

GSP Sustainable Management Actions Modeling Scenarios

IWVGA TAC MEETING: AUGUST 1, 2019

AGENDA ITEM 3B

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GSP Sustainable Management Action Modeling Scenarios

- Scenario 6 Development
- Scenario 6 Objectives
- Recap of Model Scenario 4 (Water Buyout)
- Summary of Model Scenario 6 (Modified Water Buyout)
 - Scenario 6.1
 - Scenario 6.2
- Model Results and Comparison (6.1 & 6.2)
- Discussion and Next Steps

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Scenario 6 Development

- Results of Scenarios 3, 4, and 5 presented to the Board in May and June
 - Emphasis on minimizing loss of groundwater in storage
 - Scenario 4 identified as a potentially viably acceptable solution
- IWVGA Attorney's meeting on July 12
 - Discussion of basin water demands, groundwater in storage, use of storage, and GSP implementation
 - Agreement to proceed with a new modeling scenario (Scenario 6)
 - Modified version of Scenario 4 (Water Buyout) with "blocks" of allowed non-domestic pumping
- Draft summary of concepts for Scenario 6 was developed in coordination with the Attorneys
 - Final model inputs provided to DRI after finalizing the summary of concepts with the Attorneys
- Discussion of Scenario 6 results and goals with DRI
 - Second iteration of Scenario 6 (6.2) developed to further evaluate imported water requirement

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Scenario 6 Objectives

- Create an allocation and management plan based on 2010-2014 pumping history and the highest beneficial uses of groundwater
- Maintain a similar cumulative loss of groundwater in storage as in Scenario 4 (Water Buyout) by replicating the total pumping volume used in Scenario 4
- Provide pumping "blocks" to non-domestic pumpers approximately equivalent to total non-domestic pumping in Scenario 4
 - More practical and feasible than the "ramp-down" in Scenario 4
- Optimize pumping locations to minimize future large drawdowns

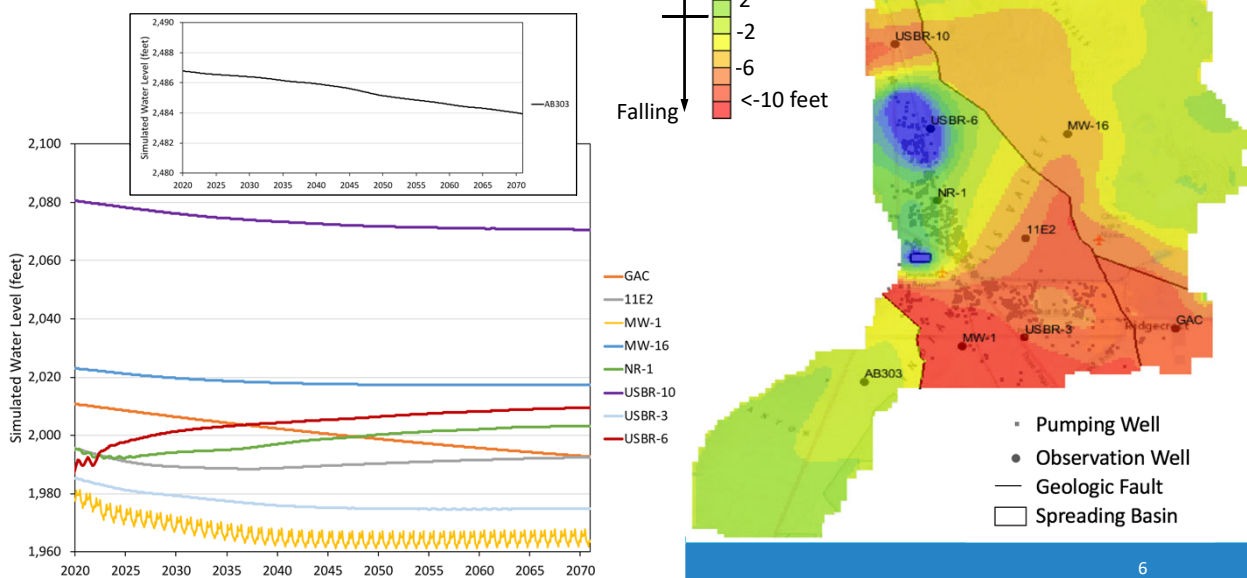
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Recap - Model Scenario 4 (Water Buyout)

- Start of Management Action – January 2022
 - Current pumping maintained in 2020 and 2021
- 2022: Total pumping going forward consists only of allocated rights (Federal and State rights).
 - Pumping includes reduced quantities of unprotected pumping (subject to ramp-down), plus protected pumping (not subject to ramp-down).
 - Pumpers who did not pump in each of the allocation years (2010-2014) identified during Scenario 4 preparation (Simmons, Blubaugh), were given zero allocation.
- 2023 through 2027: Unprotected allocations reduced by equal increments each year to reach Total Pumping of ~12,000 AFY in 2027
- 2025: Recycled water available to help reduce overdraft
- 2028 through 2070: Total Annual Pumping of ~12,000 AFY
- 2035 through 2070: Imported water supply available for basin recharge to operate sustainably

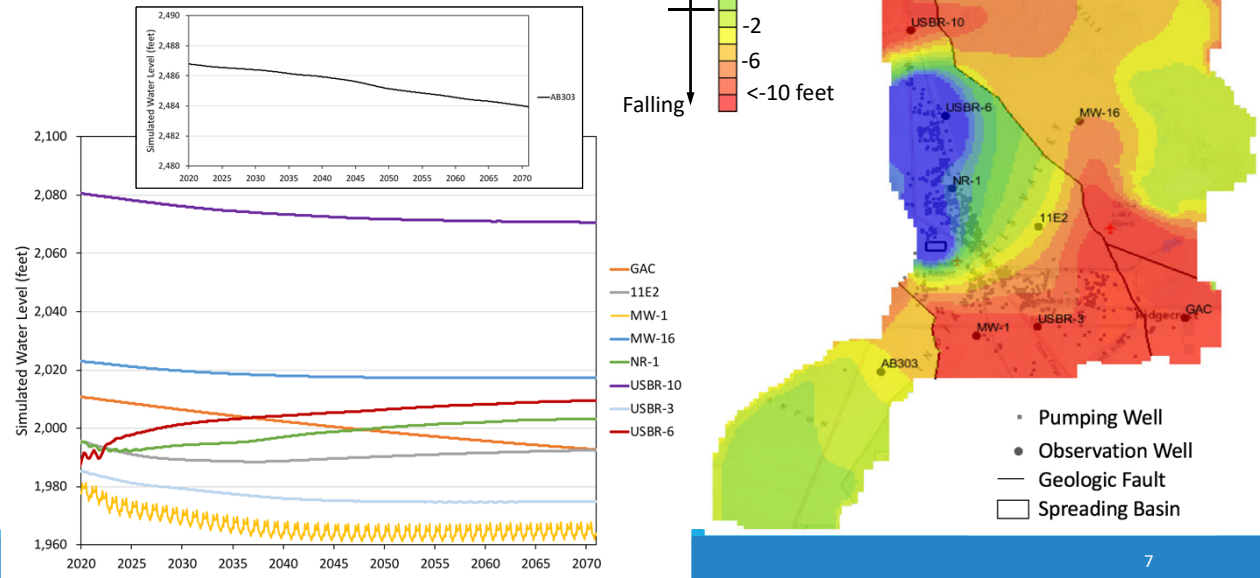
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Scenario 4: Water Level Change (2020-2040)

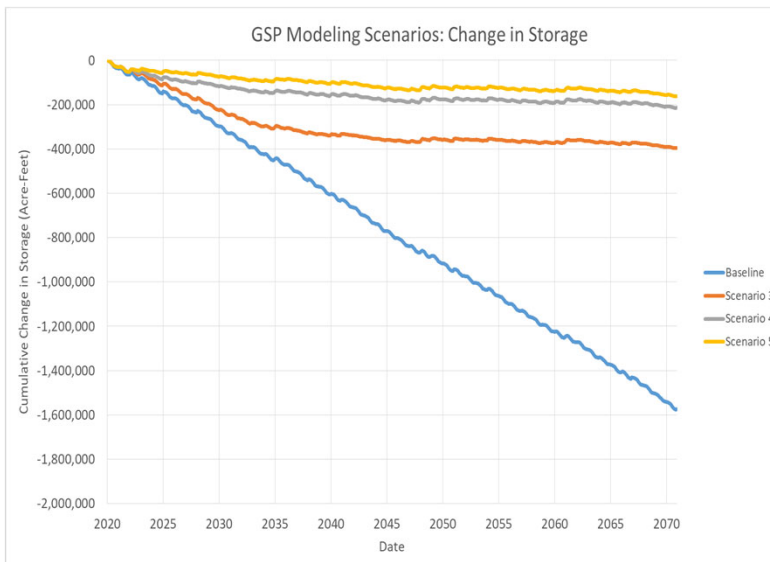


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Scenario 4: Water Level Change (2020-2070)



Change in Storage: Scenarios 3, 4, and 5 (and Baseline)



Baseline Approximate Total Loss of Storage (2020 to 2070): **1,574,000 AF**

Scenario 3 White Paper Approximate Total Loss of Storage (2020 to 2070): **395,000 AF**

Scenario 4 Water Buyout Approximate Total Loss of Storage (2020 to 2070): **213,000 AF**

Scenario 5 Immediate Halt Approximate Total Loss of Storage (2020 to 2070): **162,000 AF**

Summary of Model Scenario 6 (Modified Water Buyout)

- Discontinue all pumping that was **not continuous** from 2010-2014 (i.e. post-SGMA pumpers)
 - McGee, Blubaugh, Simmons Ranch
 - Status as post-SGMA pumpers to be verified as a post-GSP action
- Pumpers with continuous pumping from 2010 – 2014 categorized into one of two groups:

Domestic Group	Non-Domestic Group
Kern County	Meadowbrook
City of Ridgecrest	Mojave
IWVWD	SVM (industrial)
Inyokern CSD	Other small ag. (Quist, Sierra Shadows, Amberglow, Terese, Hickie, Bellino)
SVM (Trona only)	
Mutuals and domestic/private wells	
Navy	

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Summary of Model Scenario 6 (Modified Water Buyout) (cont.)

Domestic group

- Starting in February 2020, allocation equal to lowest annual pumping from 2010-2014
 - Does not result in decreases in current pumping, except for a minor decrease for City of Ridgecrest
- Modeled pumping for 2020-2070 is equal to allocation, except the IWVWD
 - IWVWD pumping in 2020 equal to 6,507 AFY (based on 2017 actual pumping)
 - Assumed growth rate of 1% per year for IWVWD demands
 - IWVWD pumping above allocation due to growth will be offset by purchasing additional imported water
 - City stops pumping when recycled water becomes available

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Summary of Model Scenario 6 (Modified Water Buyout) (cont.)

➤ Domestic group allocations

• Navy	2,041 AFY
• Kern County	18 AFY
• IWVWD	7,319 AFY
• Private/domestic wells	800 AFY
• Mutuels	300 AFY
• Inyokern CSD	108 AFY
• City of Ridgecrest	339 AFY
• SVM (Trona)	225 AFY
	11,150 AFY

➤ Domestic group modeled 2020 pumping

• Navy	2,041 AFY
• Kern County	18 AFY
• IWVWD	6,507 AFY
• Private/domestic wells	800 AFY
• Mutuels	300 AFY
• Inyokern CSD	108 AFY
• City of Ridgecrest	339 AFY
• SVM (Trona)	225 AFY
	10,338 AFY

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Summary of Model Scenario 6 (Modified Water Buyout) (cont.)

Non-domestic group

- Pumpers have no allocations but are allowed to pump up to an assigned portion of a non-domestic pool/block volume.
- Total non-domestic pool/block volume: **63,836 AF**
 - Approximately equal to total non-domestic pumping in Scenario 4 over 8 years (2 years of current pumping and 6 years of "ramp-down" pumping)
- Agricultural pumpers: assigned portion of the pool volume is distributed proportionate to existing information on irrigated acres from 2010-2014
 - Acreage per the March 2014 Farm Group letter
- SVM (industrial): assigned portion of the pool volume is distributed proportionate to SVM's lowest pumping in 2010-2014 compared to the total of the lowest pumping by each non-domestic producer in 2010-2014
- All pumping from the non-domestic pool is required to cease by **2040**
 - For modeling purposes, non-domestic group pumpers continue to pump at current levels over a "cliff" period until their assigned portions of the pool volume are depleted
 - Assigned portion of the pool volume may be used variably until 2040, but total pumping shall not exceed assigned portion.

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Summary of Model Scenario 6 (Modified Water Buyout) (cont.)

Name	Irrigated Acreage (acres)	Portion of Pool Volume (AF)	Estimated "Cliff" Period (months)
Meadowbrook	890	31,832	60
Mojave*	120	4,292	8
Quist	140	5,007	92
Sierra Shadows	168	6,009	94
Amberglow	12	429	83
Terese	80	2,861	111
Hickle	17	608	86
Bellino	13	465	112
SVM (industrial)**	-	12,333	62
Total	1,440	63,836	-

*Irrigated acres consists only of 120 acres of alfalfa converted to pistachio

**Does not reflect recent information provided by SVM on pumping before establishment of China Lake NAWIS

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Summary of Model Scenario 6 (Modified Water Buyout) (cont.)

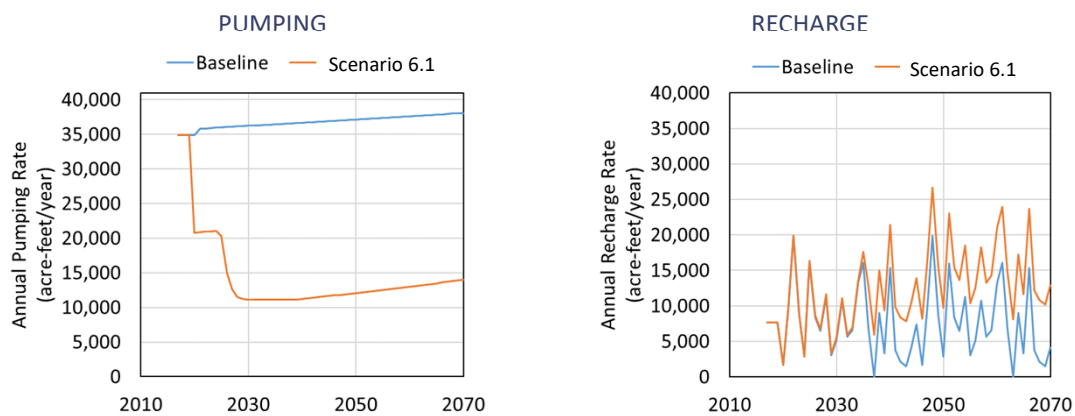
- Lease Market
 - Possible sellers
 - Meadowbrook
 - IWWVD (after accounting for annual growth)
 - City of Ridgecrest (demands assumed to be replaced with recycled water in 2025)
 - Possible buyers
 - Mojave
 - SVM (industrial)
 - Small Ag
 - SVM would purchase lease water or recycled water for its industrial demands until imported water becomes available in 2035.
- Some IWWVD and SVM pumping relocated towards Brown Road to optimize pumping.
- Imported water assumed to be available for basin recharge starting in 2035 to offset pumping above sustainable yield and offset increased pumping demands due to projected growth (IWWVD).
 - Included in Scenarios 6.1 and 6.2
- 2,500 AFY of additional imported water would be required for recharge to offset ongoing losses of groundwater in storage due to evapotranspiration.
 - Only included in Scenario 6.1

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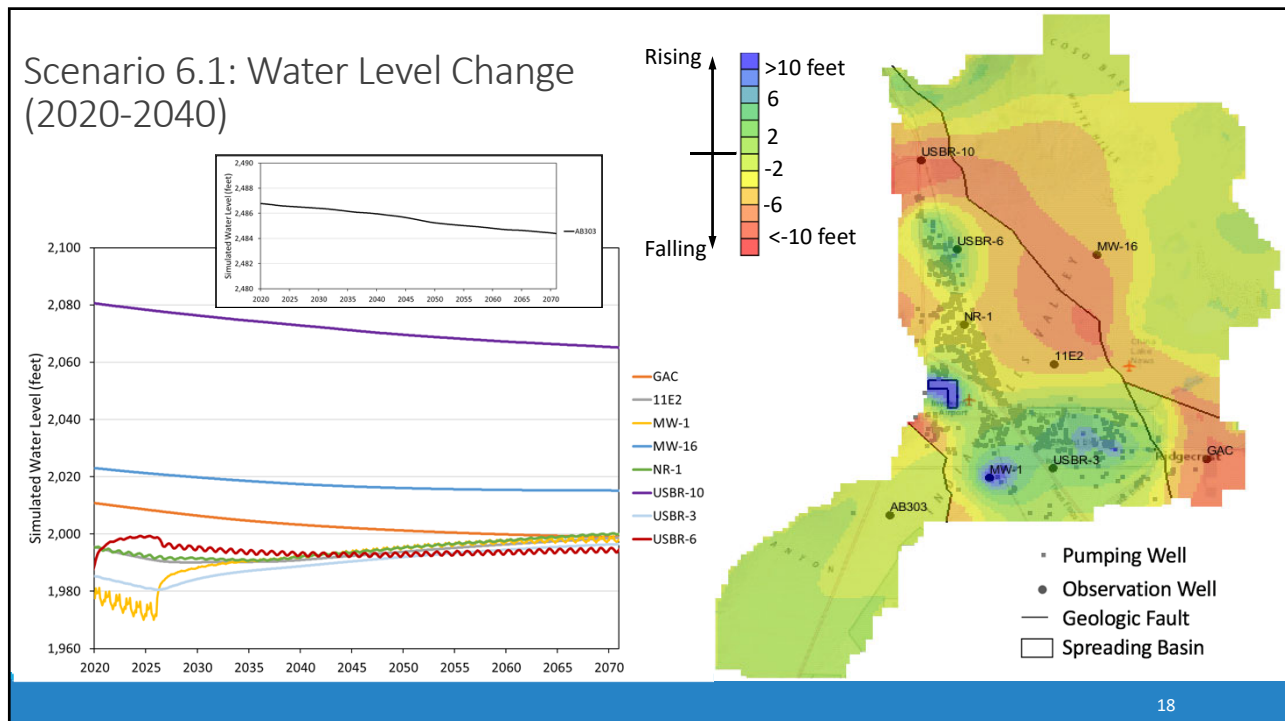
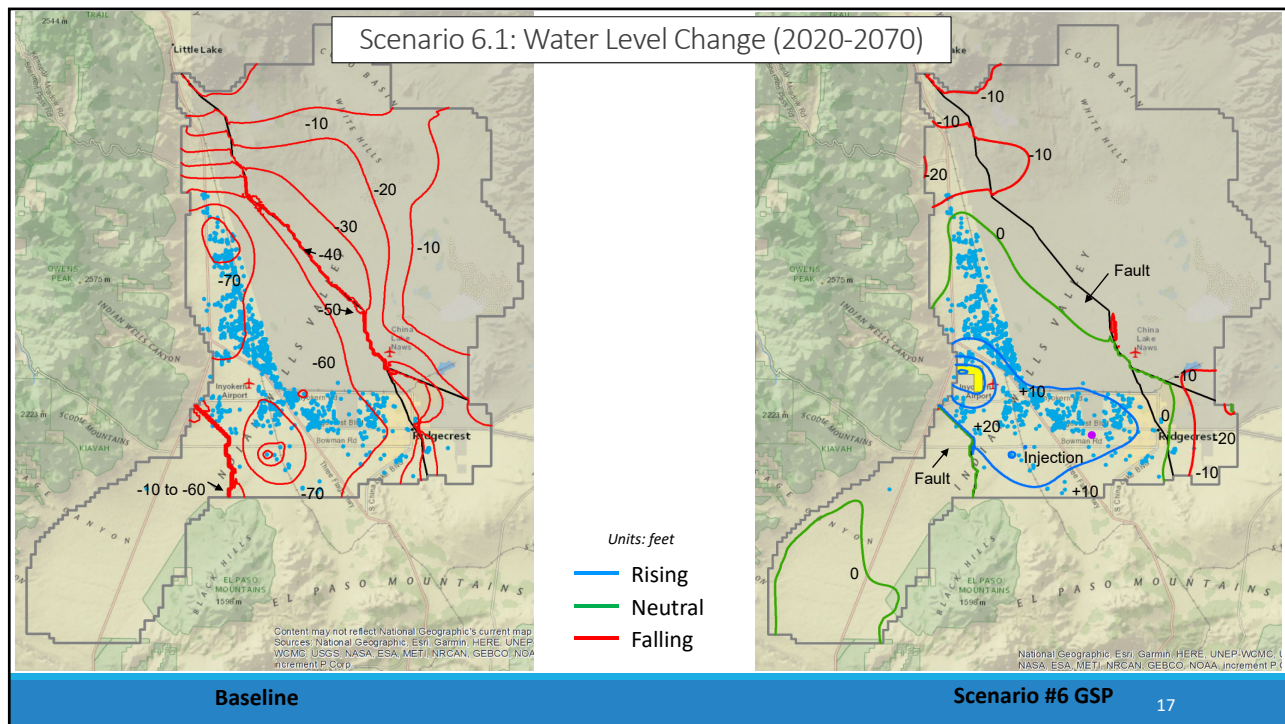
Model Results – Scenario 6.1

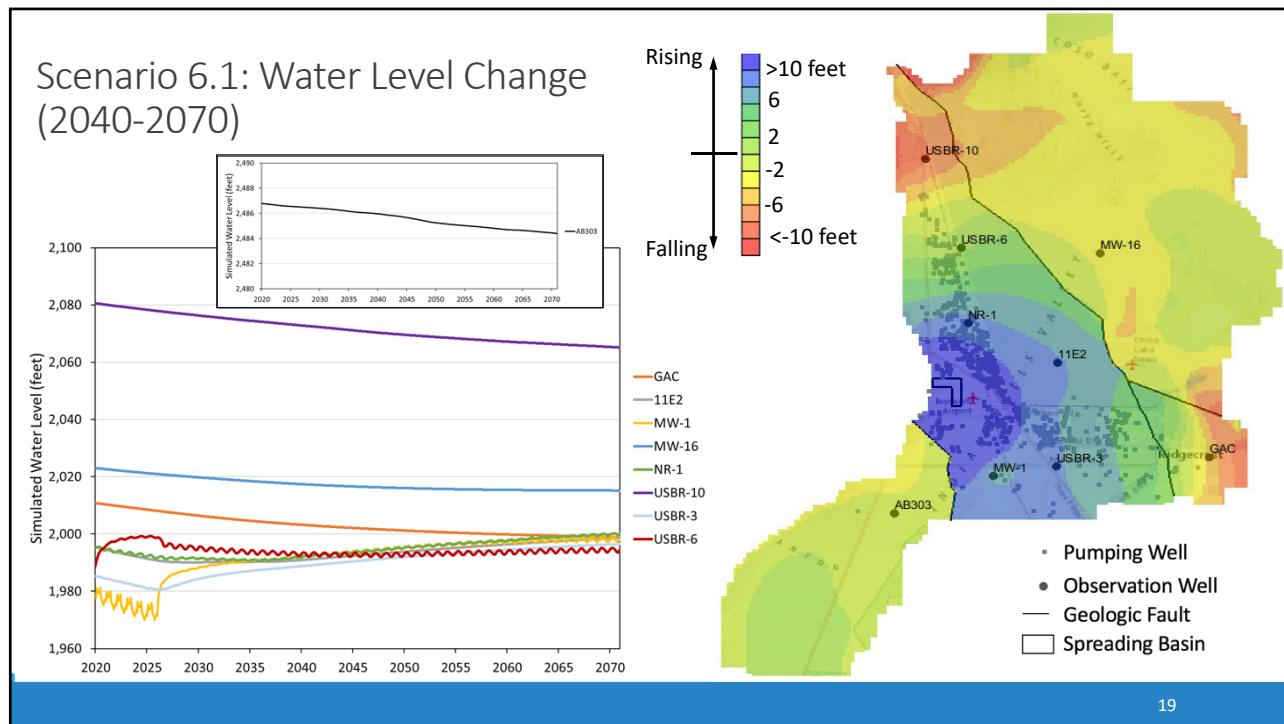
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Simulated Pumping and Recharge (Scenario 6.1)

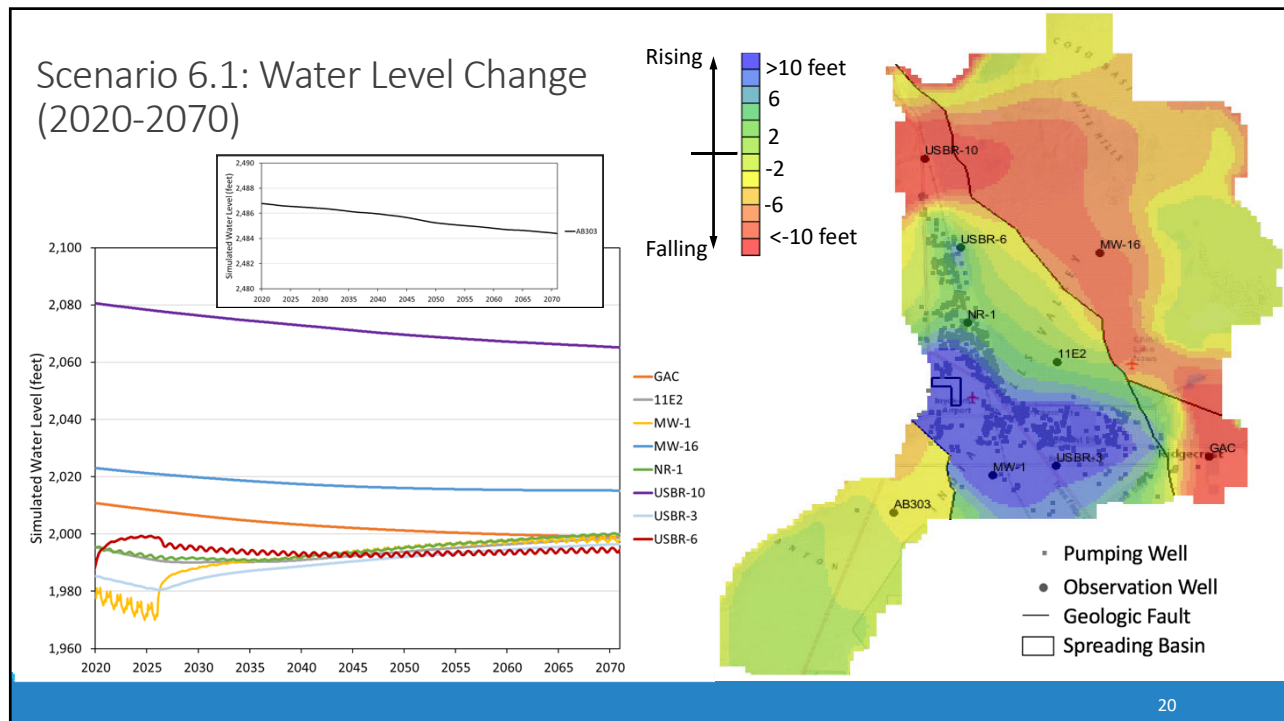


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Basin Water Budget (Scenario 6.1)

	BASELINE (2020 - 2070)	SCENARIO 6.1 (2020 - 2025) (2035 - 2040) (2065 - 2070)		
<u>INFLOW</u>				
Natural Recharge	7,650	8,570	7,050	5,180
Imported Water Recharge	-	-	4,750	8,200
Recyled Water Recharge	-	-	352	352
TOTAL	7,650	8,570	12,152	13,732
<u>OUTFLOW</u>				
Pumping	36,880	20,940	11,150	13,700
Evapotranspiration	1,610	2,660	2,040	1,400
Flow to Salt Wells Valley	40	70	50	20
TOTAL	38,530	23,670	13,240	15,120
<u>CHANGE IN GW STORAGE</u>	-30,880	-15,100	-1,088	-1,388

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Basin Groundwater Budgets for 2020 through 2070 (Scenario 6.1)

Annual Average (acre-feet/year)

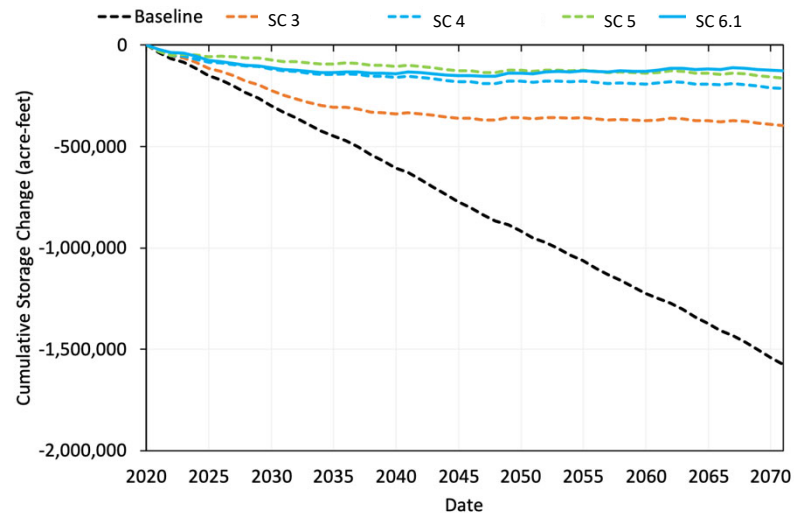
	Baseline	Scenario 3	Scenario 4	Scenario 5	Scenario 6.1
INFLOW					
Recharge	7,650	7,650	10,959	9,600	12,707
TOTAL	7,650	7,650	10,959	9,600	12,707
OUTFLOW					
Pumping	36,880	13,591	13,176	10,743	13,260
Evapotranspiration	1,610	1,771	1,944	1,979	1,885
Flow to Salt Wells Valley	40	38	38	39	39
TOTAL	38,530	15,400	15,158	12,760	15,184
CHANGE IN GW STORAGE	-30,880	-7,750	-4,199	-3,160	-2,477

Cumulative (acre-feet)

	Baseline	Scenario 3	Scenario 4	Scenario 5	Scenario 6.1
INFLOW					
Recharge	390,405	390,405	558,906	489,579	648,042
TOTAL	390,405	390,405	558,906	489,579	648,042
OUTFLOW					
Pumping	1,880,898	693,158	671,973	547,872	676,270
Evapotranspiration	82,347	90,337	99,128	100,910	96,141
Flow to Salt Wells Valley	1,893	1,927	1,931	1,970	1,991
TOTAL	1,965,139	785,423	773,033	650,752	774,402
CHANGE IN GW STORAGE	-1,574,734	-395,018	-214,127	-161,173	-126,360

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Change in Basin Groundwater Storage (Scenarios 3, 4, 5, & 6.1)

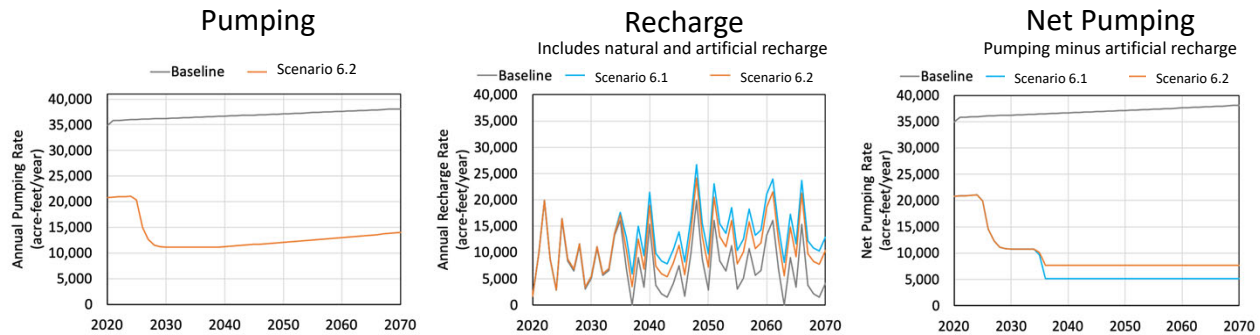


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Model Results – Scenario 6.2

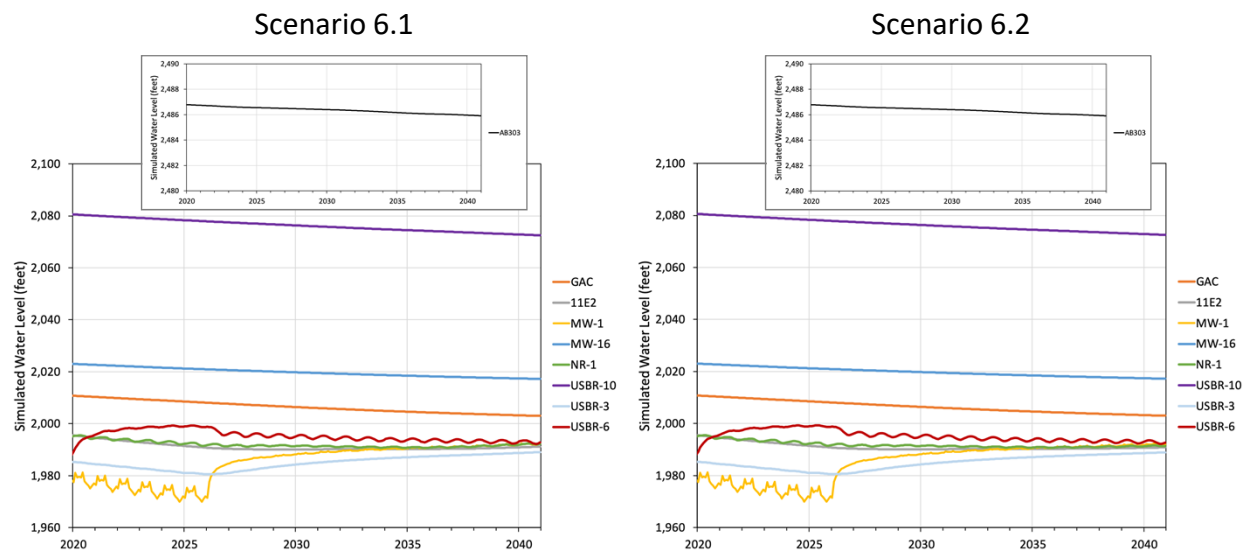
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Simulated Pumping and Recharge (Scenario 6.2)

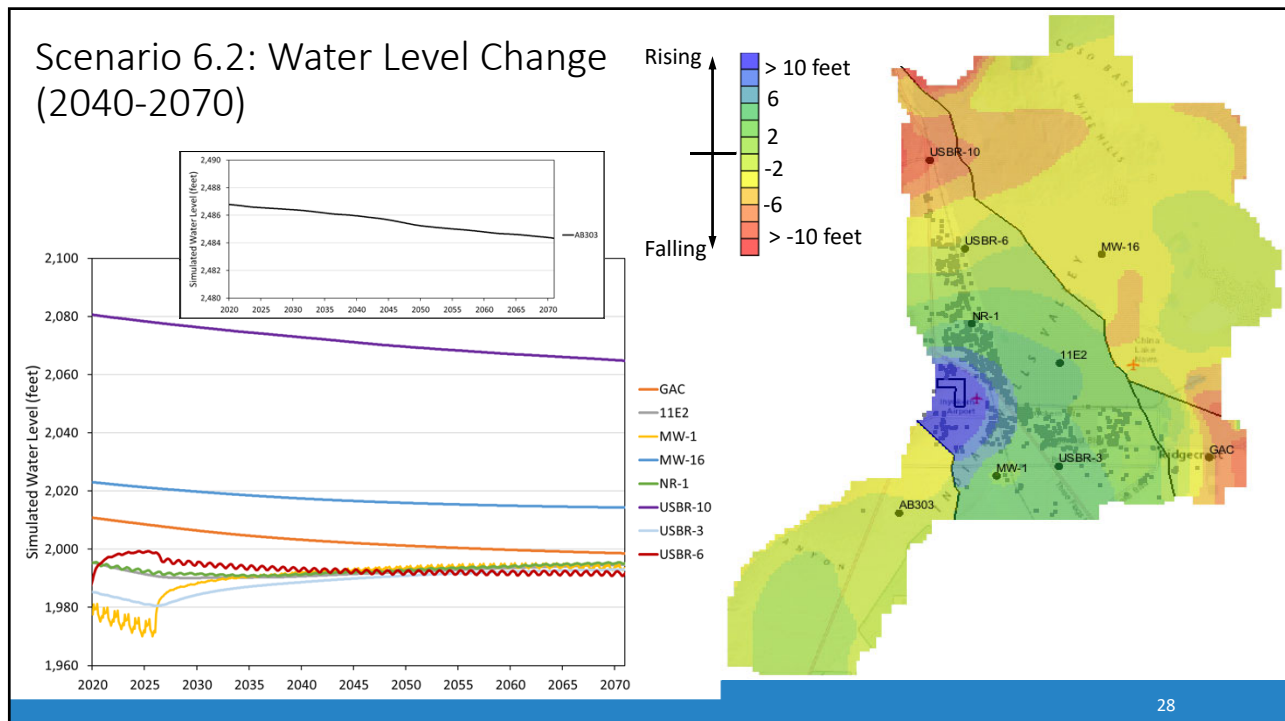
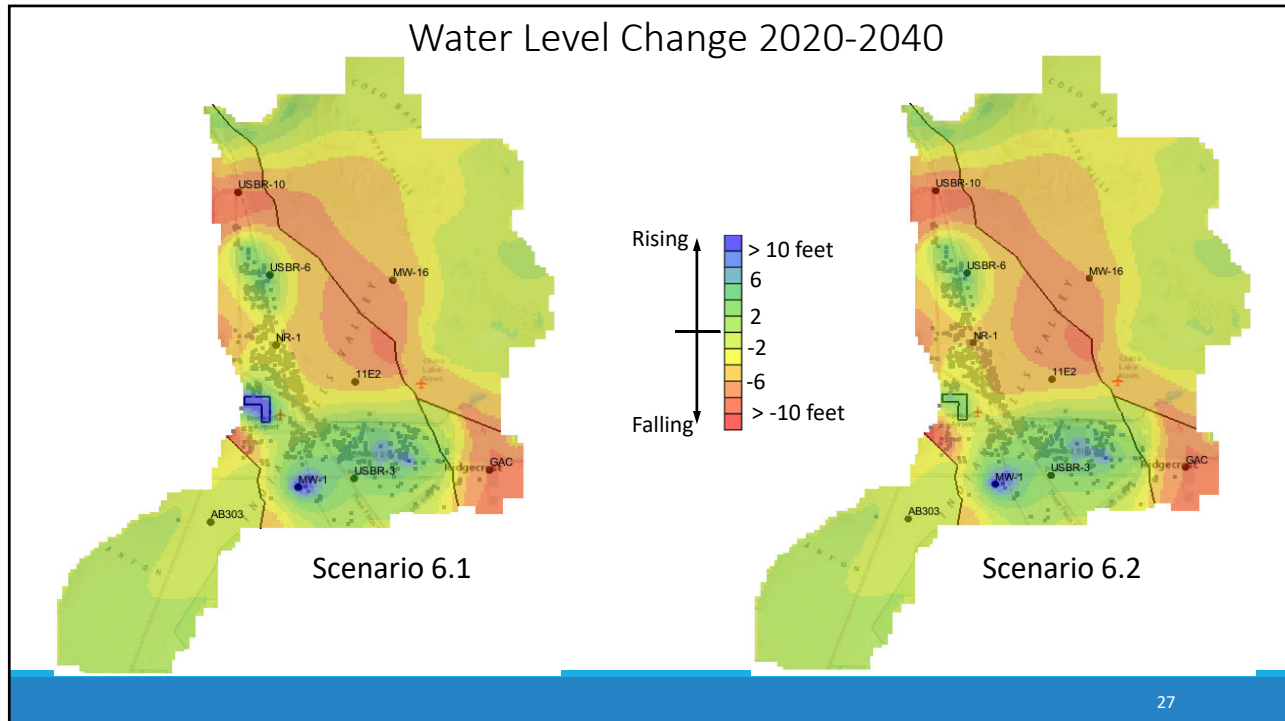


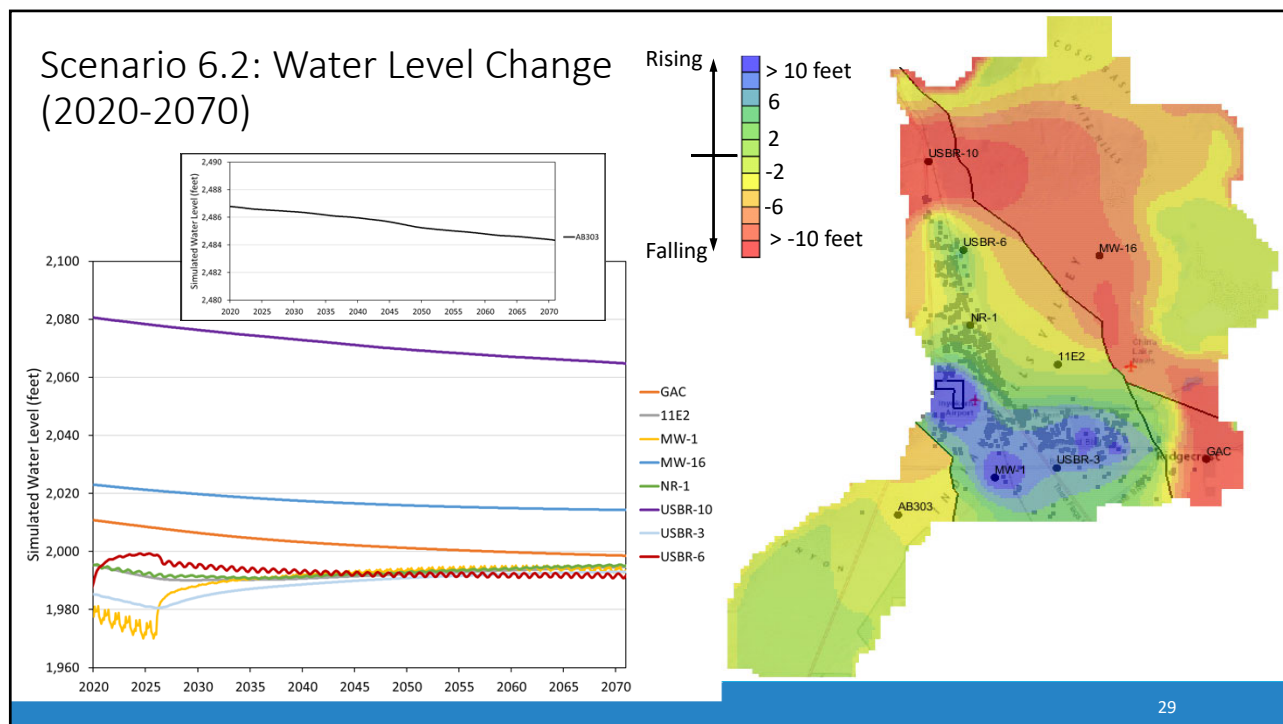
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Water Level Change (2020-2040)



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Basin Groundwater Budgets for 2020 through 2070 (Scenarios 4, 6.1, & 6.2)

Annual Average
(acre-feet/year)

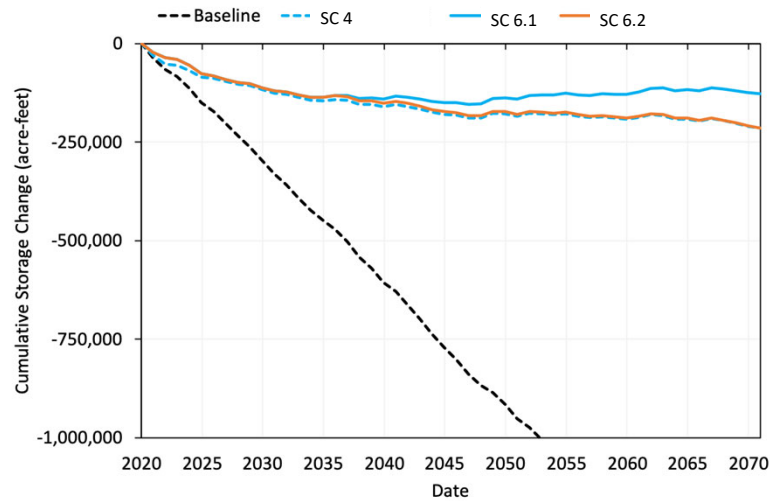
	Baseline	Scenario 4	Scenario 6.1	Scenario 6.2
INFLOW				
Natural Recharge	7,650	7,639	7,630	7,639
Artificial Recharge	0	3,320	5,077	3,352
TOTAL	7,650	10,959	12,707	10,990
OUTFLOW				
Pumping	36,880	13,176	13,260	13,260
Evapotranspiration	1,610	1,944	1,885	1,877
Flow to Salt Wells Valley	40	38	39	39
TOTAL	38,530	15,158	15,184	15,176
CHANGE IN GW STORAGE	-30,880	-4,199	-2,477	-4,186

Cumulative
(acre-feet)

	Baseline	Scenario 4	Scenario 6.1	Scenario 6.2
INFLOW				
Natural Recharge	390,405	389,594	389,109	389,575
Artificial Recharge	0	169,312	258,933	170,933
TOTAL	390,405	558,906	648,042	560,508
OUTFLOW				
Pumping	1,880,898	671,973	676,270	676,270
Evapotranspiration	82,347	99,128	96,141	95,722
Flow to Salt Wells Valley	1,893	1,931	1,991	1,990
TOTAL	1,965,139	773,033	774,402	773,982
CHANGE IN GW STORAGE	-1,574,734	-214,127	-126,360	-213,475

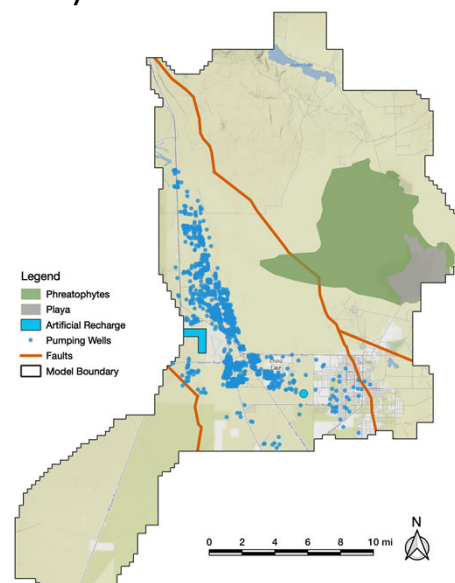
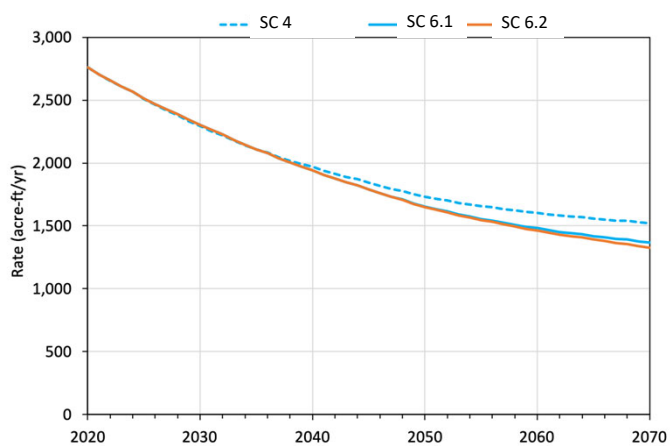
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Change in Basin Groundwater Storage (Scenarios 4, 6.1, & 6.2)



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Evapotranspiration (Scenarios 4, 6.1, & 6.2)



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Discussion and Next Steps
