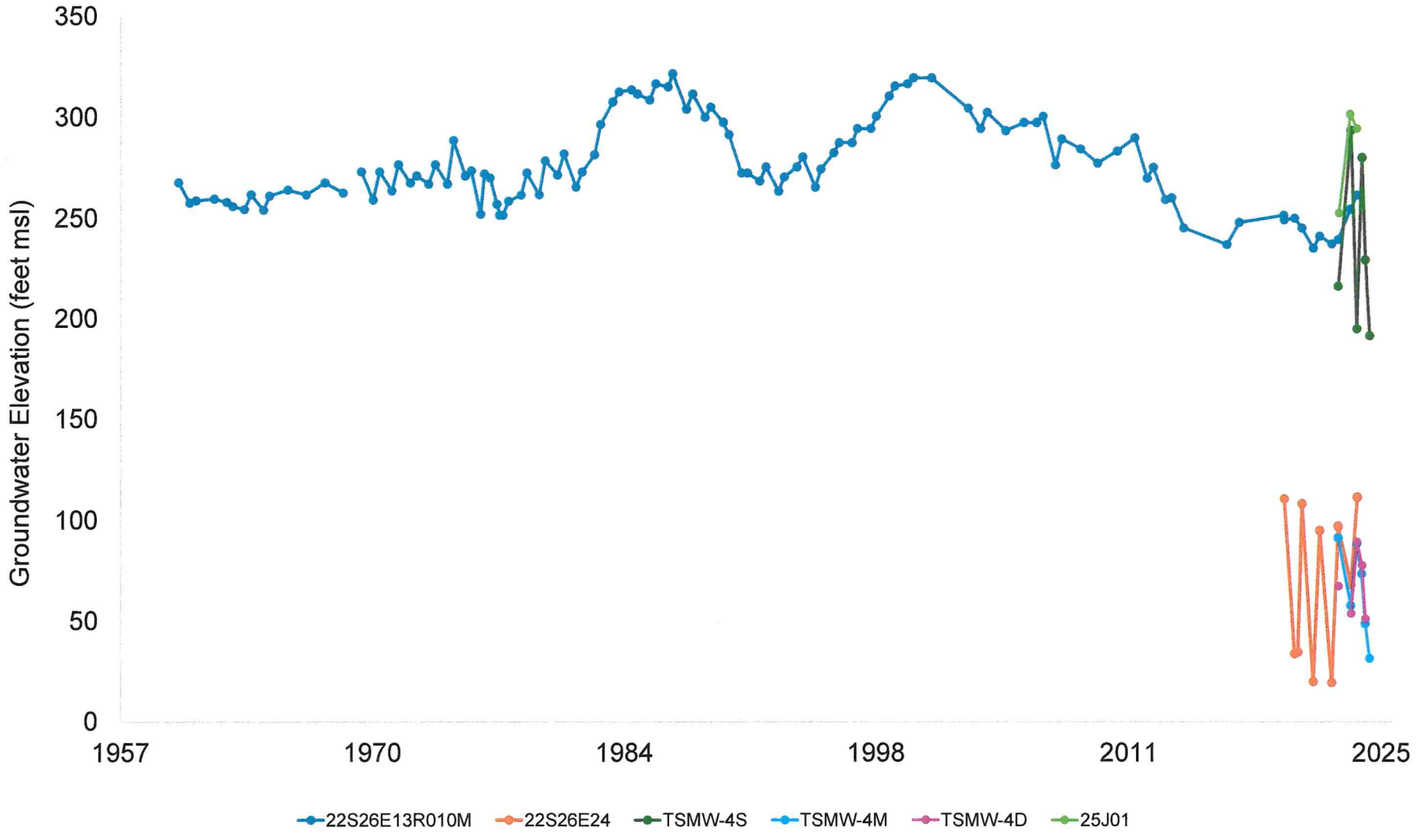
Monitoring Well Locations

Saucelito Irrigation District
Tule Subbasin
Water Budget Analysis

Figure 6



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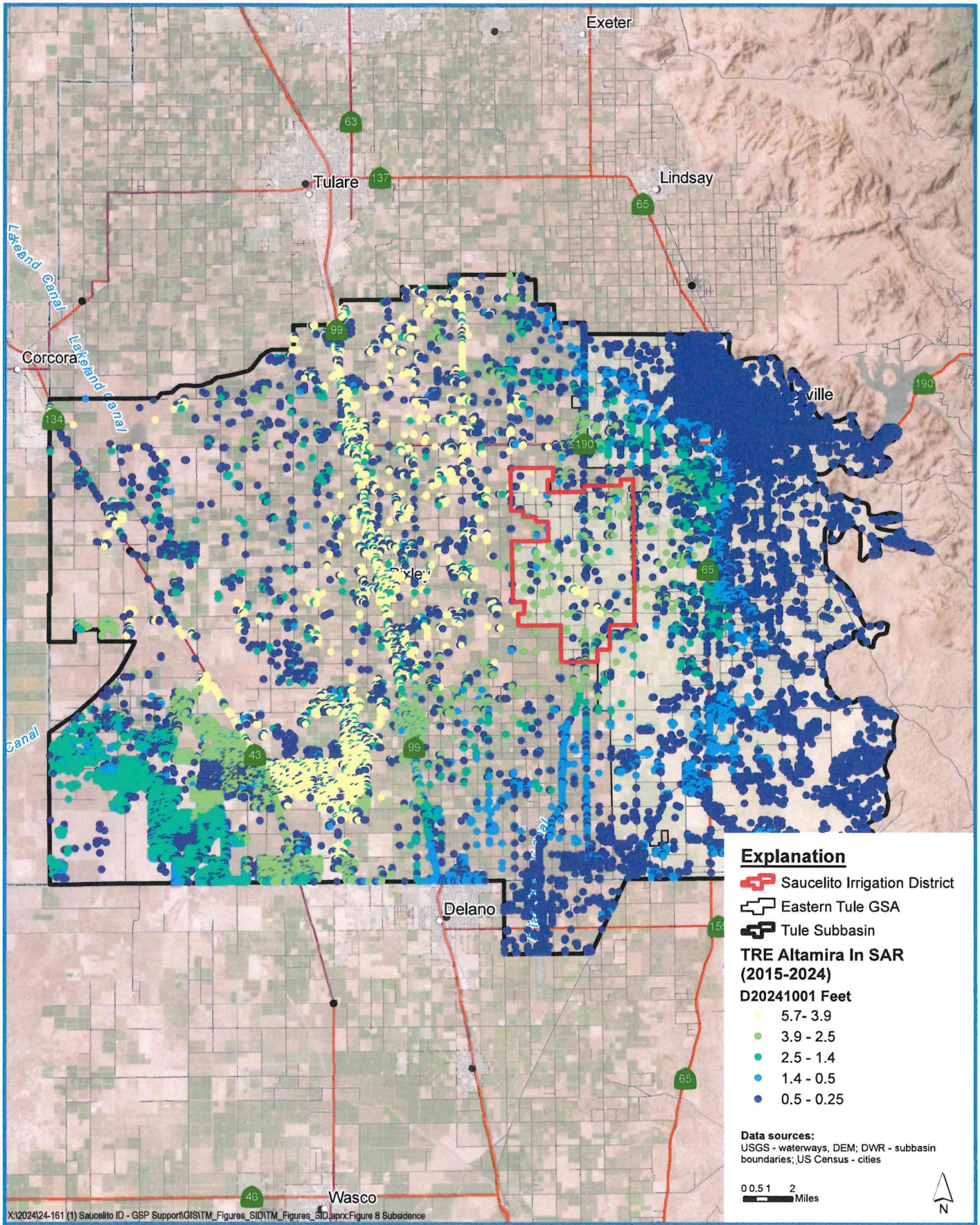
Groundwater Elevations

Saucelito Irrigation District
Tule Subbasin
Water Budget Results

Figure 7



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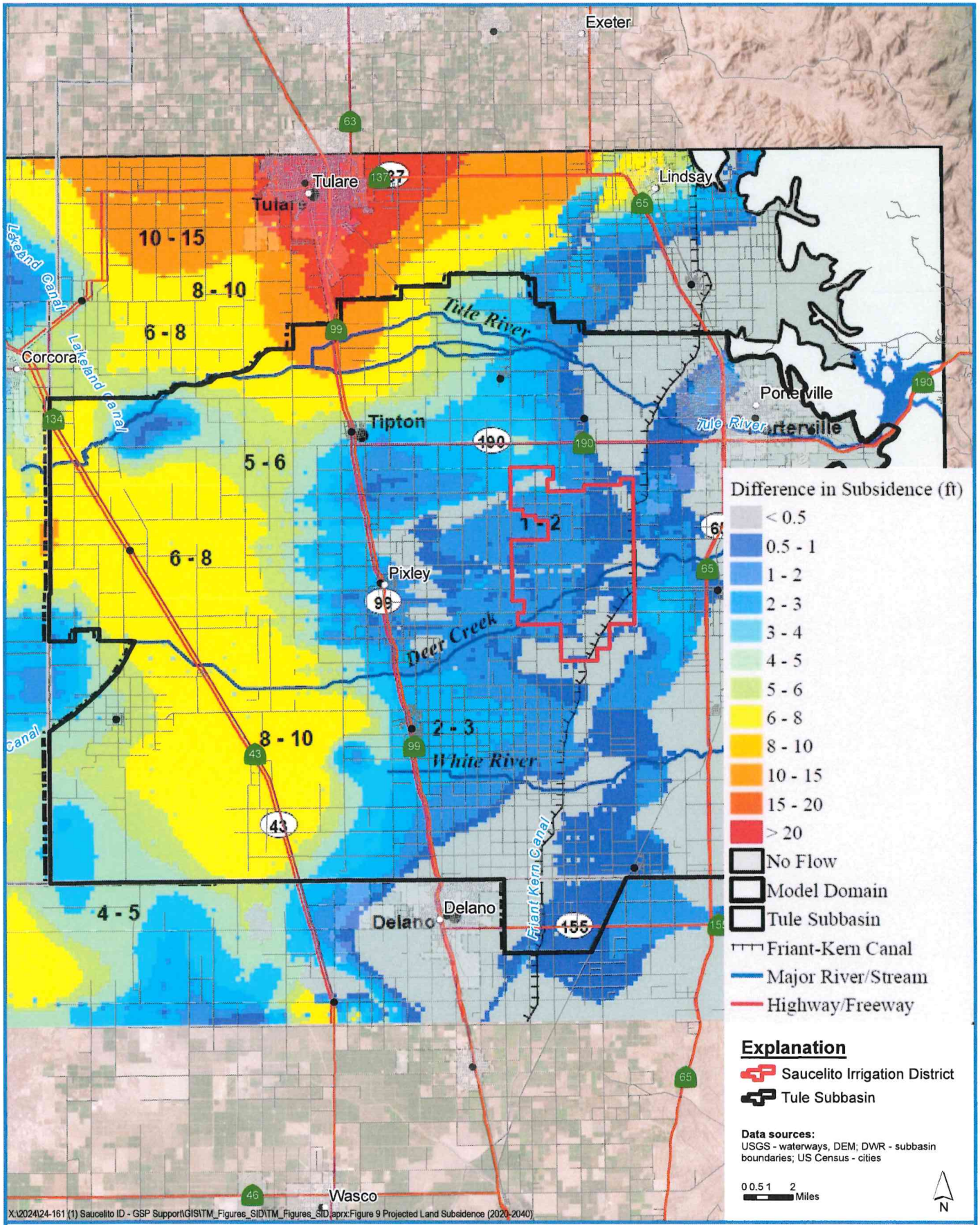
Subsidence Data (2015-2024)

Water Budget Analysis
Saucelito Irrigation District
Tule Subbasin

Figure 8



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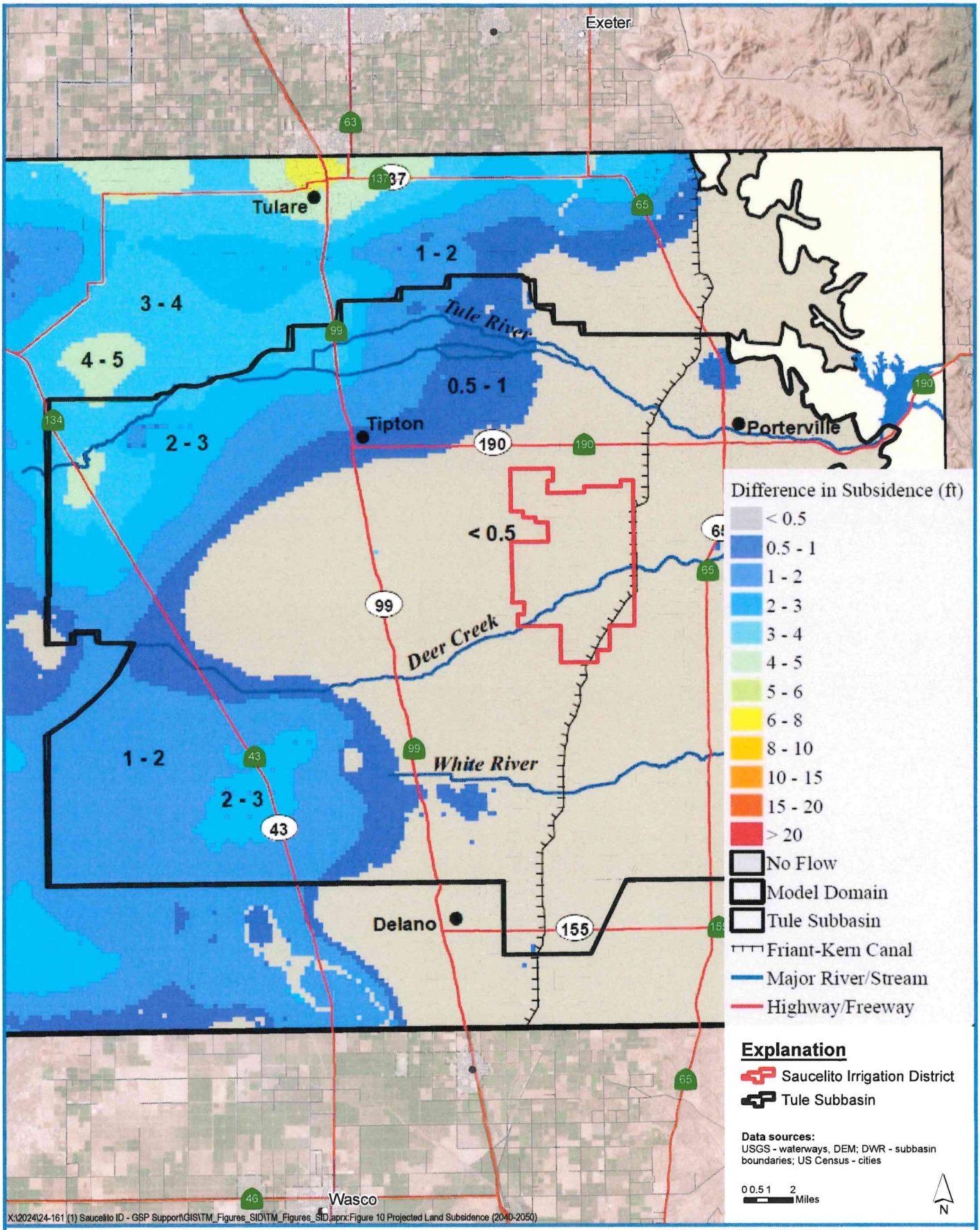
Projected Land Subsidence (2020-2040)

Figure 9

Water Budget Analysis
Saucelito Irrigation District
Tule Subbasin



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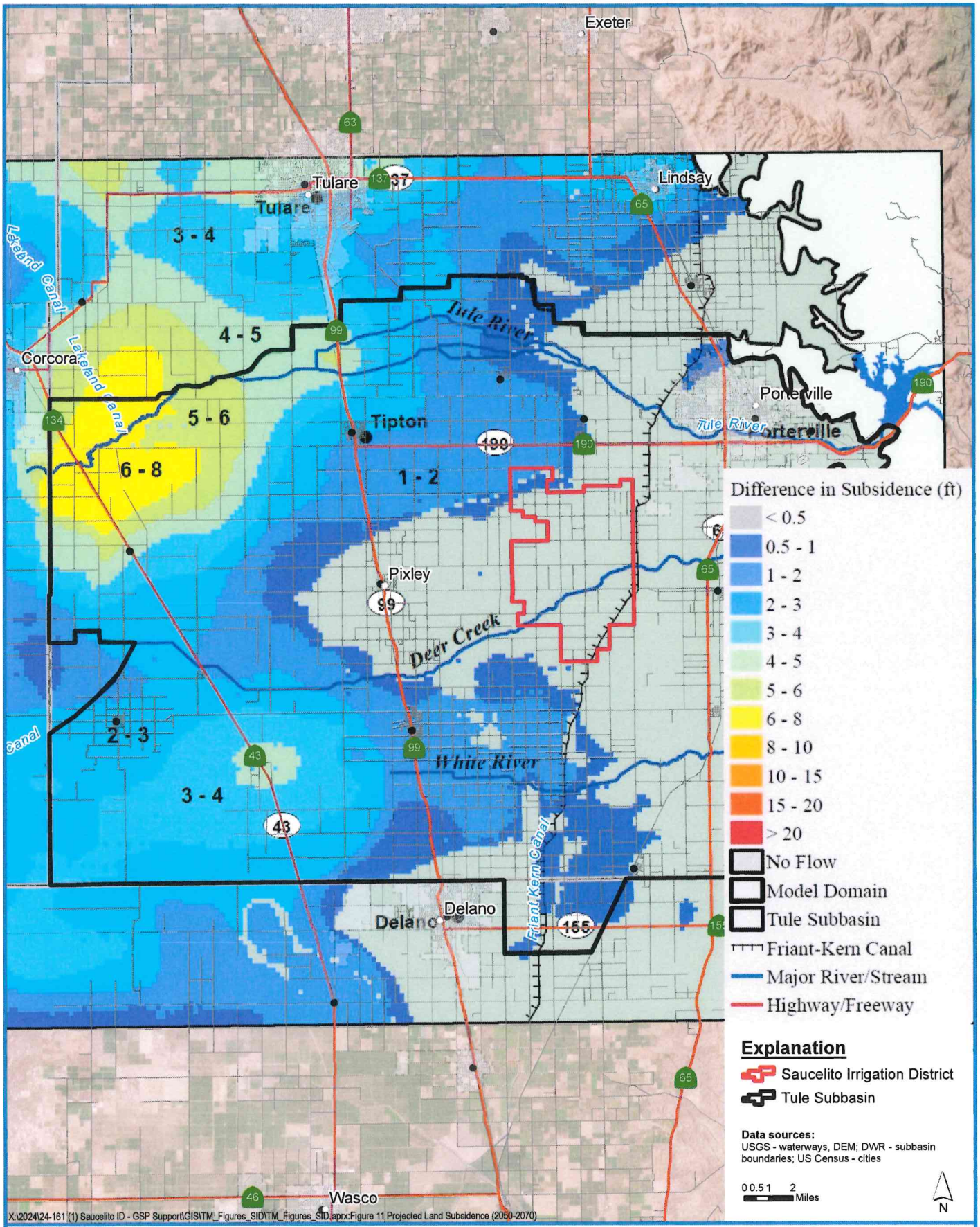
Projected Land Subsidence (2040-2050)

Figure 10

Water Budget Analysis
Saucelito Irrigation District
Tule Subbasin



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Projected Land Subsidence (2050-2070)

Water Budget Analysis
Saucelito Irrigation District
Tule Subbasin

Figure 11