Meeting Minutes

Engineering/Minerals
Tonto National Forest
Phoenix, AZ

To: Project Record

From: Chris Garrett, SWCA

Re: ADWR/Desert Wellfield Modeling Meeting 11/9/2018

Attendees:

USFS: Mary Rasmussen, Lee Ann Atkinson
SWCA: Chris Garrett
RCM: Greg Ghidotti, Tim Bayley M&A, Hale Barr M&A, Anita Marks, Vicky Peacey, Mary Morissette
ADWR: Vineetha Kartha, Bret Esslin, Kyle Richards

Handouts:

Presentation Slides – Montgomery & Associates (26 pgs)

Discussion:

Introductions

Goals of meeting:

- Review results of modeling conducted by RCM for the Desert Wellfield pumping in the East Salt River Valley.
- Discuss permitting pathway.

Desert Wellfield

Desert Wellfield – GPO indicates up to 30 wells along the MARRCO corridor to supply part of the mine water balance. In reality, 12 wells are being modeled.

Wellfield simulation modeling conducted using an updated version of the ADWR Salt River Valley flow model.

Have also analyzed the simulated effects of the acquisition of long-term storage credits at the New Magma Irrigation and Drainage District Groundwater Savings Facility. Estimate that 10-30 feet of drawdown in the regional aquifer at Desert Wellfield has been avoided because of the long-term storage credits enabled by Resolution.

M&A gave an overview of flow model history, updates, and use for the project (see slides 4-8)

M&A reviewed the long-term storage credits acquired by Resolution in various facilities, and how the model was used to estimate the Area of Impact (AOI) for that recharge (see slides 9-12)

M&A presented the modeling results for the physical impact of pumping the Desert Wellfield, without consideration for any long-term storage credits. Also assumes that the non-Indian Agricultural (NIA) allotment of CAP water requested by Resolution is not going to materialize. Modeling conducted for all scenarios with alternative 2 representing the maximum impact and alternative 4 representing the minimum impact (see slides 13-26)

Permitting

Discussed briefly if there are any protection zones associated with the Gila River Indian Community (similar to the Tohono O'odham protections written into the Southern Arizona Water Rights Settlement Act). Do not believe there are any that exist.

Resolution would like to permit the Desert Wellfield wells as recovery wells. That is to be discussed later, as the necessary AMA people from ADWR were not present.

Action Items:

1. SWCA to ensure that appropriate information is translated into Chapter 3 (Groundwater Quantity), and that once figured out, regulatory/permitting framework is properly described in Chapter 1 or 2
2. Additional meeting to be scheduled with AMA to discuss: 1) appropriate type of permit for wells, 2) ramifications of basin transfer of water for Skunk Camp

Evaluation of Impacts from Desert Wellfield Pumping, Resolution Copper EIS

Resolution Copper | November 9, 2018

Presentation Overview

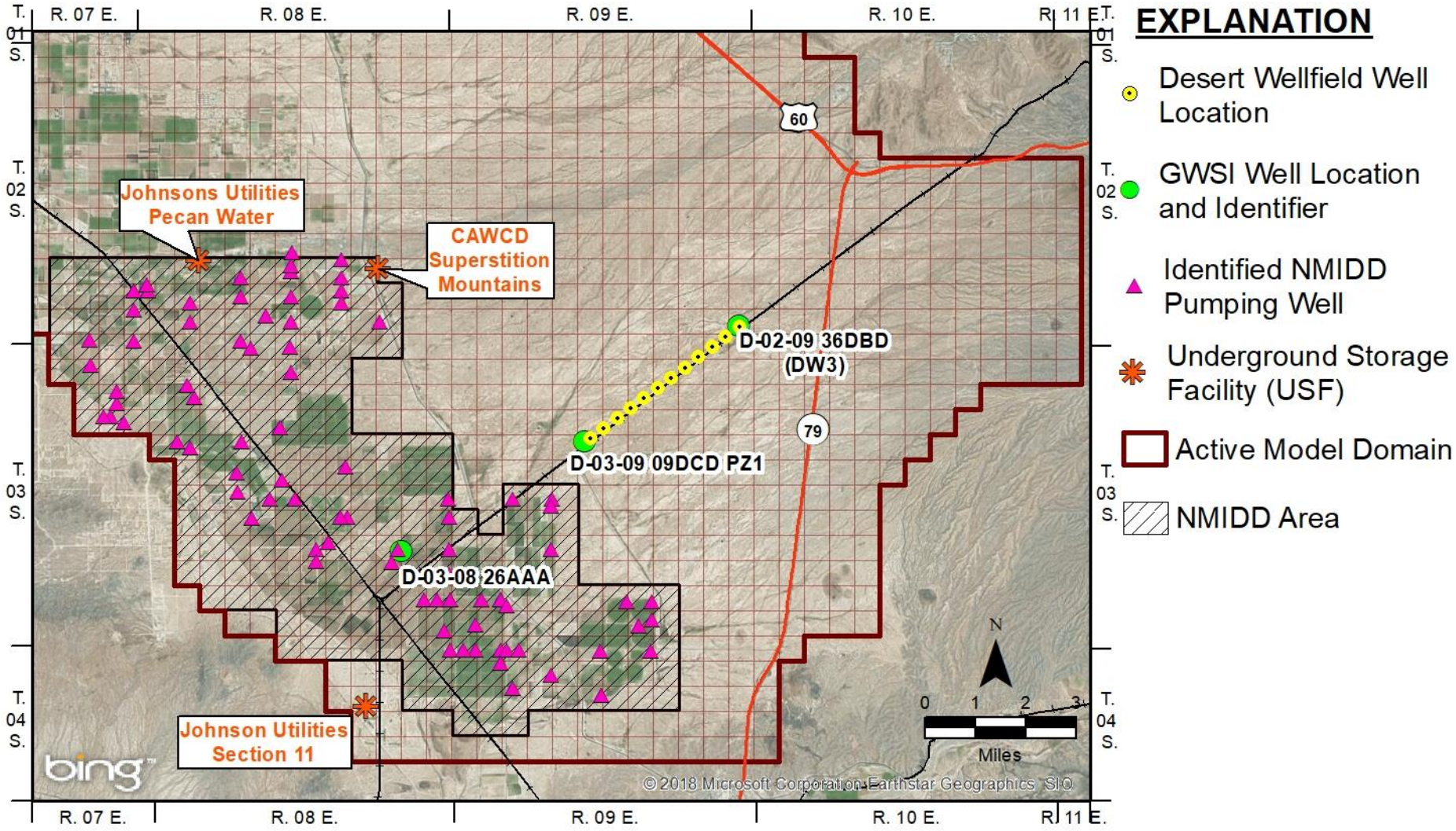
Part 1: ADWR SRV Flow Model Updated for Desert Wellfield Simulations

Part 2: Simulated Effects of Resolution Long Term Storage Credits (LTSC) at New Magma Irrigation Drainage District (NMIDD) GSF

Part 3: Projected Drawdown Due to Desert Wellfield Pumping

Part 1: ADWR SRV Flow Model Update for Desert Wellfield Simulation

Desert Wellfield Location



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Flow Model Summary

- Preliminary analysis using existing ADWR model
- Utilize 2009 ADWR SRV model that simulates groundwater flow from 1983 through 2006 (Freihoefer et. al., 2009)
- Includes all of Salt River Valley
- Uses MODFLOW 2000
- Half-mile grid spacing and 3 layers
- Extended to include predictive period through 2268 (10 years of minor pre-mining pumping, 41 years of pumping during active mining, and 200 years post-pumping)
- Lowered selected layer 3 cell bottom elevations to maintain wetted model cells

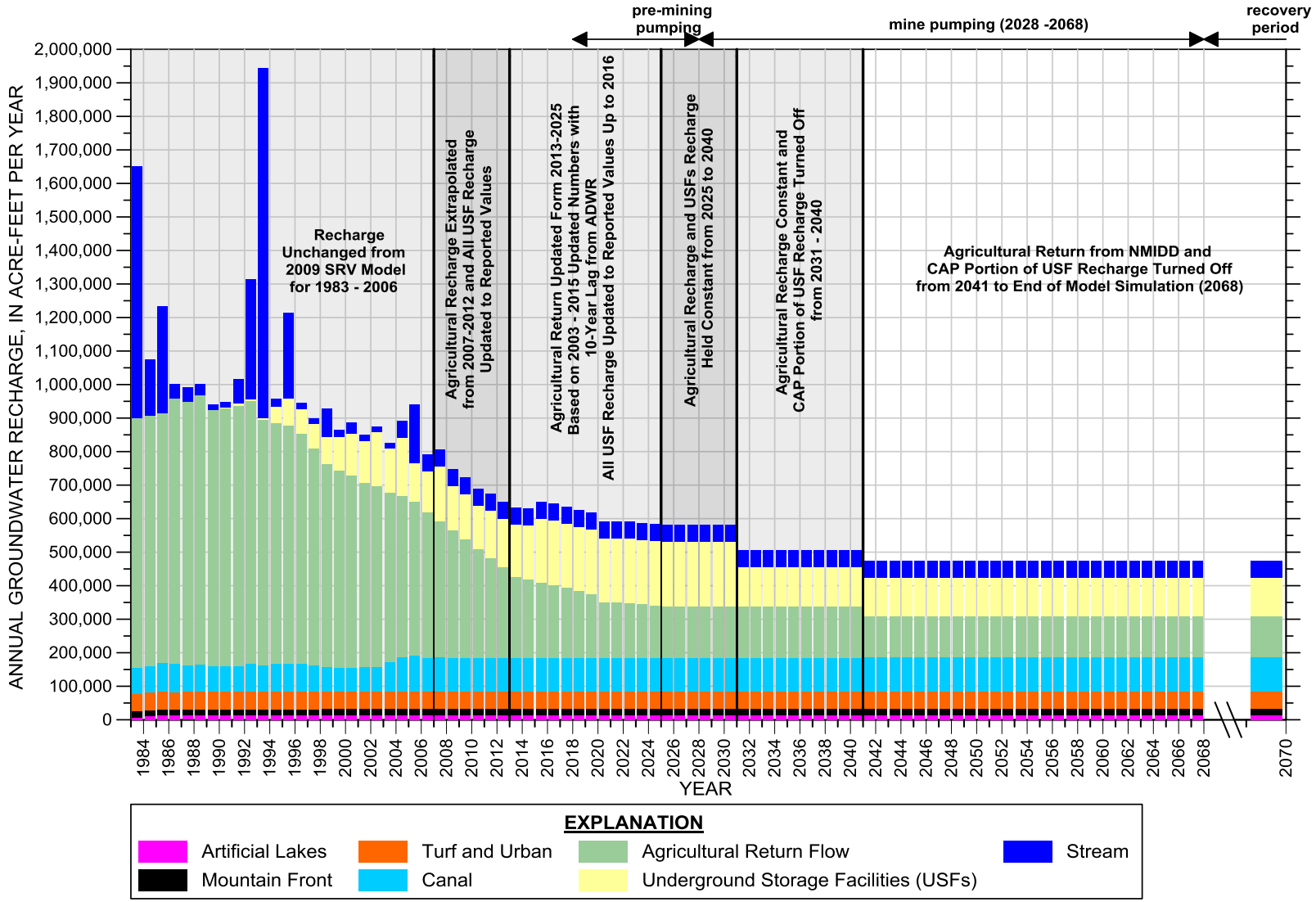
Model Updates: Non-DW Pumping

- Non-DW Well Pumping
  - 1983 to 2006 - same as SRV model
  - 2007 to 2016 - Groundwater pumping updated to reported values (provided by ADWR)
  - 2017 to 2268 - Groundwater pumping held constant at 2016 rates.

Model Updates: Recharge

- USF Recharge
  - 1983 to 2006 – same as SRV model
  - 2007 to 2016 – updated to reported values (provided by ADWR)
  - 2017 to 2030 – held constant at 2016 values
  - 2031 to 2268 – CAP-sourced USFs turned off, effluent USFs held constant
- Agricultural Recharge
  - 1983 to 2006 – same as SRV model
  - 2007 to 2012 – interpolated linearly between 2006 and 2013 estimated rates
  - 2013 to 2025 – ADWR-sourced 2003 to 2015 Ag returns; assume 10-year recharge lag
  - 2026 to 2040 – held constant at 2025 recharge rates (2015 Ag return flows)
  - 2041 to 2268 – assume NMIDD Ag returns cease in 2030; with 10-year lag NMIDD Ag recharge ceases in 2041
- Other recharge (mountain front, stream, urban, turf, etc.)
  - 1983 to 2006 – same as SRV model
  - 2007 to 2268 – held constant at 2006 rates

Model Updates: Recharge



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Part 2: Simulated Effects of Resolution Long Term Storage Credits (LTSC) at New Magma Irrigation Drainage District (NMIDD) GSF

Resolution Long Term Storage Credits to Date

Facility Name	Total (AF)	Total after 5% Deduction (AF)
Phoenix Active Management Area		
New Magma Irrigation Drainage District (NMIDD) GSF	195,630	187,575
Long-Term Storage Credits purchased from Gila River Water Storage LLC stored at NMIDD	---	36,936
Roosevelt Water Conservation District (RWCD) GSF	14,000	13,300
Tonopah USF	19,637	18,544
Phoenix AMA Total	**---**	**256,355**
Pinal Active Management Area		
Hohokam Irrigation Drainage District GSF	60,390	56,780
Pinal AMA Total	**60,390**	**56,780**
Phoenix and Pinal AMA Total	**---**	**313,135**

AF = acre-feet; Data from annual reports submitted to ADWR accessed through ADWR imaged records

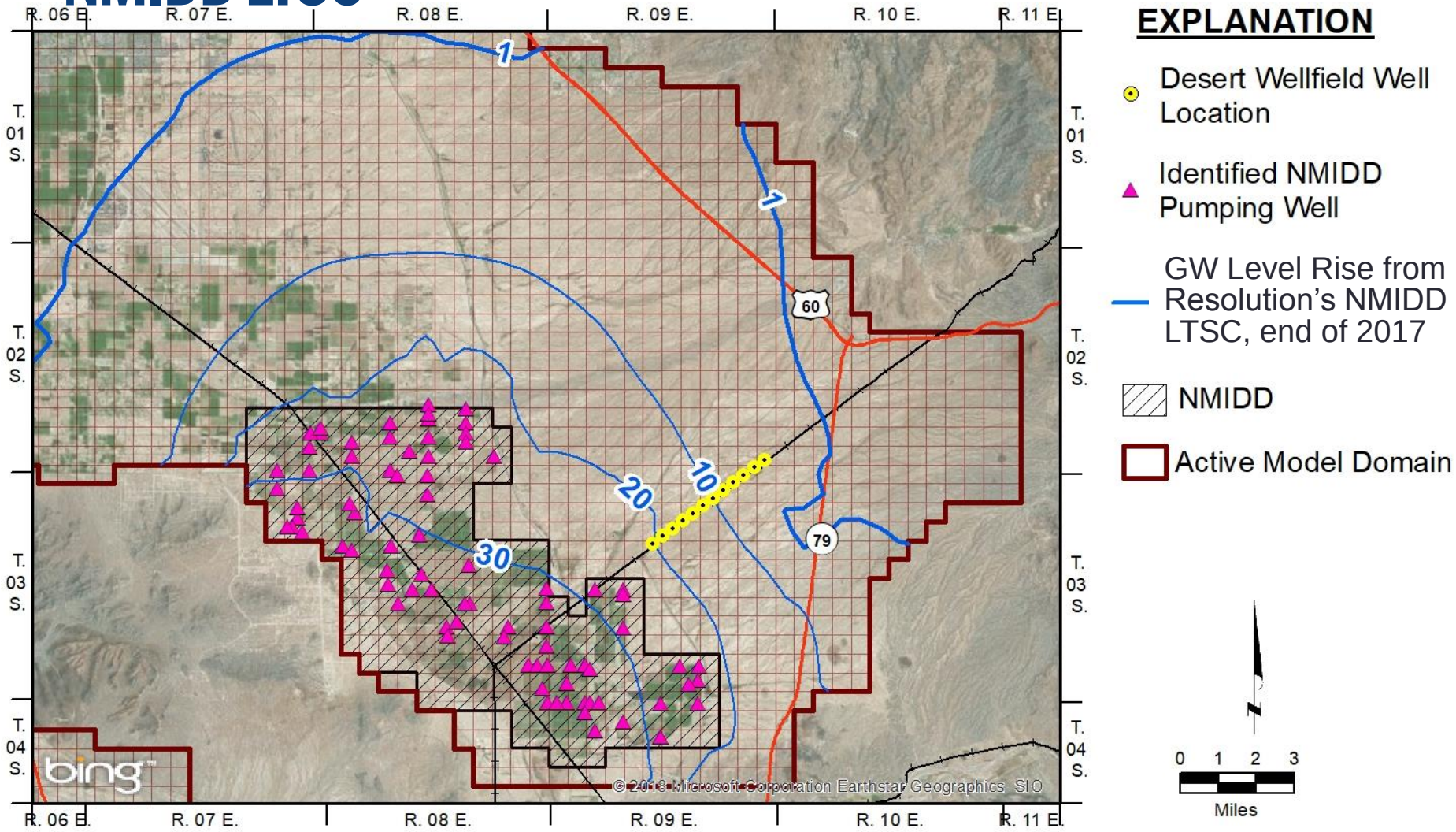
Model Simulation of NMIDD Hypothetical Pumping Equivalent to Resolution LTSC

- Used 94 identified NMIDD pumping wells
- Added hypothetical equivalent pumping to NMIDD wells for each year Resolution accrued LTSC
- Calculated the rise by subtracting 2017 simulated hypothetical water table from 2017 simulated actual water table

Summary of Resolution LTSC at NMIDD

Year	RC LTSC Volume with 5% Reduction (acre-feet)	RC Purchased LTSC Volume with 5% Reduction (acre-feet)
2006	33,067	0
2007	34,200	0
2008	31,057	0
2009	34,213	0
2010	19,111	0
2011	34,200	0
2012	0	9,046
2013	0	25,830
2014	0	0
2015	0	0
2016	0	0
2017	0	3,106

Simulated GW Level Rise and AOI from Resolution NMIDD LTSC



Part 3: Projected Drawdown Due to Desert Wellfield Pumping

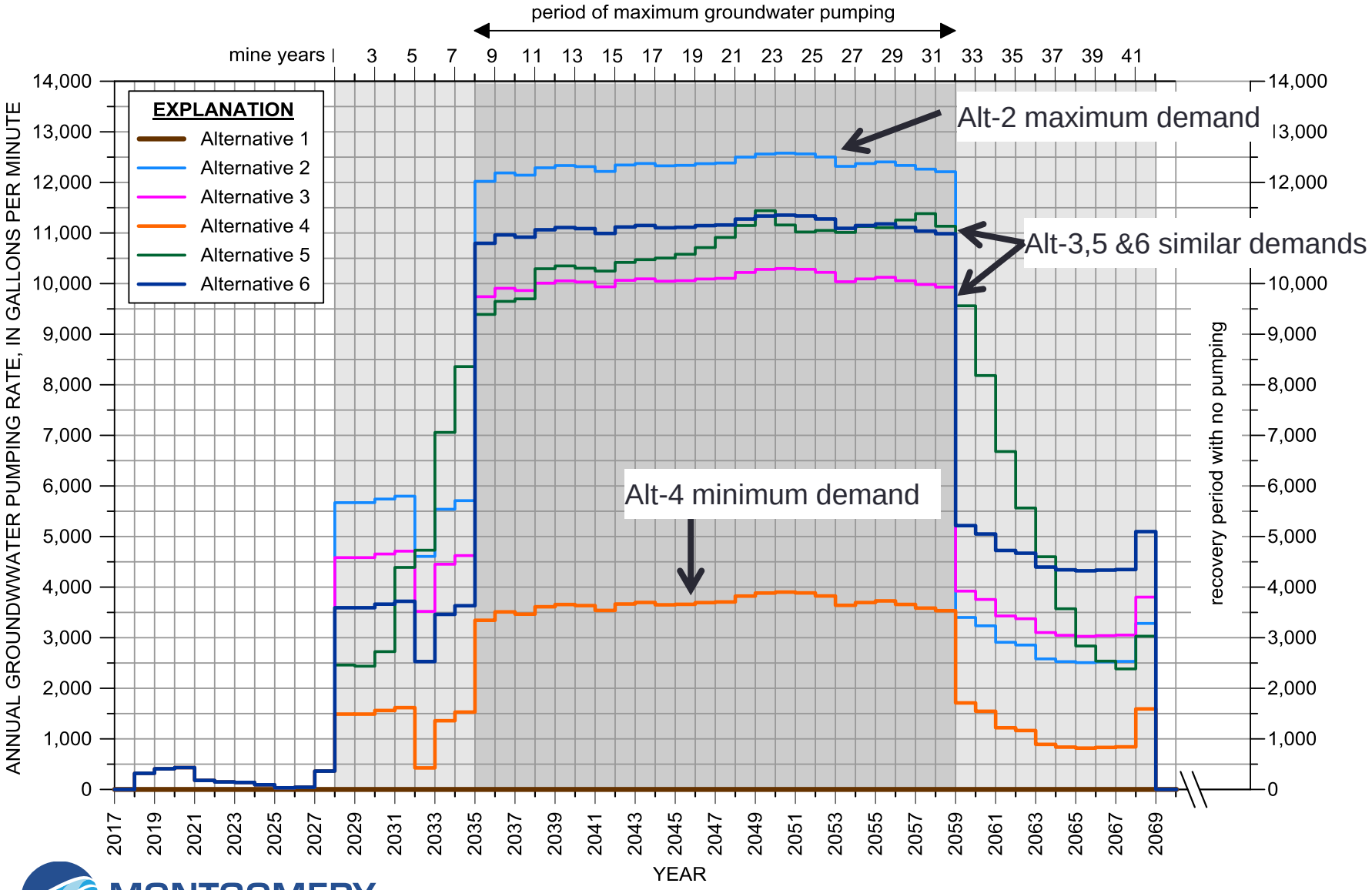
Desert Wellfield Groundwater Pumping Summary

Alternative	Pre-Mining (2018 - 2027)		Mining (2028 - 2068)		Maximum Groundwater Pumping Rate (AF/yr)
	Average (AF/yr)	Total (AF)	Average (AF/yr)	Total (AF)	
1 – No Mining	0	0	0	0	0
max → 2	316	3,484	14,305	586,512	20,305
3			12,056	494,290	16,623
min → 4			4,287	175,804	6,297
5			13,287	544,765	18,470
6			13,290	544,862	18,326

gpm = gallons per minute; AF = acre-feet

- Simulated 12 wells for Desert Wellfield
- Pre-mining period of 10 years with minor pumping
- Active Mining for 41 years with 25 years of heavy pumping
- Calculated drawdown by subtracting Alternatives 2 thru 6 from Alternative 1 (No Mining)

Desert Wellfield Pumping Alternatives



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DW Pumping Demand Alternatives Compared to LTSC

DW Groundwater Pumping Alternative	Total Pumping Volume from 2018 - 2068 (acre-feet)	Percent of Resolution Storage Credits in Phoenix AMA	Percent of Resolution Storage credits in Phoenix and Pinal AMAs
1 – No Mining	0	Not Applicable	Not Applicable
2	589,996	43%	53%
3	497,774	52%	63%
4	179,288	143%	175%
5	548,249	47%	57%
6	548,346	47%	57%

max → 2

min → 4

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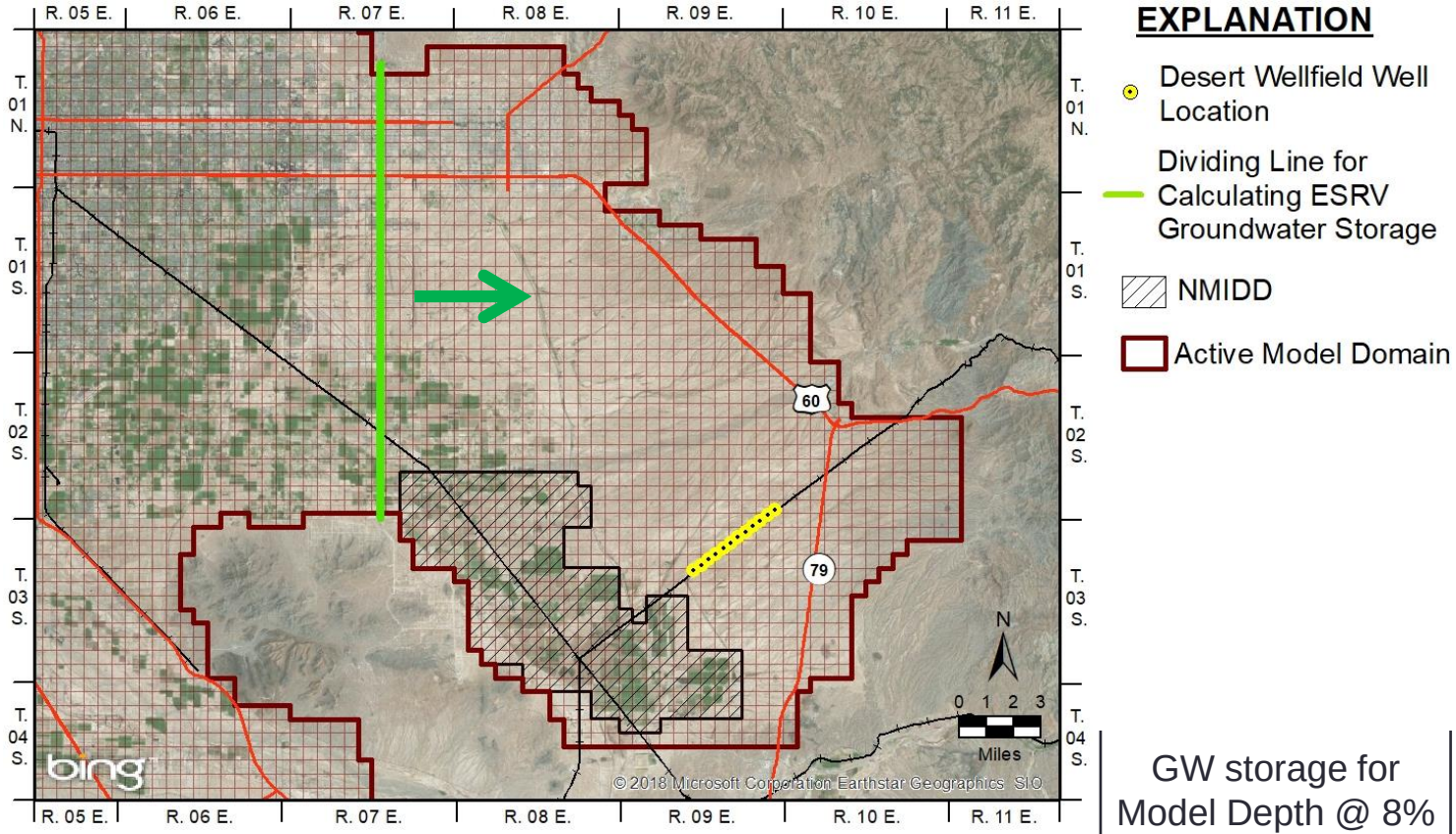
ESRV Groundwater Storage and DW Pumping Comparison



	DW Total Pumping (acre-feet)	GW storage for Model Depth @ 8% Sy* (acre-feet)	GW storage at 1,000 feet bls @ 8% Sy* (acre-feet)
		17,682,002	8,114,732
DW Alt. 2 (max)	589,996	**3.3%**	**7.3%**
DW Alt. 4 (min)	179,288	**1.0%**	**2.2%**

*Used 2017 simulated water table

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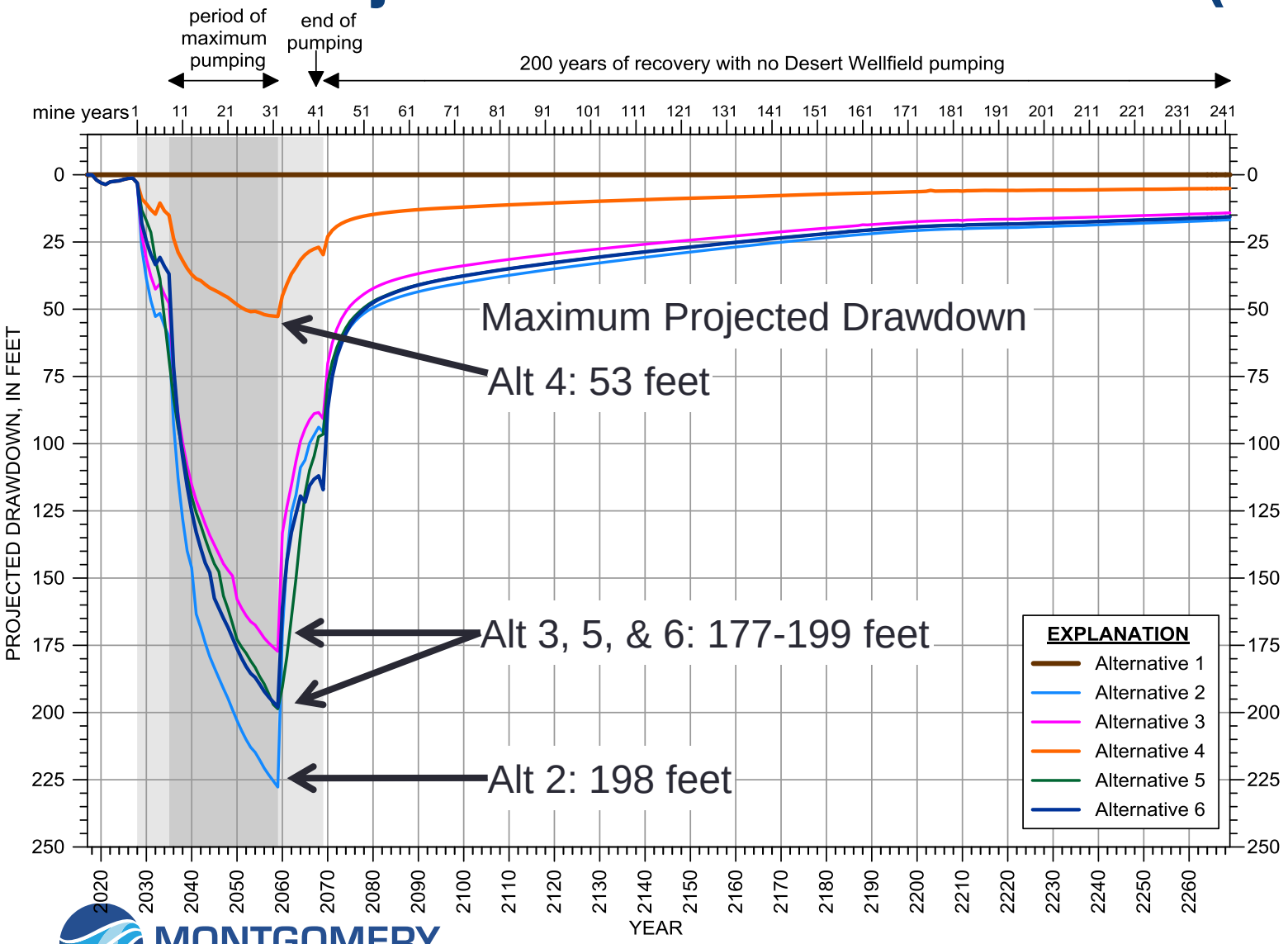
Results: Projected Drawdown at Center of DW (2058)



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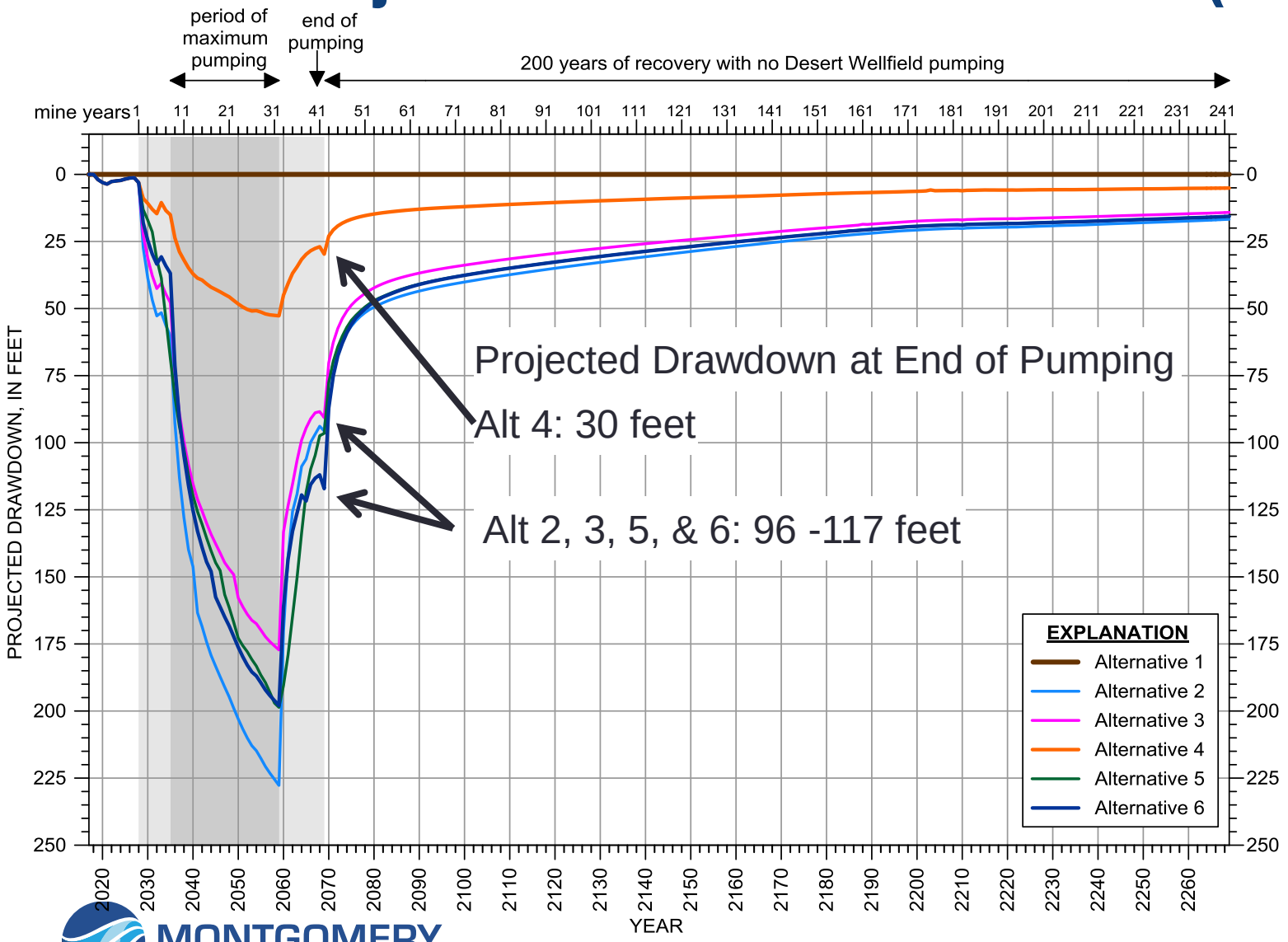

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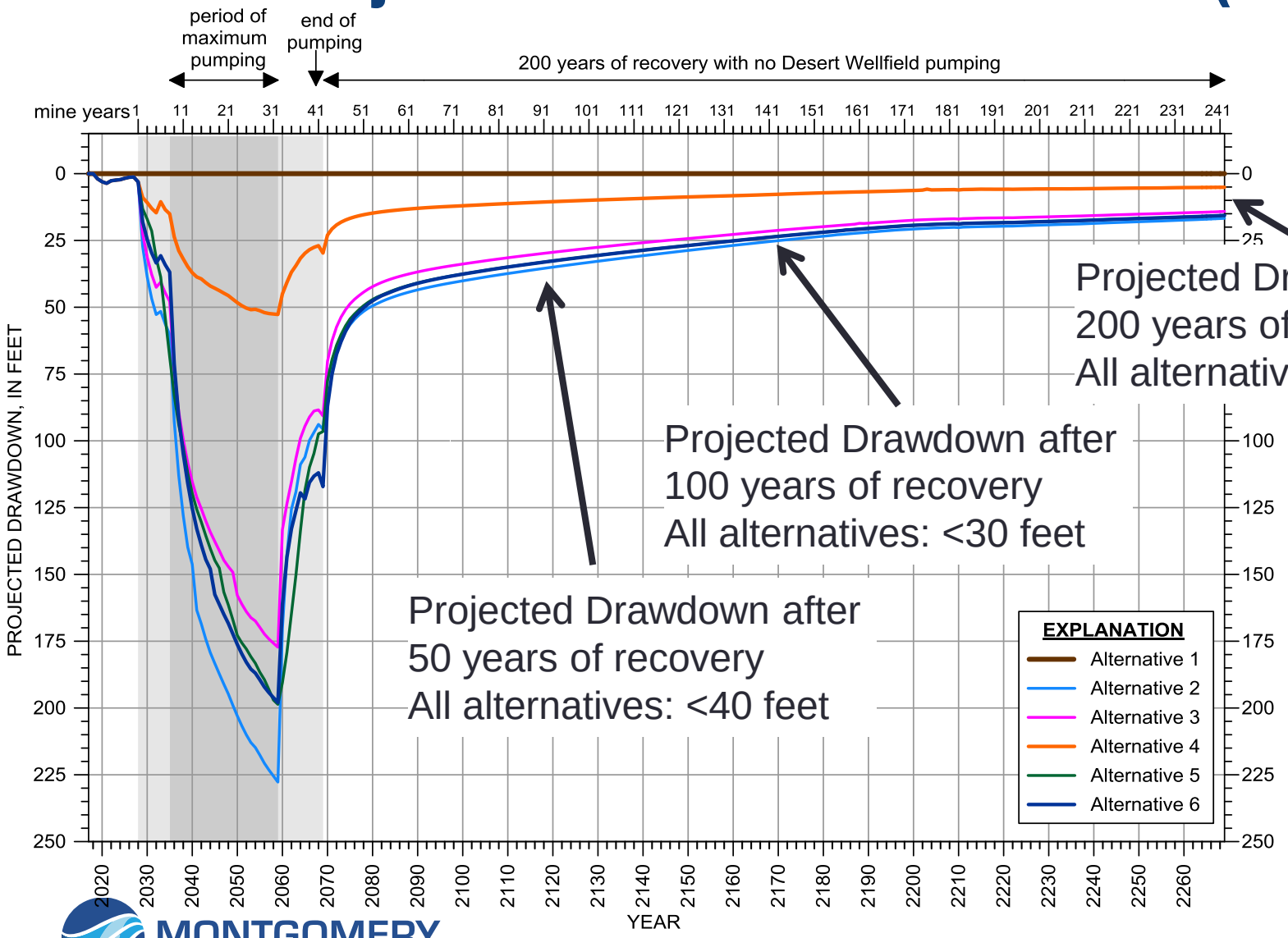
Results: Projected Drawdown at Center of DW (>2068)



Projected Drawdown after
200 years of recovery
All alternatives: <20 feet

Projected Drawdown after
100 years of recovery
All alternatives: <30 feet

Projected Drawdown after
50 years of recovery
All alternatives: <40 feet

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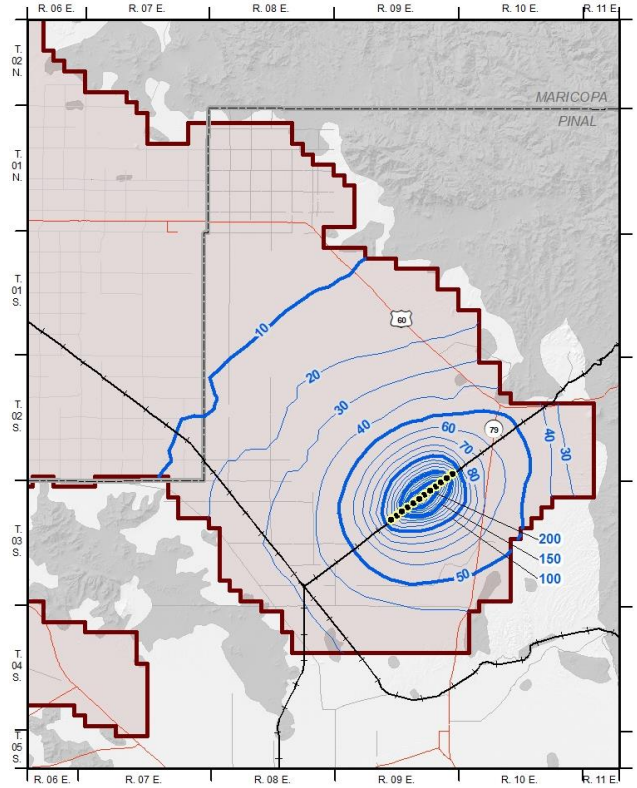
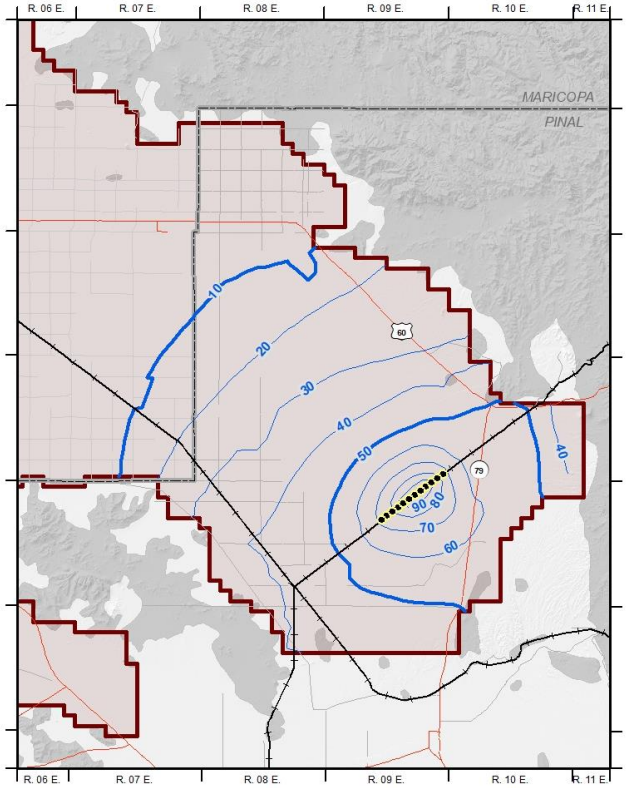
PROJECTED DRAWDOWN FOR ALTERNATIVE 2 (max)

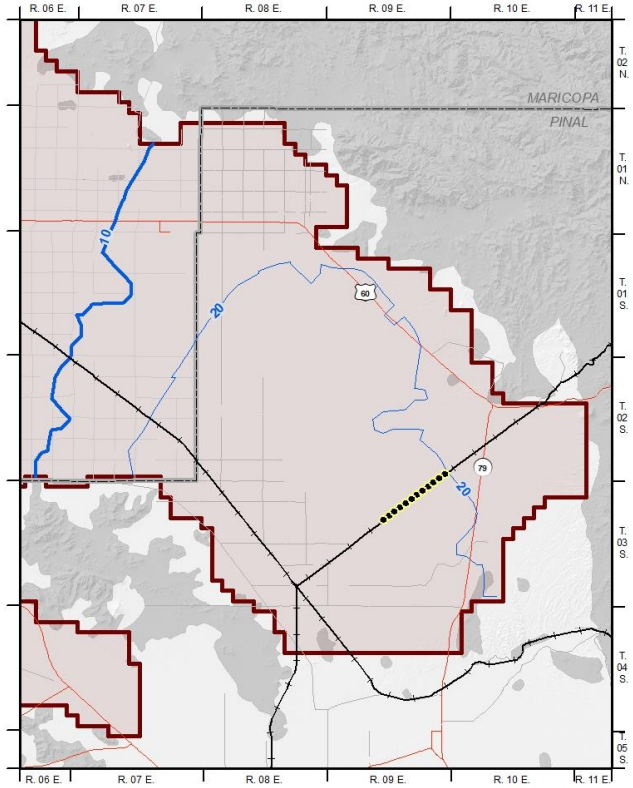
Projected Drawdown at End of Desert Wellfield Maximum Pumping Period (end of mine year 31, year 2058)



Projected Drawdown at End of Desert Wellfield Pumping (end of mine year 41, year 2068)



Projected Maximum Extent of 10-foot Drawdown Contour After Cessation of Desert Wellfield Pumping (124 years after end of pumping, year 2192)



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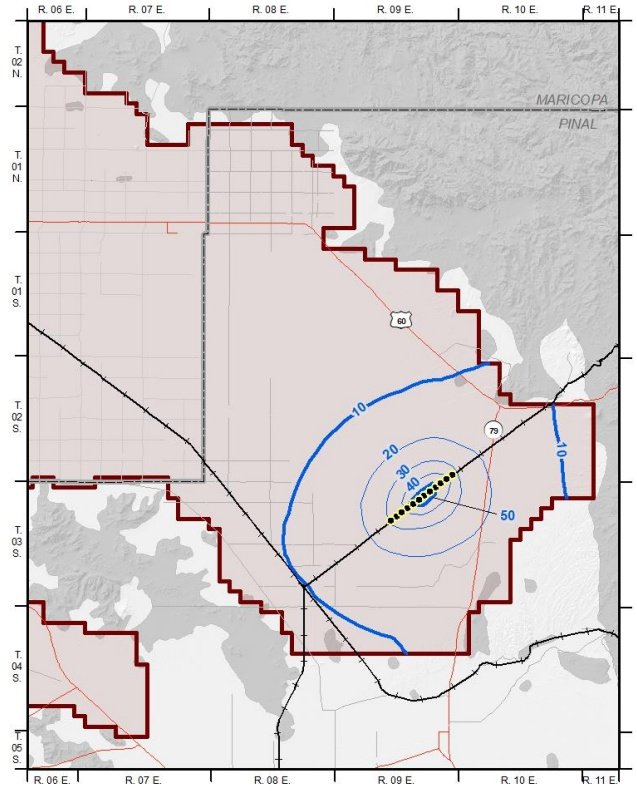
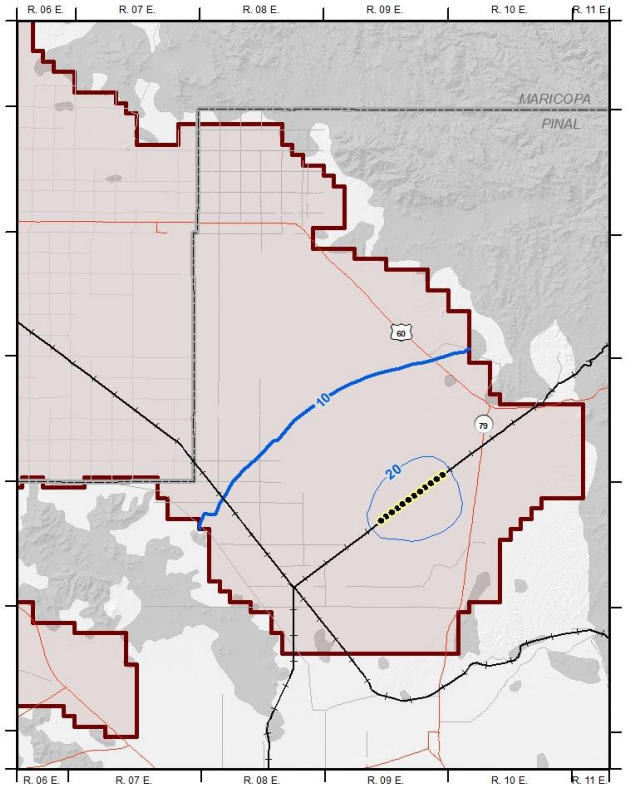
PROJECTED DRAWDOWN FOR ALTERNATIVE 4 (min)

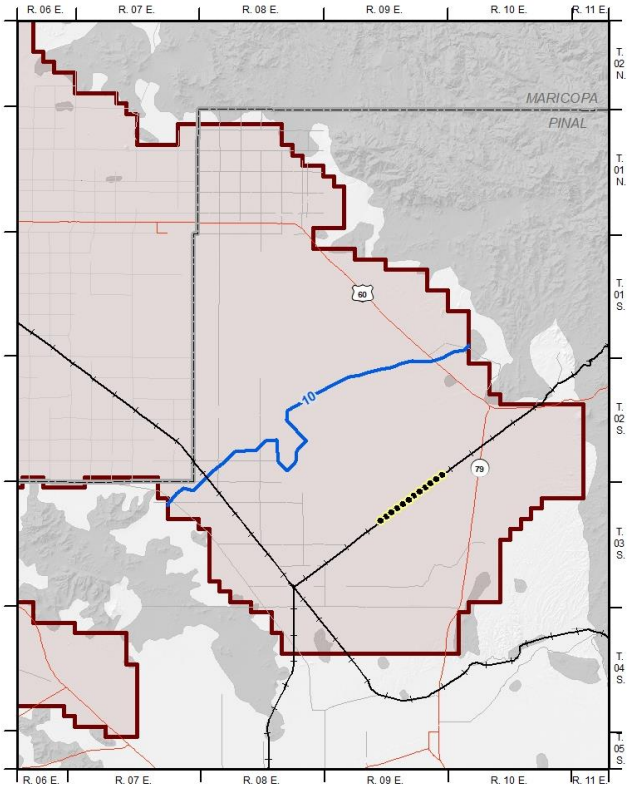
Projected Drawdown at End of Desert Wellfield Maximum Pumping Period (end of mine year 31, year 2058)



Projected Drawdown at End of Desert Wellfield Pumping (end of mine year 41, year 2068)



Projected Maximum Extent of 10-foot Drawdown Contour After Cessation of Desert Wellfield Pumping (11 years after end of pumping, year 2079)



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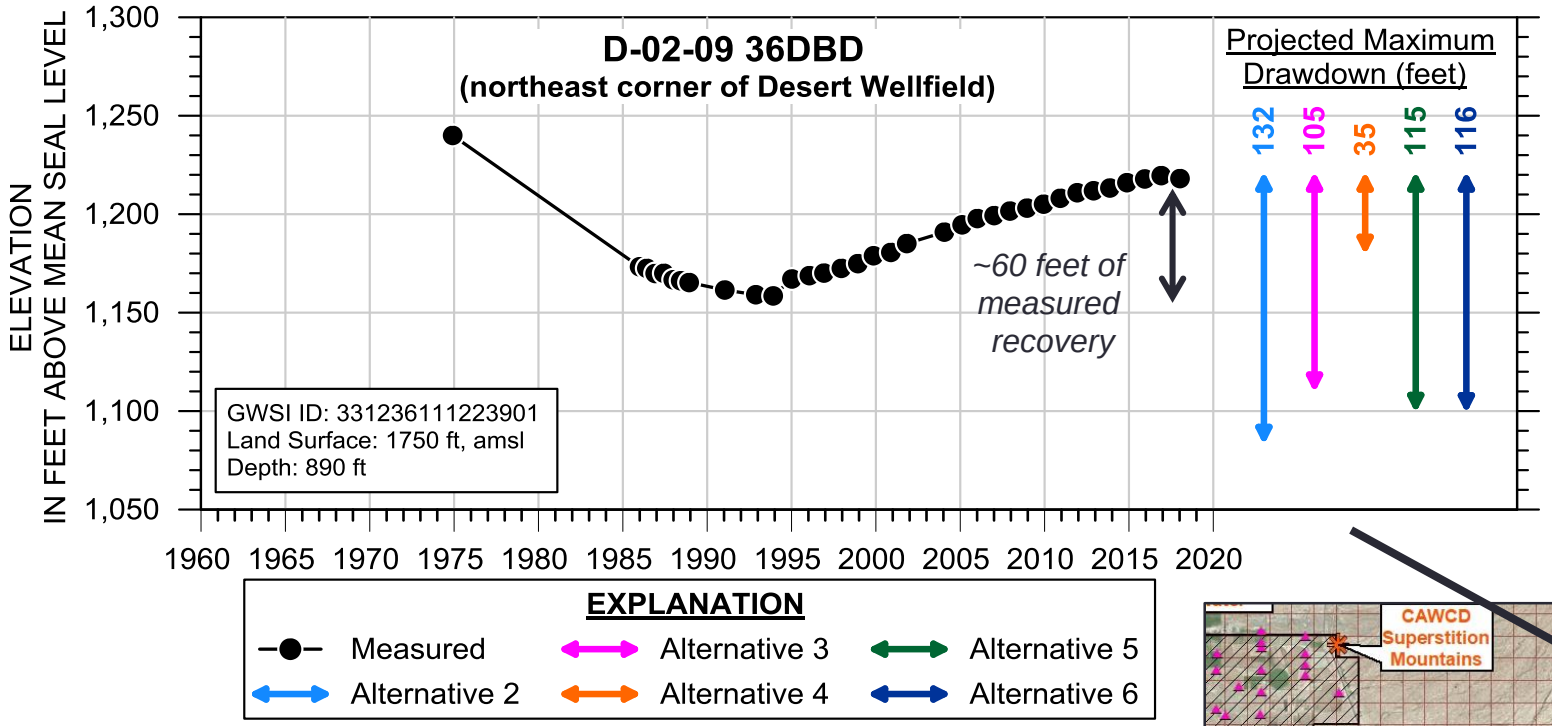
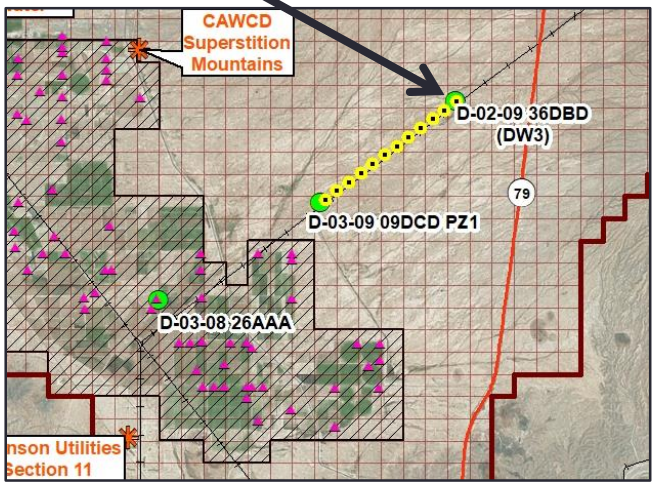
Comparison of Historical Groundwater Trends to Maximum Projected Drawdown from DW Pumping





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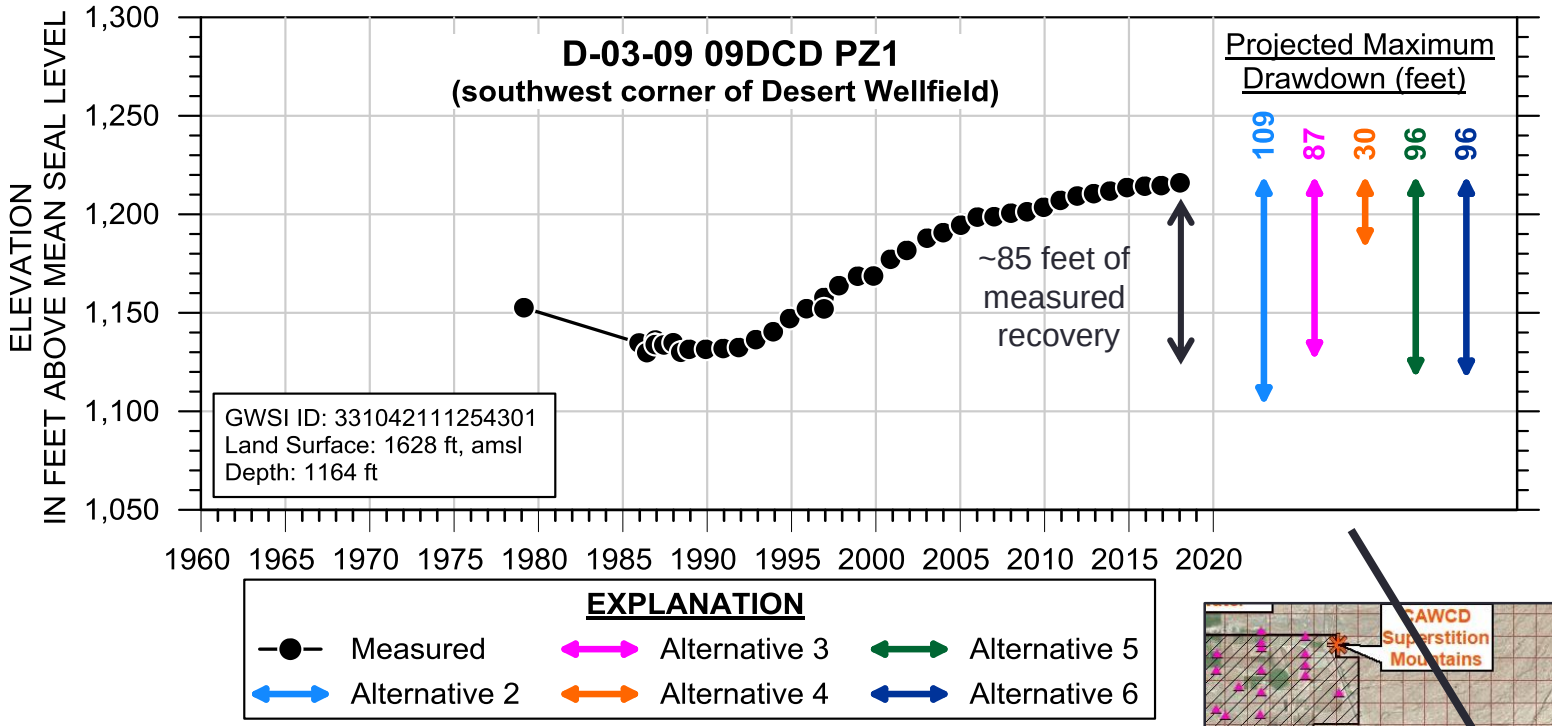

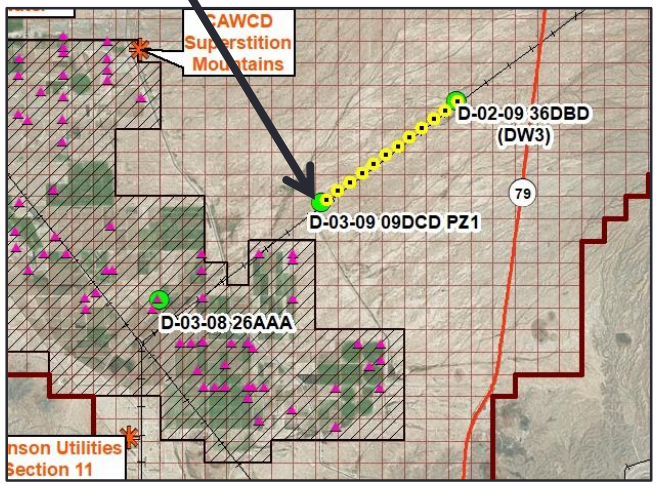

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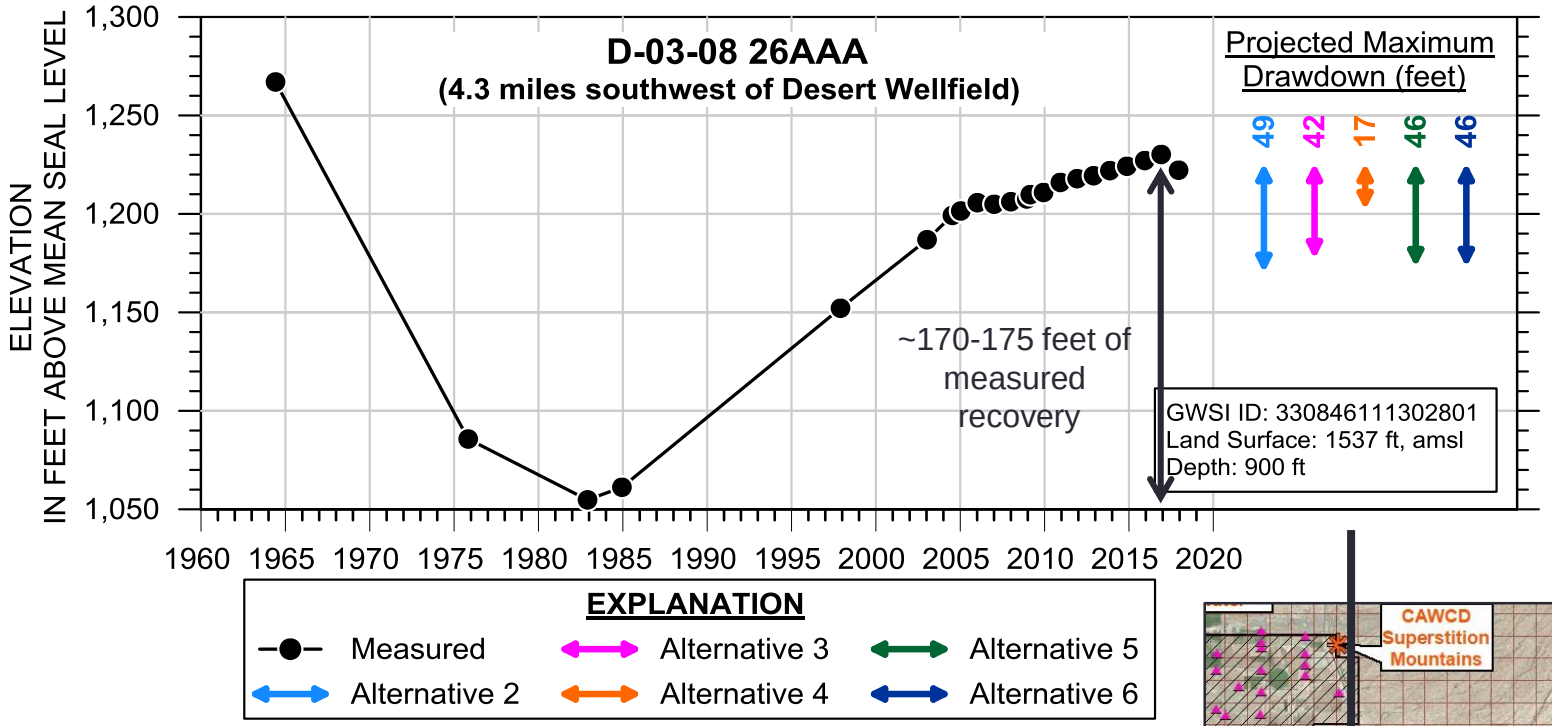

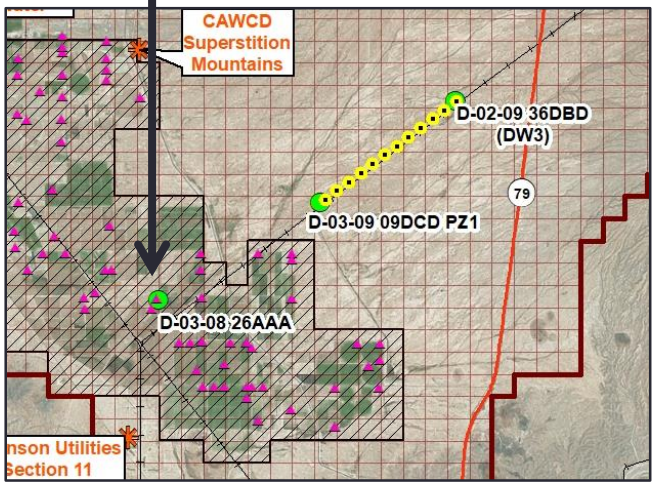

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Summary

- Resolution has accrued LTSC equivalent to 50 percent or more of potential DW pumping already
- ESRV GW levels recovering substantially due to NMIDD GSF and Resolution LTSC, which is a preemptive offset to future DW drawdown
- Ideally, Resolution would like to recover from the "Desert Wellfield"
- Desert Wellfield is lowest energy and cost option, it utilizes an existing utility corridor
- The Desert Wellfield is within the 1 foot AOI of Resolution recharge to date