

(Agenda item 3a Estimated Shallow Well Impact Analysis GA Model Runs 3, 4, and 5

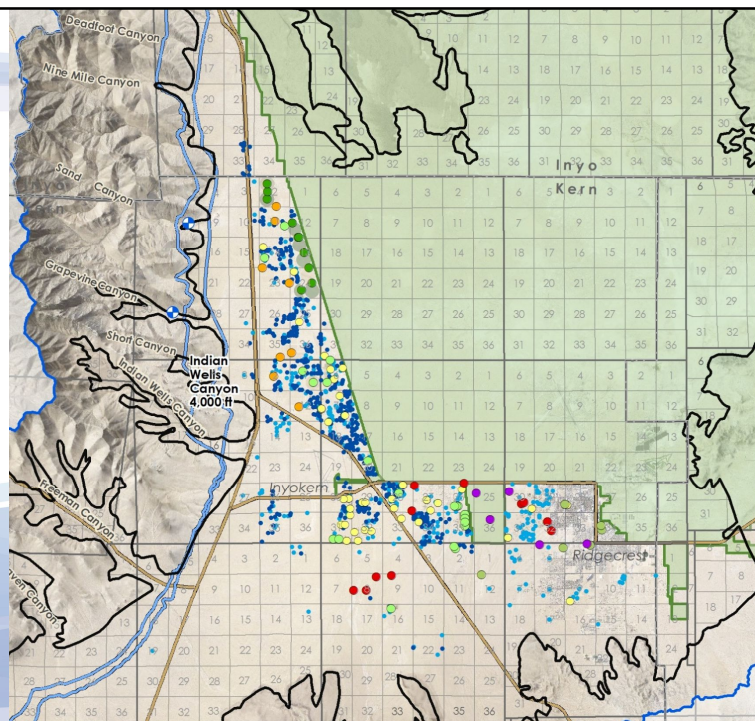
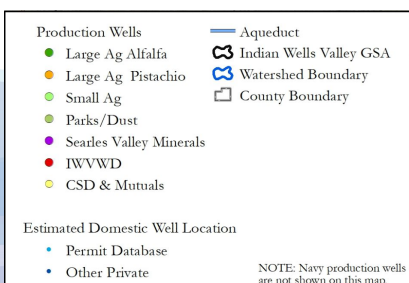
Estimated Shallow Well Inventory

- 377 DOM Wells from Well Permits (Kern County Health Department)
 - 455 Other private wells estimated from # Rural Domestic
 - 2 Coop Wells representing 265 Hookups
 - 38 Mutual Wells representing 491 Hookups
- 872 Shallow Wells (1,588 residences)



Production Well Location Map

66 Larger Production Wells
40 Mutual and CSD Wells
832 Domestic/Private Wells
938 Production Wells



Shallow Well Impact Analysis: Rate of Drawdown (DDN) by Section

Methodology to Develop Annual Rate of Groundwater Table Drawdown

HISTORICAL (KCWA Groundwater Level (GWL) Contour Maps and GIS)

- Digitize 2010 & 2015 contours into GIS
- Develop GIS raster of average change in GWL/year by Section
- Apply 2010-2015 average annual DDN rate to historical conditions

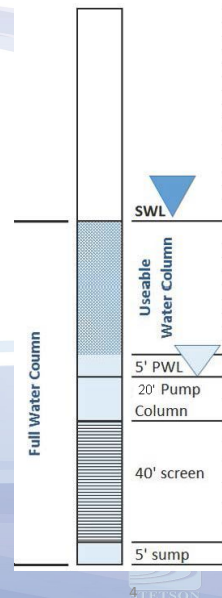
FUTURE BASELINE AND MANAGEMENT SCENARIOS (Model Output and GIS)

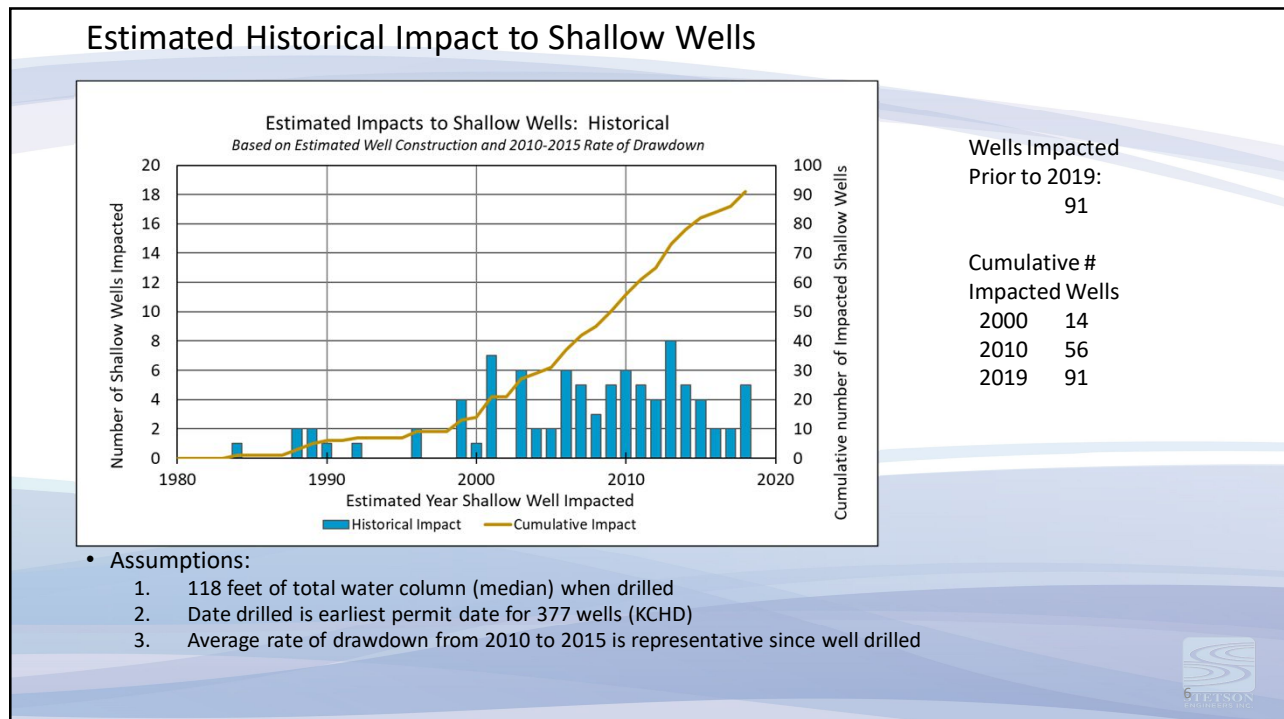
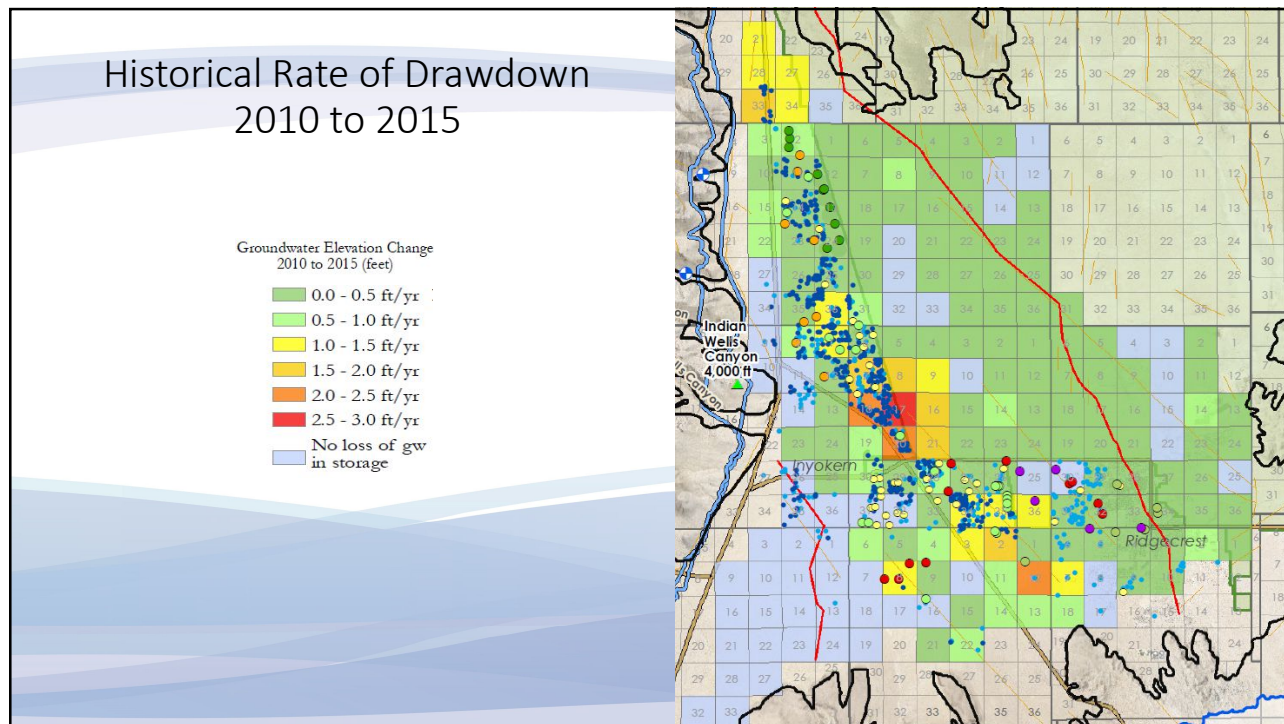
- Develop annual DDN rate from simulated 2020-2070 GWL
- GIS analysis to apply DDN Rates from model cells to Sections
- Develop GIS maps of average change in GWL/year by Section
- Apply changing DDN Rate to Shallow Well Impact Analysis (2020, 2025, 2030, 2040, 2070)



Methodology (useable water column within a well)

1. Establish Construction Dates for Each Shallow Well
 - 377 with earliest permit date
 - 495 randomized construction dates
2. Determine initial Water Column when Well Drilled
 - 118 feet (median of permitted wells)
3. Estimate Well Construction:
 - 5' sump + 40' screen + 20' pump column + 5' PWL = 70' minimum water column
4. Estimate Usable Water Column at time of initial construction
 - $TD - SWL - 70' = \text{useable water column}$ (assumed 48 feet historically)
5. Estimate # years until impacted by aquifer drawdown
 - $\text{Useable Water Column (feet)} / \text{rate of drawdown per year (feet/year)} = \# \text{ years left of well operation}$





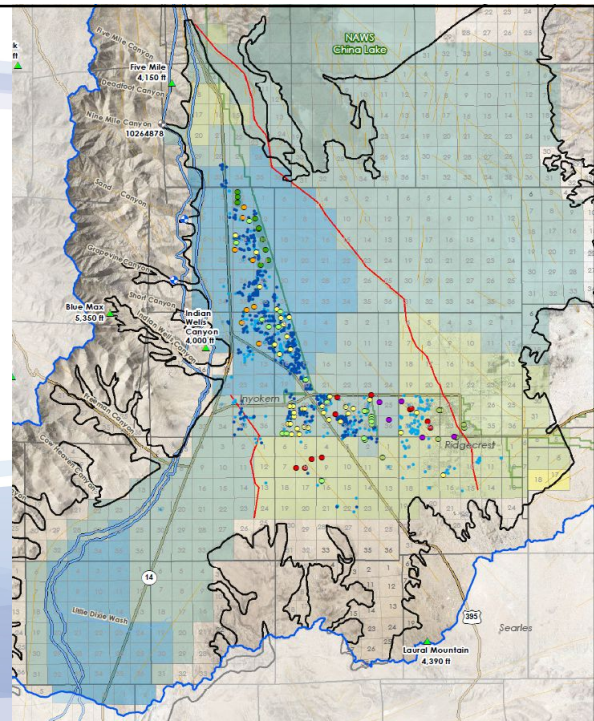
Scenario #3 50-Year Predicted DDN White Paper (modified)

2020-2029 Pumping 28,551 AFY

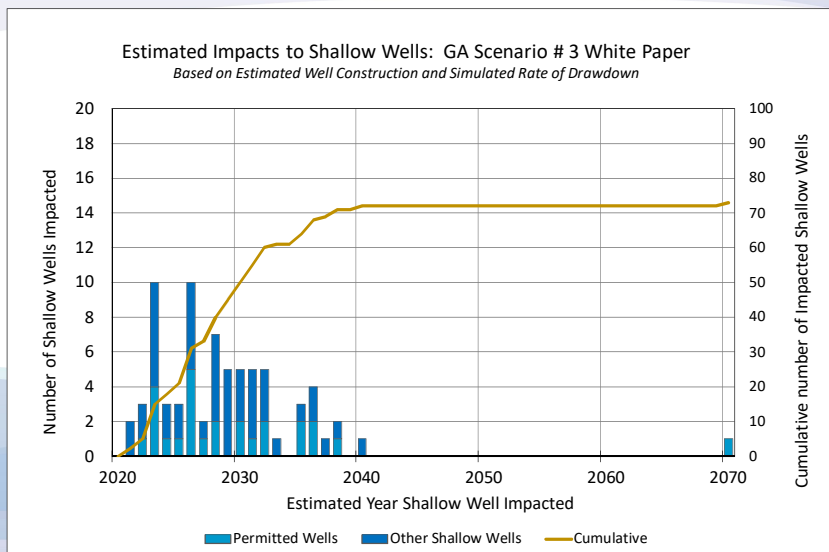
2030-2039 Pumping Ramp Down

2040-2070 Pumping 7,650

Simulated Predicted Groundwater Level Change
2020 to 2070



Estimated Management Scenario #3 Impact to Shallow Wells



Wells Impacted
By 2040:

72

Cumulative #
Impacted Wells

2025 21

2030 50

2040 72

2070 73

Assumption: well is
deepened by 100
feet when re-drilled.

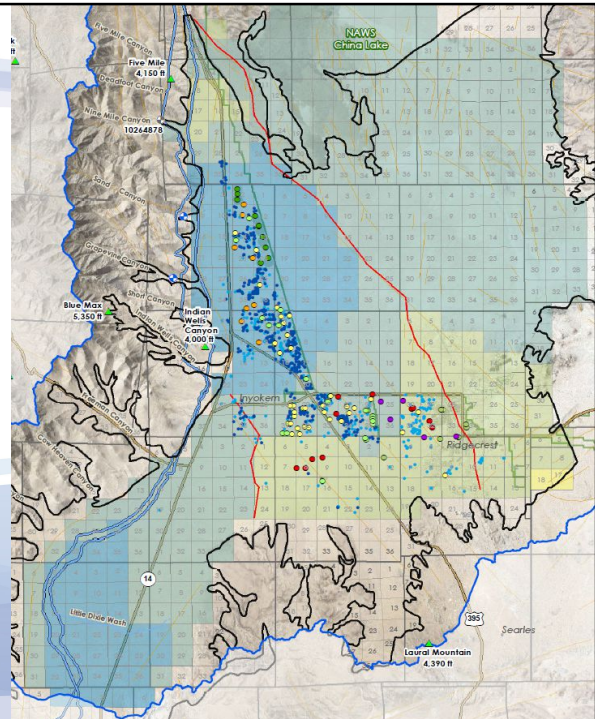
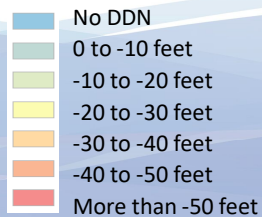


Scenario #4 50-Year Predicted DDN Water Buyout

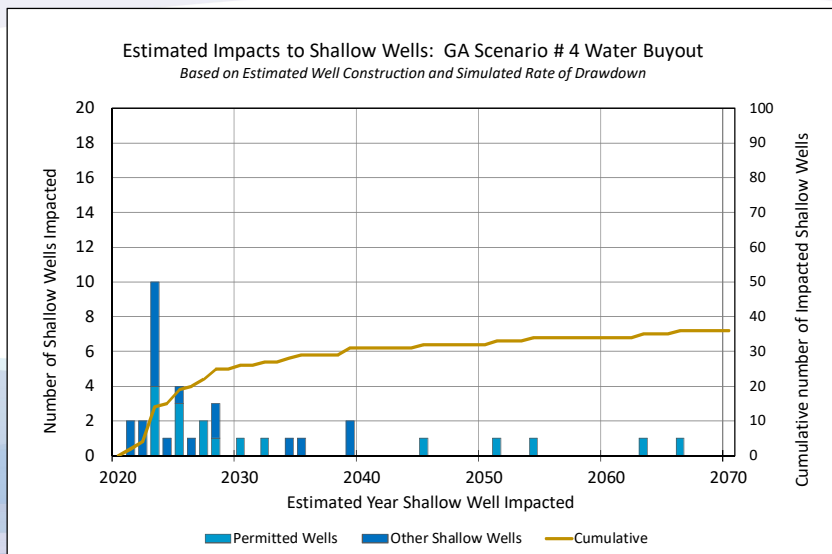
2020-2021 28,551 AFY Pumping
2021 Leased Water Available
2021-2027 Ramp Down from 21,006 AFY
2027-2070 12,000 AFY Pumping

2025 352 AFY Recycled Water Recharge
2035 4,350 AFY Imported Water Recharge

Simulated Predicted Groundwater Level Change
2020 to 2070



Estimated Management Scenario #4 Impact to Shallow Wells



Wells Impacted
Prior to 2040:
31

Cumulative #
Impacted Wells
2025 19
2030 26
2040 31
2050 36

Assumption: well is
deepened by 100
feet when re-drilled.

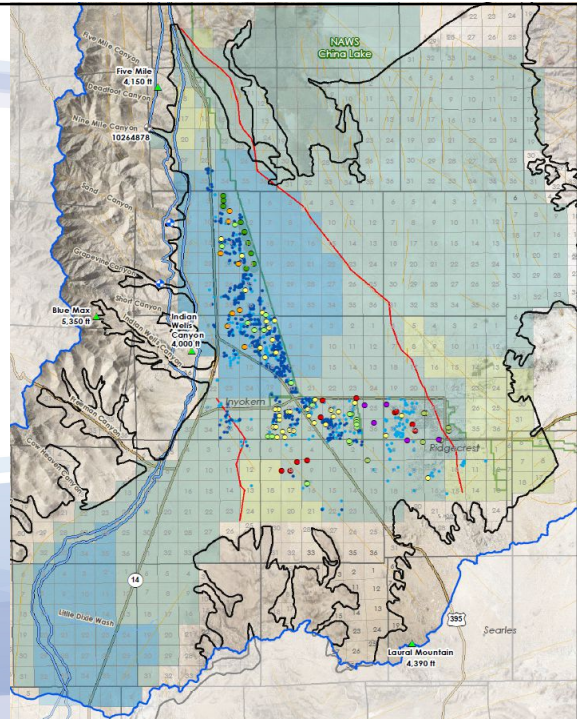
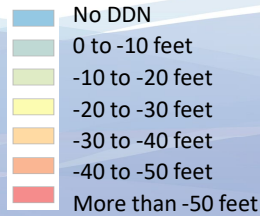


Scenario #5 50-Year Predicted DDN Immediate Halt to Pumping

2020-2021 28,551 AFY Pumping
2022-2070 10,119 AFY Pumping

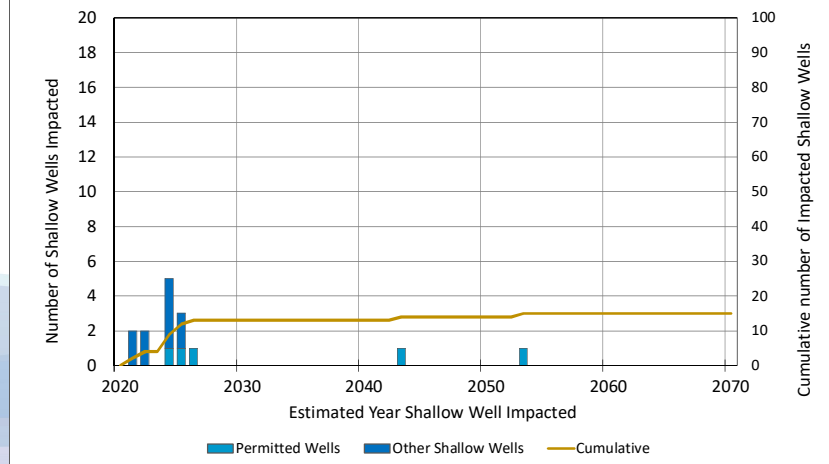
2025 352 AFY Recycled Water Recharge
2035 2,370 AFY Imported Water Recharge

Simulated Predicted Groundwater Level Change
2020 to 2070



Estimated Management Scenario #5 Impact to Shallow Wells

Estimated Impacts to Shallow Wells: GA Scenario # 5 Immediate Halt
Based on Estimated Well Construction and Simulated Rate of Drawdown



Wells Impacted
Prior to 2040:
13

Cumulative #
Impacted Wells
2025 12
2030 13
2040 13
2050 15

Assumption: well is
deepened by 100
feet when re-drilled.



Summary Table

	GA#3	GA#4	GA#5
<u>Cumulative Well Impact</u>			
2025	21	19	12
2030	50	26	13
2040	72	31	13
2070	73	36	15

Note: Historically (194-2018), an estimated 91 shallow wells were impacted.

