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TECHNICAL MEMORANDUM

DATE: January 23, 2020 PROJECT #: 605.7506

TO: Victoria Peacey & Greg Ghidotti, RESOLUTION COPPER

FROM: Hale Barter, Brittney Bates, and Tim Bayley

PROJECT: Resolution Copper

SUBJECT: Desert Wellfield Pumping 100-Year Drawdown Analysis for ADWR Evaluation in Support of the Resolution Copper EIS

INTRODUCTION

In support of the Resolution Copper (RC) Environmental Impact Statement (EIS) and as directed by Arizona Department of Water Resources (ADWR), Montgomery & Associates (M&A) evaluated potential 100-year drawdown impacts from groundwater pumping to supply the proposed RC mine. The pumping is planned to occur at the proposed Desert Wellfield, located in the east Salt River Valley (SRV) within the Phoenix Active Management Area (AMA), approximately 3.5 miles southwest from the junction of Superstition Freeway (US-60) and AZ-79 along the MARCo corridor, as shown on **Figure 1**.

Potential drawdown impacts from proposed Desert Wellfield pumping are simulated using a modified version of the regional SRV flow model published by ADWR (Freihoefer et al., 2009). In this modeling evaluation, M&A simulated Desert Wellfield pumping for Alternatives 1 and 2, which are two of the six alternative tailings designs being considered by the United States Forest Service as part of the ongoing RC EIS. Both simulated alternatives evaluate a 100-year period, including a pre-mining pumping period from 2019 through 2027, a Life of Mine (LOM) pumping period from 2028 through 2068, and a post-mining pumping period from 2069 through 2118.

- Alternative 1 is a baseline simulation with no Desert Wellfield pumping associated with the “no action” alternative.
- Alternative 2 is the highest planned pumping, with total groundwater withdrawals of 589,440 acre-feet (AF).
- Planned pumping for Alternatives 1 through 6 is shown on **Figure 2**; only alternatives 1 and 2, the lowest and highest pumping volumes, are simulated for this modeling evaluation.

Per ADWR direction, the 100-year simulations are modified to account for: 1) recovery of banked and future Long-Term Storage Credits (LTSC); and 2) committed Assured Water Supply (AWS) permit new pumping. With ADWR approval, it was assumed CAP deliveries to underground storage facilities (USFs) and Groundwater Savings Facilities (GSFs) would cease after 2030 due to the unavailability of CAP water.

RC began storing water in the Phoenix AMA in 2006. The water was stored in several GSFs and USFs, as summarized in **Table 1**. Statutes stipulate that a 5% deduction for LTSC be applied as a cut to the aquifer. The closest storage facility to the proposed Desert Wellfield is the New Magma Irrigation and Drainage District (NMIDD) GSF. RC has accrued 187,575 AF of recoverable LTSC at NMIDD during the period 2006 to 2011. In addition, RC purchased 36,936 AF of recoverable LTSC at NMIDD GSF from Gila River Water Storage, LLC. The other facilities in the Phoenix AMA with RC LTSC include Tonopah USF and Roosevelt Water Conservation District GSF in West Salt River Valley. A total of 256,355 AF of recoverable water has been stored in the Phoenix AMA.

In addition, RC has stored water for which it is not accruing credits or that is outside of the AMA. Within the Phoenix AMA, RC has delivered 9,360 AF of shaft dewatering water to farmers in NMIDD. This water does not accrue LTSC, but presumably has had the same effect as a GSF by reducing NMIDD groundwater demand. RC has also stored 56,780 AF in the Hohokam Irrigation & Drainage District GSF in the Pinal AMA. This stored water should be noted in assessment of the overall impact of mine water demand.

Table 1. Summary of Phoenix AMA Long Term Storage Credits accrued by RC

Facility Permit Number	RC Water Storage Permit Number	Facility Name	Total (AF)	Total after 5% Deduction (AF)
Phoenix Active Management Area				
72-534888	73-534888.0601	New Magma Irrigation and Drainage District (NMIDD) GSF	195,630	187,575
73-534888	---	Long-Term Storage Credits purchased from Gila River Water Storage LLC stored at NMIDD	---	36,936
72-545695	73-545695.1400	Roosevelt Water Conservation District GSF	14,000	13,300
71-593305	73-593305.1800	Tonopah USF	19,637	18,544
		Phoenix AMA Total	---	256,355
Pinal Active Management Area				
72-534489	73-534489.0500	Hohokam Irrigation & Drainage District GSF	60,390	56,780
		Pinal AMA Sub-total	60,390	56,780
		Phoenix and Pinal AMA Total	---	313,135

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

Groundwater that RC has stored at the NMIDD GSF has contributed to groundwater level rise in NMIDD and surrounding areas. Groundwater levels in some wells near the Desert Wellfield have risen by over 100 feet since the early 1990s and continue to rise. The potential impacts of Desert Wellfield pumping on groundwater levels should be viewed in the context of recharge and groundwater saving accrued by the mine. To date, and depending on the tailings storage facility design alternative, RC has stored 43% to 143% of its projected water demands in the form of LTSC in the Phoenix AMA and between 53% and 175% of its projected water demands in the form of LTSC in the combined Phoenix and Pinal AMAs, as summarized in **Table 2**.

Table 2. Summary of Groundwater Pumping for Each Desert Wellfield Pumping Alternative and Comparison to RC Storage Credits

Groundwater Pumping Alternative	Pre-Mining (2019 - 2027)	Mining (2028 -2068)		Percent of Pumping Offset by Storage Credits in Phoenix AMA	Percent of Pumping Offset by Storage Credits in Phoenix and Pinal AMAs
	Total Volume (AF)	Average Rate (AF/year, gpm*)	Total Volume (AF)		
1 – No Mining	0	0	0	Not Applicable	Not Applicable
2 – Near West Wet	2,970	14,305 *8,862**	586,472	43%	53%
3 – Near West Drier		12,056 *7,469**	494,290	52%	63%
4 – Silver King Filtered		4,288 *2,656**	175,804	143%	175%
5 – Peg Leg		13,287 *8,231**	544,765	47%	57%
6 – Skunk Camp		13,289 *8,233**	544,862	47%	57%

gpm = gallons per minute
AF = acre-feet

RC's Phoenix AMA LTSC portions of the projected pumping for Alternatives 2 through 6 are shown on **Figure 2**.

RESULTS

Model projected drawdown during the 100-year Alternative 2 maximum pumping simulation is less than 25 feet outside the vicinity of the Desert Wellfield and does not result in depth to water at the Desert Wellfield and in east SRV exceeding 1,000 feet below land surface (bls).

Desert Wellfield Projected Groundwater Levels

Projected drawdowns at the Desert Wellfield center for Alternatives 1 and 2 are shown on **Figure 3**. Alternative 1 projected drawdown (no RC pumping) shows rise through 2043 of 43 feet reflecting rising regional groundwater levels due to recovery from retired agricultural

pumping and ongoing groundwater storage, followed by drawdown reaching 75 feet by 2118 due to increased non-agricultural pumping and cessation of CAP groundwater storage after 2030. Alternative 2 projected drawdown begins after the start of mining operations in 2028 and reaches a maximum of 212 feet at the end of 2058 (end of maximum pumping). Post-mining Alternative 2 drawdown is projected to decrease to 50 feet by 2076 after the Desert Wellfield pumping ends, and then increase to 100 feet by 2118 reflecting regional declines.

Projected depths to water at the Desert Wellfield center for alternatives 1 and 2 are shown on **Figure 3**. Alternative 1 projected depth to water (no RC pumping) decreases through 2043 to a depth of 432 feet bls reflecting rising regional groundwater levels due to recovery from retired agricultural pumping and ongoing groundwater storage, followed by an increase to 550 feet bls by 2118 due to increased non-agricultural pumping and cessation of CAP groundwater storage after 2030. Alternative 2 projected depth to water begins increasing after the start of mining operations in 2028 and reaches a maximum depth of 687 feet bls at the end of 2058 (end of maximum pumping). Post-mining Alternative 2 depth to water is projected to decrease to 525 feet bls by 2076 after the Desert Wellfield pumping ends, and then increase to 575 feet bls by 2118 reflecting regional declines.

East Salt River Valley Projected Groundwater Levels

Projected drawdowns for Alternatives 1 and 2 after 40 years (2058; end of maximum Alternative 2 pumping) are shown on **Figure 4**, and same projected drawdowns after 100 years (2118) are shown on **Figure 5**. Substantial projected drawdown increases for Alternative 2 compared to Alternative 1 (no RC pumping) are confined to the southern portion of the east SRV, in the vicinity of the Desert Wellfield. Outside the vicinity of the Desert Wellfield, Alternative 2 results in less than 25 feet of additional projected drawdown compared to Alternative 1 (no RC pumping), at 2058 and 2118.

Measured 2017 depth to water in the Desert Wellfield vicinity is approximately 410 to 525 bls, and maximum depth water is approximately 600 feet bls in the Apache Junction area, as shown on **Figure 6**. Projected depths to water for Alternatives 1 and 2 after 40 years (2058; end of maximum Alternative 2 pumping) are shown on **Figure 7**, and same projected depths to water after 100 years (2118) are shown on **Figure 8**. Substantial projected depth to water increases for Alternative 2 compared to Alternative 1 (no RC pumping) are confined to the southern portion of the east SRV, in the vicinity of the Desert Wellfield. Outside the vicinity of the Desert Wellfield, Alternative 2 results in less than 25 feet of additional projected depth to water compared to Alternative 1 (no RC pumping), at 2058 and 2118.

GROUNDWATER FLOW MODEL

This evaluation utilizes the ADWR SRV model (Freihoefer et. al., 2009). The 2009 model simulates groundwater conditions between 1983 and 2006 using the model code MODFLOW 2000 (Harbaugh and others, 2000). For this current evaluation, the 2009 ADWR model is extended to include years 2007 through 2018 using updated groundwater pumping and recharge volumes provided by ADWR. The model was further extended to include a 100-year predictive period through 2118.

Grid spacing, layering, and aquifer hydraulic parameters are not changed from the original 2009 SRV model. Grid spacing is uniformly 0.5 by 0.5 miles throughout the model. The model is divided into three layers with variable thicknesses reflecting the regional hydrogeology. Model boundary conditions for evapotranspiration (EVT), specified-head (CHD), and stream flow (STR) are extended in the SRV DW model through 2118 and are set to the 2006 specifications in the original 2009 SRV model. Additional documentation of these properties can be found in the 2009 ADWR model report (Freihoefer and others, 2009).

SRV Model Recharge Updates

Simulated SRV model USF, agricultural return flow, and other types of recharge are updated through 2118, as shown on **Figure 9**.

- **Recharge from 1983 to 2006** – Simulated USF, agricultural, and other recharge for 1983 through 2006, are unchanged from the 2009 ADWR model.
- **USF Recharge 2007 to 2017** – Simulated USF recharge for 2007 through 2017 is updated to ADWR reported rates.
- **USF Recharge 2018 to 2030** – Simulated USF recharge for 2018 through 2030 is held constant at 2017 rates, regardless of permit end dates.
- **USF Recharge 2031 to 2118** – CAP-sourced USFs recharge is not simulated after 2030, based on the ADWR-approved assumption that CAP water may not be available after 2030. Starting in 2031 it was conservatively assumed all non-CAP USF recharge is recovered annually except for the 5% cut to the aquifer, with no future LTSC recharge accruals occurring. For model efficiency purposes, after 2030 all non-CAP USF recharge is ended except for the 5% cut to the aquifer, and simultaneously all corresponding annual storage water recovery pumping is ended.
- **Agricultural Recharge from 2007 to 2025** – In the 2009 SRV model, a variable lag time is assumed for agricultural return flows based on the estimated depth to groundwater. Historically this lag time has been assumed to be 10 to 15 years (Freihoefer and others, 2009). ADWR provided M&A with SRV model agricultural recharge estimates for years

2003 through 2015 (data request June 2018). For this model study, a 10-year lag was assumed for these return flows resulting in simulated recharge for the period 2013 through 2025. For years 2007 through 2012, the simulated agricultural recharge is extrapolated linearly between 2006 and 2013 rates.

- **Agricultural Recharge from 2026 to 2118** – Simulated agricultural recharge is held constant at 2025 rates for the period 2026 through 2118, with the following exceptions:
    - Assume agricultural pumping at permitted AWS locations ends after 2018 (per ADWR direction), including Maricopa Water District and Queen Creek Irrigation District GSFs; therefore, irrigation recharge at permitted AWS locations is not simulated after 2028, assuming a 10-year lag, as shown on **Figure 10**.
    - Assume CAP agricultural supply at SRV GSFs (Salt River Valley Water Users Association, Roosevelt Water Conservation District, and NMIDD) is unavailable after 2030 and locations are urbanized; therefore, associated CAP GSF irrigation recharge is not simulated after 2040, assuming a 10-year lag, as shown on **Figure 11**.
    - Assume agricultural pumping at NMIDD (**Figure 1**) ends after 2030 due to planned urbanization; therefore, NMIDD irrigation recharge is not simulated after 2040, assuming a 10-year lag.
- **Other recharge 2007 to 2118** – All other SRV model recharge sources besides USF and agricultural components are held constant at 2006 rates from 2007 through 2118.

SRV Model Pumping Updates

Simulated SRV model LTSC and annual storage recovery pumping, and non-recovery pumping are updated through 2118, as shown on **Figure 12**.

- **All Pumping from 1983 to 2006** – Simulated pumping for recovery and non-recovery pumping for 1983 through 2006 is unchanged from the 2009 ADWR model.
- **All Pumping 2007 to 2017** – Simulated pumping for recovery and non-recovery pumping for 2007 through 2017 is updated to ADWR reported rates.
- **Recovery Pumping from 2018 to 2030** – Simulated pumping for LTSC recovery, annual CAP water storage recovery, and annual non-CAP water storage recovery for 2018 through 2030 is set to 2017 rates.
- **Recovery Pumping from 2031 to 2118** – Simulated pumping for LTSC recovery for 2031 through 2118 is set to 2017 rates. Simulated annual CAP water storage recovery pumping is ended since CAP water is assumed unavailable after 2030, but in the model simulated pumping at 2017 rates is converted to LTSC recovery pumping for 2031 through 2118.

For model efficiency purposes, simulated annual non-CAP water storage recovery pumping is ended after 2030 and simultaneously all corresponding USF annual recharge is ended. However, in the model the simulated annual non-CAP water storage recovery pumping is maintained at 2017 rates and converted to LTSC recovery pumping for 2031 through 2118.

- **Additional LTSC Recovery Pumping from 2019 to 2118** – Per ADWR direction, additional recovery pumping was added to the 100-year simulation, to ensure all banked and future LTSC are withdrawn. The calculated amount of the additional LTSC pumping added to the model is described in the following LTSC section of this memorandum. Per ADWR direction, the additional LTSC pumping is distributed at locations where the LTSC were accrued in the SRV basin using the same method as was done by ADWR for the 100-year predictive modeling for determination of physical availability in the Phoenix AMA (Hipke, 2010).

- **Non-Recovery Pumping from 2018 to 2118** – Simulated pumping for agriculture irrigation and non-agriculture for 2018 through 2118 is set to 2017 rates, with the following exceptions:

    - Assume agricultural irrigation pumping at permitted AWS locations ends after 2018 (per ADWR direction; **Figure 14**).

    - Assume agricultural pumping at NMIDD (**Figure 1**) ends after 2030 due to planned urbanization.

- **AWS New Pumping from 2018 to 2118** – Assume committed AWS permit new pumping starts in 2019 and continues through 2118 (per ADWR direction). Total added pumping includes 81,345 acre-feet per year (AF/yr) in west SRV and 24,069 AF/yr in east SRV, as shown on **Figure 13**, and individual simulated AWS permits are summarized in **Table 3**.

- **Desert Wellfield Pumping 2019 to 2068** – Simulated Desert Wellfield pumping for Alternative 2, and zero Desert Wellfield pumping for Alternative 1, are shown in **Table 4**. The Alternative 2 pumping includes a pre-mining pumping period from 2019 through 2027 at an average rate of 204 gpm, LOM pumping period from 2028 through 2068 at an average rate of 10,806 gpm, and a post-pumping period from 2069 through 2118 at an average rate of 5,477 gpm. Total simulated pumping for Alternative 2 is 589,440 AF (**Table 2**). It is noted simulated Alternative 2 pumping at Desert Wellfield includes the 256,355 AF of RC's LTSC stored in the Phoenix AMA (**Table 1**). For Alternative 1, RC's Phoenix AMA LTSC are distributed in the SRV with the other LTSC pumping.

LTSC ACCOUNTING

A complete evaluation of LTSC accounting was conducted for this study, including currently stored LTSC, future LTSC storage, and recovery of all LTSC over 100-year simulation period.

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LTSC Accruals

- **LTSC stored by the end of 2017 in Phoenix AMA:** ***7,055,625 AF***
- **LTSC Accrued 2018 through 2030:** ***3,758,625 AF***
    - **Simulated USF** – Total SRV USF recharge LTSC accruals are simulated at the 2017 rate of 91,411 AF/yr for 13 years, minus 4,570 AF for the 5% cut to the aquifer = *1,128,933 AF*
    - **GSF LTSC** – Total SRV GSF LTCS accruals at the 2016 rates (latest available) with the reduction of Queen Creek and Maricopa Water District GSFs due to AWS permits (urbanization) are calculated as 212,931 AF/yr, for 13 years minus 10,647 AF/yr for the 5% cut to the aquifer = 2,629,692 *AF*
- **LTSC Accrued 2031 through 2118:** ***666,952 AF***
    - **Simulated CAP USF and GSFs** – Assume CAP water is not available after 2030 and end simulated CAP USFs and GSFs = *0 AF/yr*
    - **Simulated non-CAP USFs** – Assume all non-CAP USF LTSC recharge ends after 2030 = *0 AF/yr*
    - **Roosevelt Irrigation District non-CAP GSF** – Total SRV GSF LTSC accruals at 2016 rate (latest available) are calculated as 7,978 AF/yr for 88 years, minus 399 AF for the 5% cut to the aquifer = *666,952 AF*

LTSC Simulated Recovery

- **LTSC Recovery 2018 through 2030:** ***230,685 AF***
    - **Simulate LTSC Recovery** – SRV LTSC recovery pumping is simulated at the 2017 rate of 17,745 AF/yr for 13 years = 230,685 *AF*
- **LTSC Recovery 2031 through 2118:** ***9,831,712 AF***
    - **Simulate LTSC Recovery** – SRV LTSC recovery pumping is simulated at the 2017 rate of 17,745 AF/yr for 88 years = *1,561,560 AF*
    - **Convert Annual CAP Recovery Pumping to LTSC Recovery** – Assume CAP water is no longer available after 2030, and convert simulated CAP water recovery pumping to LTSC recovery pumping at the 2017 rate of 69,025 AF/yr for 88 years = 6,*074,200 AF*

- **Convert Annual non-CAP Recovery Pumping to LTSC Recovery** – Convert simulated non-CAP water recovery pumping to LTSC recovery pumping at the 2017 rate of 24,954 AF/yr for 88 years, since for model efficiency purposes annual non-CAP recharge and recovery is ended after 2030 = *2,195,952 AF*

- **Additional LTSC Recovery 2019 through 2118:** ***1,418,805 AF***

    - **Simulate LTSC Recovery** – Additional recovery pumping to ensure all banked and future LTSC are withdrawn is simulated at 14,188.05 AF/yr for 100 years = *1,418,805 AF*

LTSC Recovery Calculation 2019 through 2118

- **Total LTSC Accrued:** ***11,481,202 AF***
- **Total LTSC Recovered:** ***11,481,202 AF***
- **Remaining LTSC after 2118:** **0 *AF***

CONCLUSIONS

The ADWR SRV model was updated and extended through 2118, and per ADWR direction pumping was added to recover all LTSC and account for new AWS permits. Model results demonstrate that projected drawdown impacts for Alternative 2 pumping from 2019 through 2068, the highest Desert Wellfield pumping alternative, will be confined mainly to the southeast portion of the east SRV (**Figures 3 through 5**). Maximum projected Alternative 2 depth to water of 687 feet bls occurs at the Desert Wellfield center after 2058, followed by a 162-foot recovery to 525 feet bls by 2076, and then followed by an increase to 575 feet bls by 2118 reflecting regional declines (**Figure 3**). Alternative 2 causes less than 25 feet of additional projected drawdown outside the vicinity of the Desert Wellfield compared to Alternative 1 (no RC pumping). During the 100-year Alternative 2 simulation, projected depths to water do not exceed 1,000 feet bls at the Desert Wellfield or in east SRV (**Figures 7 and 8**). Impacts for lower pumping Alternatives 3 through 6 (not simulated) will be less than those projected for Alternative 2.

REFERENCES

Freihoefer, A., D. Mason, P. Jahnke, L. Dubas, and K. Hutchinson, 2009, **Regional Groundwater Flow Model of the Salt River Valley, Phoenix Active Management Area, Model Update and Calibration**: Arizona Department of Water Resources, Modeling Report No. 19.

Harbaugh, A.W., E.R. Banta, M.C. Hill, and M.G. McDonald, 2000, **MODFLOW-2000, the U.S. Geological Survey modular ground-water model – user guide to modularization concepts and the ground-water flow process**: U.S. Geological Survey Open-File Report 00-92.

Hipke, Wesley, 2010, **100-year Predictive Scenarios Used for the Determination of Physical Availability in the Phoenix Active Management Area**: Arizona Department of Water Resources, Modeling Report No. 22.

TABLE 3. SUMMARY OF INDIVIDUAL SIMULATED AWS PERMITS

File Number	Subdivision	Water Provider	Issued Date	GW Demand (AF/year)
28-500081.0000	Arroyo Seco	Arizona Water Co - White Tanks	11/10/2008	529.82
28-700445.0000	Mayfield Development		3/5/2009	975.60
28-700492.0000	Arroyo Verde	Arizona Water Co - White Tanks	1/7/2009	230.59
28-700498.0000	Estrella Falls	Liberty Utilities (Litchfield Park Water & Sewer) Corp.	5/23/2008	330.04
28-700583.0000	Eagle Mountain Group Master Plan Development		2/17/2009	57.09
28-700634.0000	Bella Sierra	Diversified Water Utilities, Inc.	11/16/2010	793.31
28-700640.0000	Archer Meadows - Phase 2	Diversified Water Utilities, Inc.	11/16/2009	315.84
28-700644.0000	Cielo Crossing	West End Water Co	10/18/2010	1,031.25
28-700663.0000	Park Regional Center	City of Buckeye	11/29/2010	515.07
28-700665.0000	Bella Vista North	Diversified Water Utilities, Inc.	11/16/2010	2,656.06
28-700670.0000	Bella Vista North- Petra	Diversified Water Utilities, Inc.	1/3/2011	1,475.74
28-700672.0000	Kittyhawk	H2O Water Co	3/31/2011	461.09
28-700673.0000	Bella Vista Section 13	Diversified Water Utilities, Inc.	12/28/2010	1,554.20
28-700679.0000	Ware Farms	H2O Water Co	2/17/2011	1,118.29
28-700680.0000	Barney Farms		3/31/2011	278.03
28-700681.0000	Meridian Crossing	Town of Queen Creek	3/31/2011	885.07
28-700685.0000	Sierra Springs	H2O Water Co	3/31/2011	119.62
28-700686.0000	Sossaman Estates Phase B		3/31/2011	1,758.07
28-700687.0000	Pinal County Farms	H2O Water Co	3/31/2011	1,033.61
28-700690.0000	Queen Creek Station-Jorde		3/31/2011	1,110.54
28-700691.0000	Cloud and Crismon		3/31/2011	1,401.50
28-700692.0000	Queen Creek Station-Commercial Corner		3/31/2011	615.24
28-700693.0000	Healy Faulkner	H2O Water Co	3/31/2011	243.49
28-700693.0001	Healy Faulkner	H2O Water Co	3/31/2011	243.49
28-700694.0000	Church Farm	H2O Water Co	3/31/2011	2,053.03
28-700700.0000	Ellsworth Farms Queen Creek		6/7/2011	202.37
28-700703.0000	Thelander-Ellsworth & Queen Creek		6/8/2011	41.50
28-700703.0001	Thelander-Ellsworth & Queen Creek II		11/14/2011	71.72
28-700717.0000	Home Place	H2O Water Co	11/29/2011	1,473.52
28-700719.0000	Schnepf Farms		12/1/2011	569.15
28-700725.0000	Ellsworth & Empire Commercial		1/13/2012	64.38
28-700730.0000	Palm Valley 303, Phase 6	EPCOR - Agua Fria	8/6/2012	1,411.55
28-700731.0000	JB Holdings	H2O Water Co	4/13/2012	100.80
28-700734.0000	Aviara	Sunrise Water Co	8/22/2012	316.33
28-700735.0000	Ellsworth 200	Diversified Water Utilities, Inc.	9/19/2012	513.75
28-700747.0000	NWC Cotton Ln. & Northern Ave.	EPCOR - Agua Fria	3/21/2013	815.35
28-700765.0000	Sierra Norte		1/7/2014	330.83
28-700771.0000	Arroyo Seco- South I	Arizona Water Co - White Tanks	2/12/2014	163.76
28-700792.0000	Rancho Cabrillo Parcels H-L, N, Q, R	EPCOR - Agua Fria	5/6/2014	409.94
28-700807.0000	Marbella Ranch		8/20/2014	877.47
28-700823.0000	Light Sky Ranch	Town of Queen Creek	11/12/2014	72.65
28-700831.0000	Palm Valley 303 Phases II, III, IV, and V	Liberty Utilities (Litchfield Park Water & Sewer) Corp.	1/13/2015	2,115.51
28-700904.0000	Ellsworth & Germann	Town of Queen Creek	9/20/2016	291.78
28-700909.0000	Terravella	Town of Queen Creek	10/7/2016	207.82
28-700919.0000	San Tan 30	Town of Queen Creek	12/20/2016	59.95
28-700928.0000	Malone Place	Town of Queen Creek	2/17/2017	596.88
28-700931.0000	Luke Landing		4/18/2017	70.14

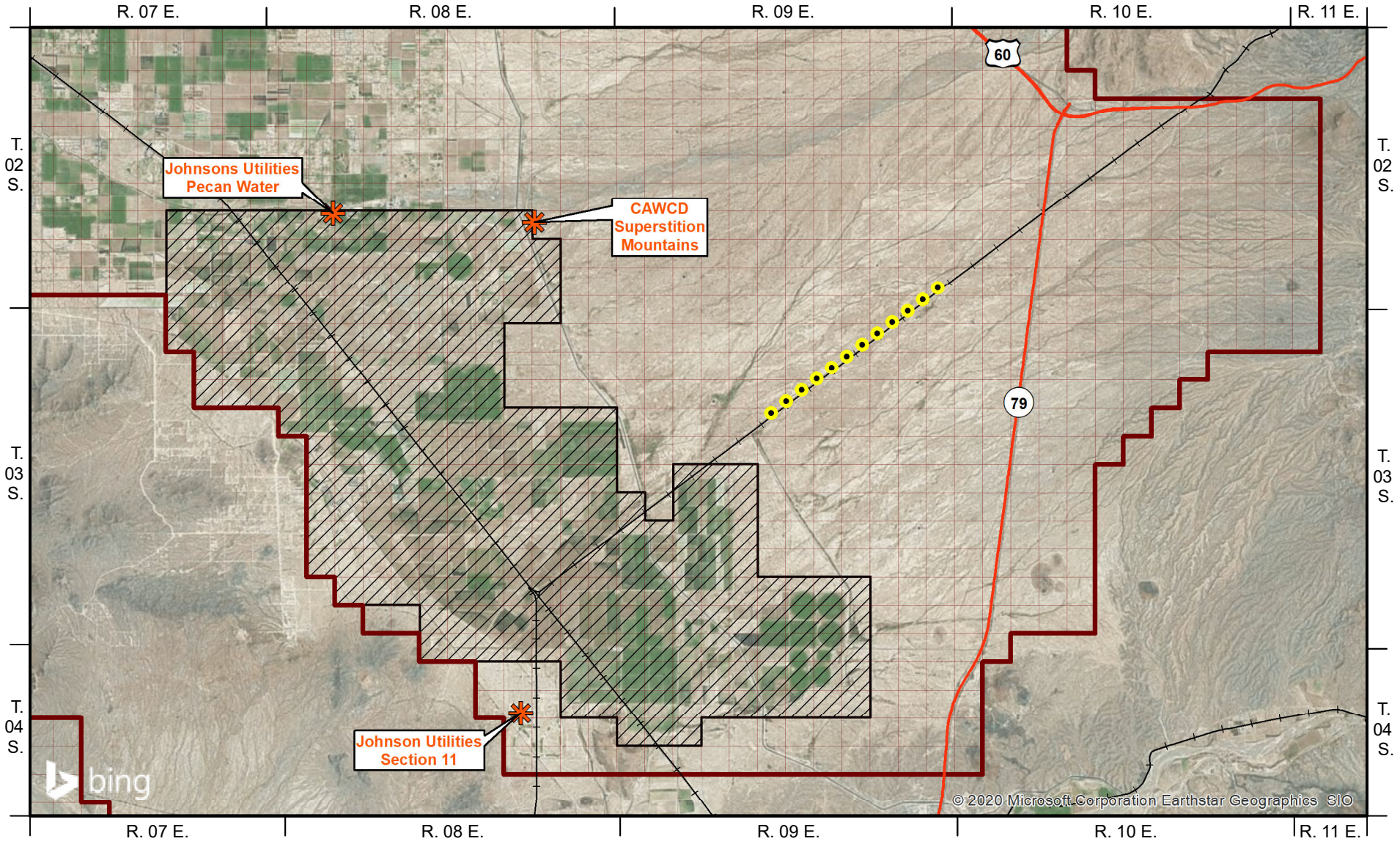
TABLE 3. SUMMARY OF INDIVIDUAL SIMULATED AWS PERMITS

File Number	Subdivision	Water Provider	Issued Date	GW Demand (AF/year)
28-700936.0000	QCEL Property	Town of Queen Creek	3/27/2017	95.67
28-700943.0000	Estates at Picket Post	Town of Queen Creek	6/27/2017	12.12
28-700948.0000	Pecan Cove East	Town of Queen Creek	6/9/2017	34.45
28-700949.0000	Barney Farms	Town of Queen Creek	7/31/2017	1,544.21
28-700958.0000	Luke Land 58		10/25/2017	12.11
28-700960.0000	North Copper Canyon (AKA Austin Ranch)	Beardsley Water Co	11/15/2017	1,234.15
42-400460.0002	Verrado (fka Whitestone)	EPCOR - Agua Fria	11/5/2015	7,326.74
42-400513.0001	Roston/Buckeye Community	City of Buckeye	10/6/2010	1,407.54
42-400513.0002	Roston/Buckeye Community (Westpark)	City of Buckeye	2/25/2016	1,407.54
42-400858.0001	Sun Haven Ranch		11/12/2014	5,699.00
42-401302.0001	107th Avenue and Broadway	Rigby Water Co	9/29/2014	409.08
42-401308.0001	Cactus Lane Ranch	EPCOR - Agua Fria	8/5/2014	9,783.96
42-401489.0001	Zanjero Trails and Pass	EPCOR - Agua Fria	12/11/2012	4,607.33
42-401647.0002	Grand Vista		12/2/2015	7,200.00
42-401738.0001	Westwind	City of Buckeye	7/14/2015	1,226.67
42-401796.0001	Monte Verde	Valencia Water Co	3/31/2015	1,630.85
42-401804.0001	Woolf Crossing	EPCOR - Agua Fria	11/17/2015	1,410.01
42-401866.0001	Cipriani	City of Buckeye	1/14/2014	5,957.45
42-401970.0001	Ventana Ranch (fka Buckeye Farms)	City of Buckeye	2/9/2016	474.55
42-402022.0002	Festival Ranch	City of Buckeye	8/30/2013	11,335.49
42-402023.0001	Spurlock	City of Buckeye	6/20/2011	9,529.00
42-402088.0001	Las Palmas	Arizona Water Co - White Tanks	10/5/2016	514.75

AF/year = acre-feet per year

TABLE 4. SIMULATED ANNUAL DESERT WELLFIELD PUMPING

		Model Stress Period	Year	Mine Year	Simulated Pumping Alternatives (gallons per minute)	
					1- No Mining	2 - Near West Wet
		37	2019	-8	0.0	408.8
		38	2020	-7	0.0	432.3
		39	2021	-6	0.0	179.0
		40	2022	-5	0.0	149.1
		41	2023	-4	0.0	138.4
		42	2024	-3	0.0	92.7
		43	2025	-2	0.0	32.2
		44	2026	-1	0.0	43.6
		45	2027	0	0.0	363.1
Period of Active Mine Operations		46	2028	1	0.0	5,669.8
		47	2029	2	0.0	5,670.0
		48	2030	3	0.0	5,741.1
		49	2031	4	0.0	5,797.6
		50	2032	5	0.0	4,606.5
		51	2033	6	0.0	5,539.1
		52	2034	7	0.0	5,709.8
	Period of Maximum Groundwater Pumping	53	2035	8	0.0	12,021.8
		54	2036	9	0.0	12,187.6
		55	2037	10	0.0	12,143.4
		56	2038	11	0.0	12,289.4
		57	2039	12	0.0	12,333.9
		58	2040	13	0.0	12,312.3
		59	2041	14	0.0	12,216.8
		60	2042	15	0.0	12,344.0
		61	2043	16	0.0	12,374.2
		62	2044	17	0.0	12,328.0
		63	2045	18	0.0	12,337.9
		64	2046	19	0.0	12,371.4
		65	2047	20	0.0	12,383.8
		66	2048	21	0.0	12,500.6
		67	2049	22	0.0	12,561.0
		68	2050	23	0.0	12,578.8
		69	2051	24	0.0	12,563.2
		70	2052	25	0.0	12,502.5
		71	2053	26	0.0	12,317.9
		72	2054	27	0.0	12,372.9
		73	2055	28	0.0	12,405.2
		74	2056	29	0.0	12,335.9
		75	2057	30	0.0	12,262.9
		76	2058	31	0.0	12,211.1
		77	2059	32	0.0	3,400.6
		78	2060	33	0.0	3,235.3
		79	2061	34	0.0	2,909.3
		80	2062	35	0.0	2,854.8
		81	2063	36	0.0	2,581.3
		82	2064	37	0.0	2,526.8
		83	2065	38	0.0	2,507.2
		84	2066	39	0.0	2,520.9
		85	2067	40	0.0	2,531.7
		86	2068	41	0.0	3,282.2
End of Pumping		87-286	2069 - 2268	42 - 241	0.0	0.0



EXPLANATION

- Proposed Desert Wellfield Well Location
- Underground Storage Facility
- Active Model Domain
- NMIDD Area

N

0 1 2 3

Miles

FIGURE 1. PROPOSED DESERT WELLFIELD LOCATION MAP ALONG MARCO CORRIDOR

G:\GIS-Tuc\Projects\605\605.7506\WellfieldLocationMap.mxd 13Jan2020

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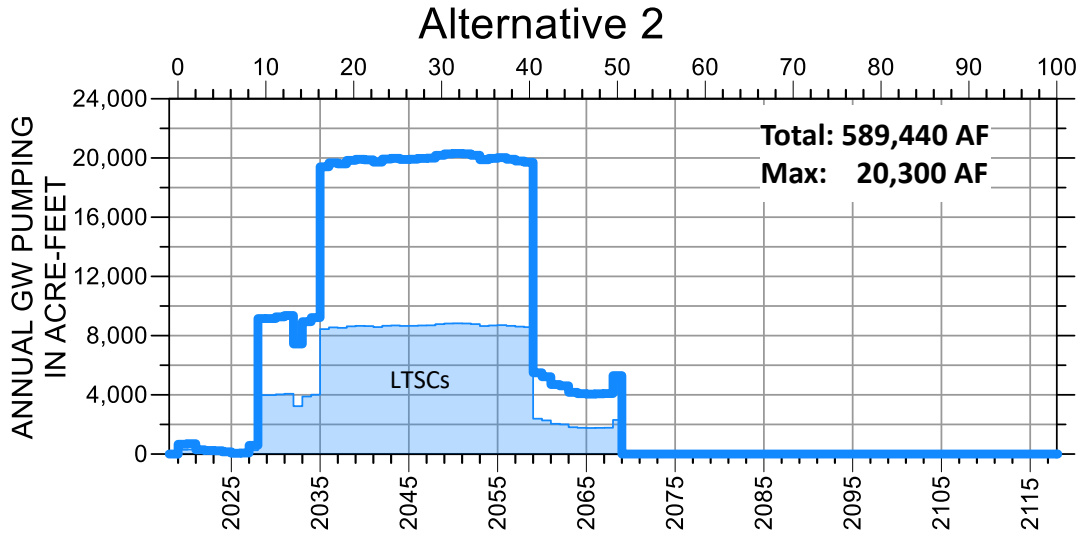
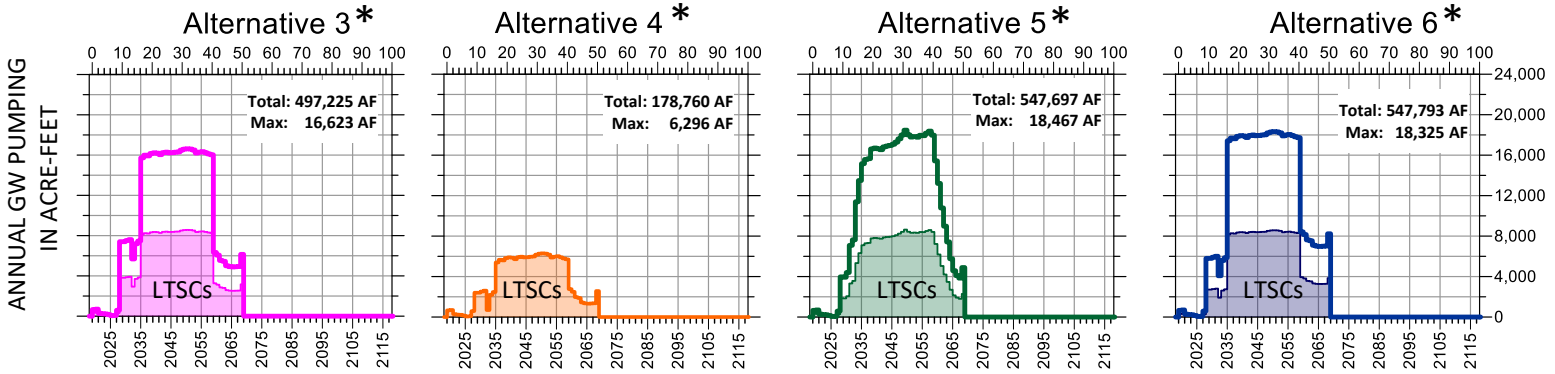
Alternative 1: "No Action"

- No pumping at Desert Wellfield
- Resolution's LTSCs are included with the total pumping of SRV LTSCs





*Note: Alternatives 3 through 6 are not simulated for this evaluation

FIGURE 2 . PLANNED DESERT WELLFIELD PUMPING FOR ALTERNATIVES 1 THROUGH 6

Gis-Tuc\Drafting\605.7506\WellfieldPumping_Alt1_6.ppt\14Jan2020

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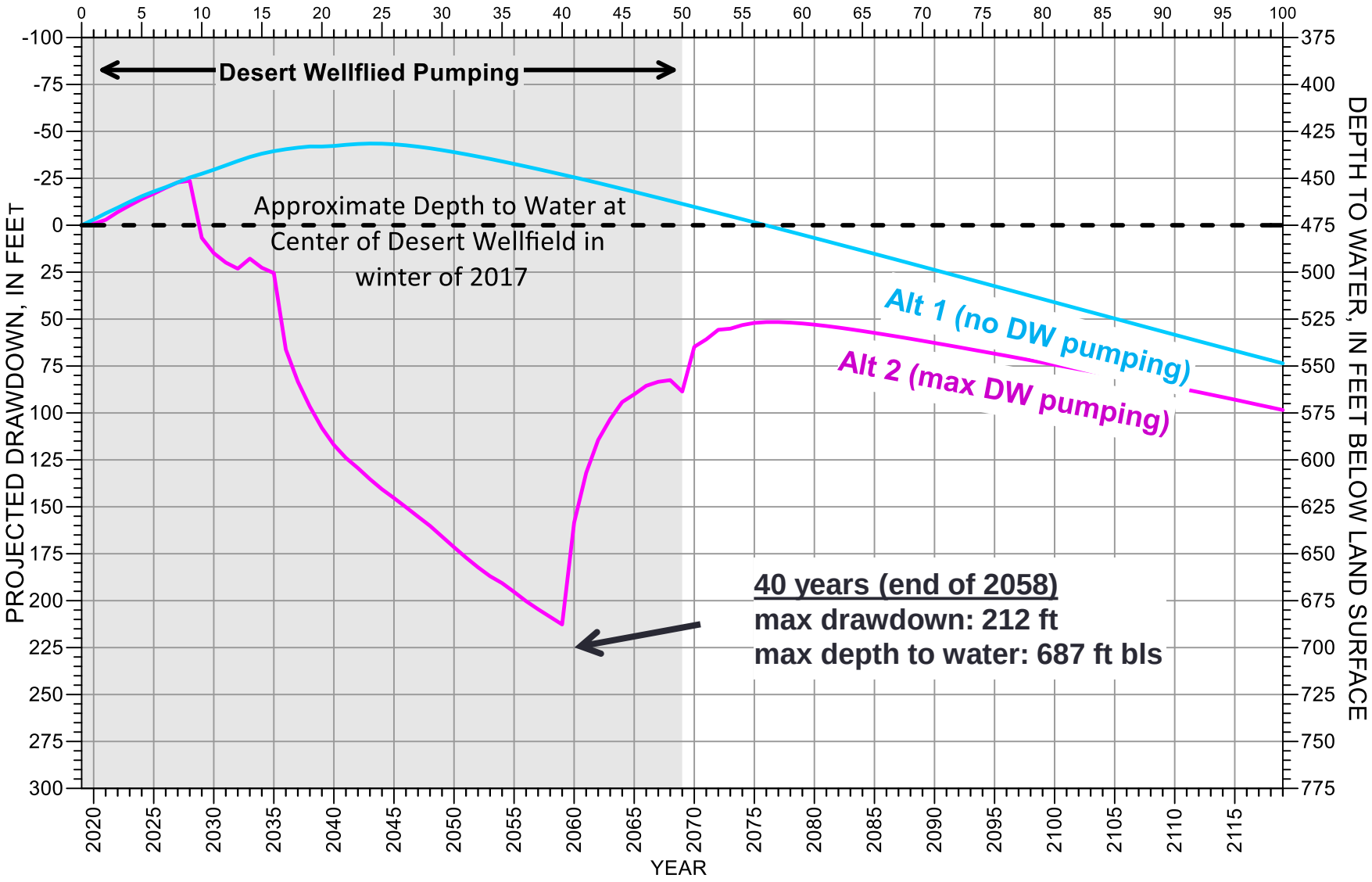

FIGURE 3. PROJECTED DRAWDOWN AT CENTER OF DESERT WELLFIELD

Gis-Tuc\Drafting\605.7506\Projected DD_CenterDW.ppt\13Jan2020

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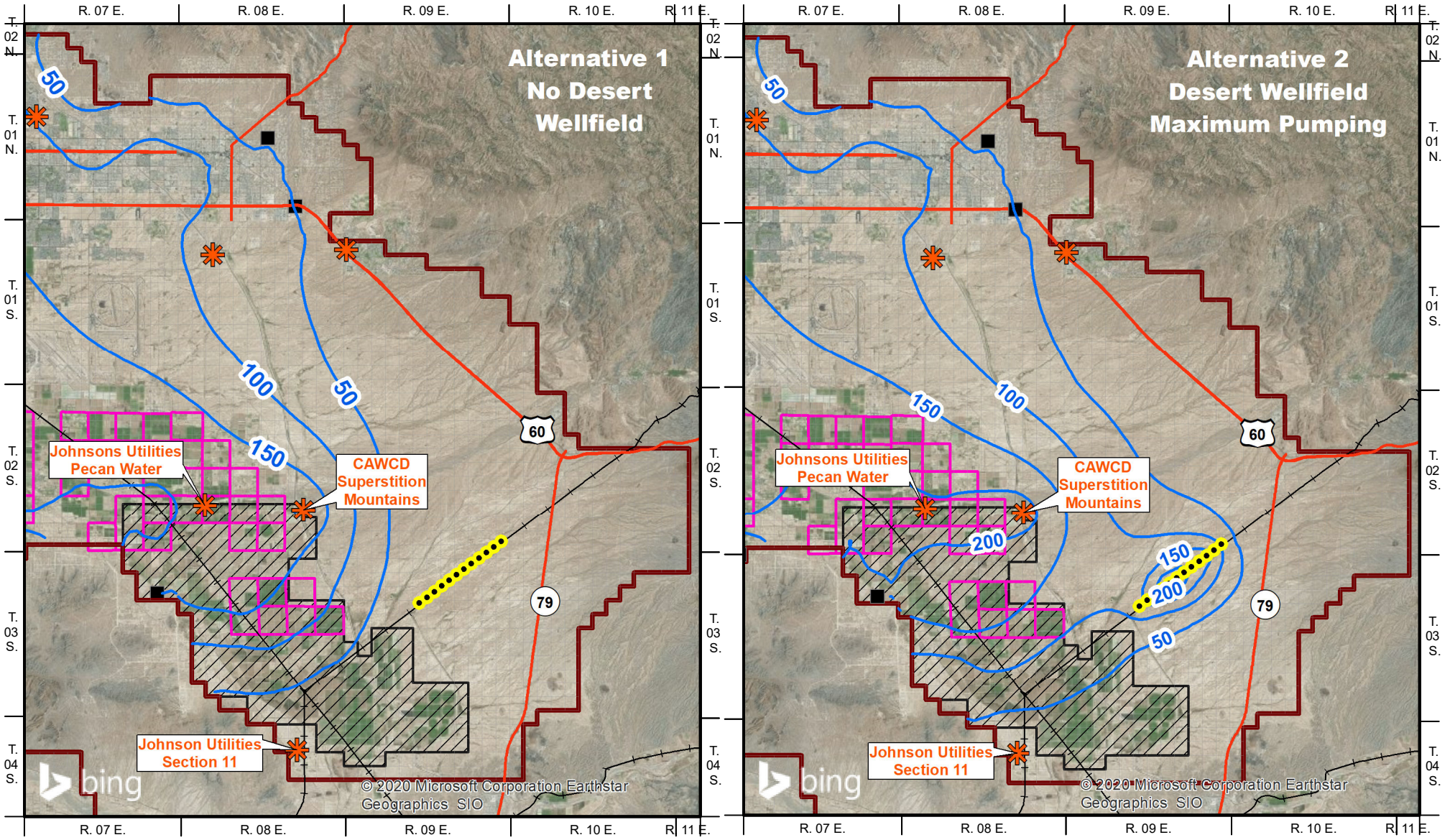

EXPLANATION

- Proposed Desert Wellfield Well Location
- Underground Storage Facility
- Projected Drawdown, in feet
- Active Model Domain
- NMIDD Area
- Areas with New AWS Permits
- Layer 3 Dry Cells

N

0 1 2 3

Miles

FIGURE 4. PROJECTED DRAWDOWN IN EAST SALT RIVER VALLEY AFTER 40 YEARS (2058)

G:\GIS-Tuc\Projects\605\605.7506\DDprojected_EastSRV_40years_2058.mxd 14Jan2020

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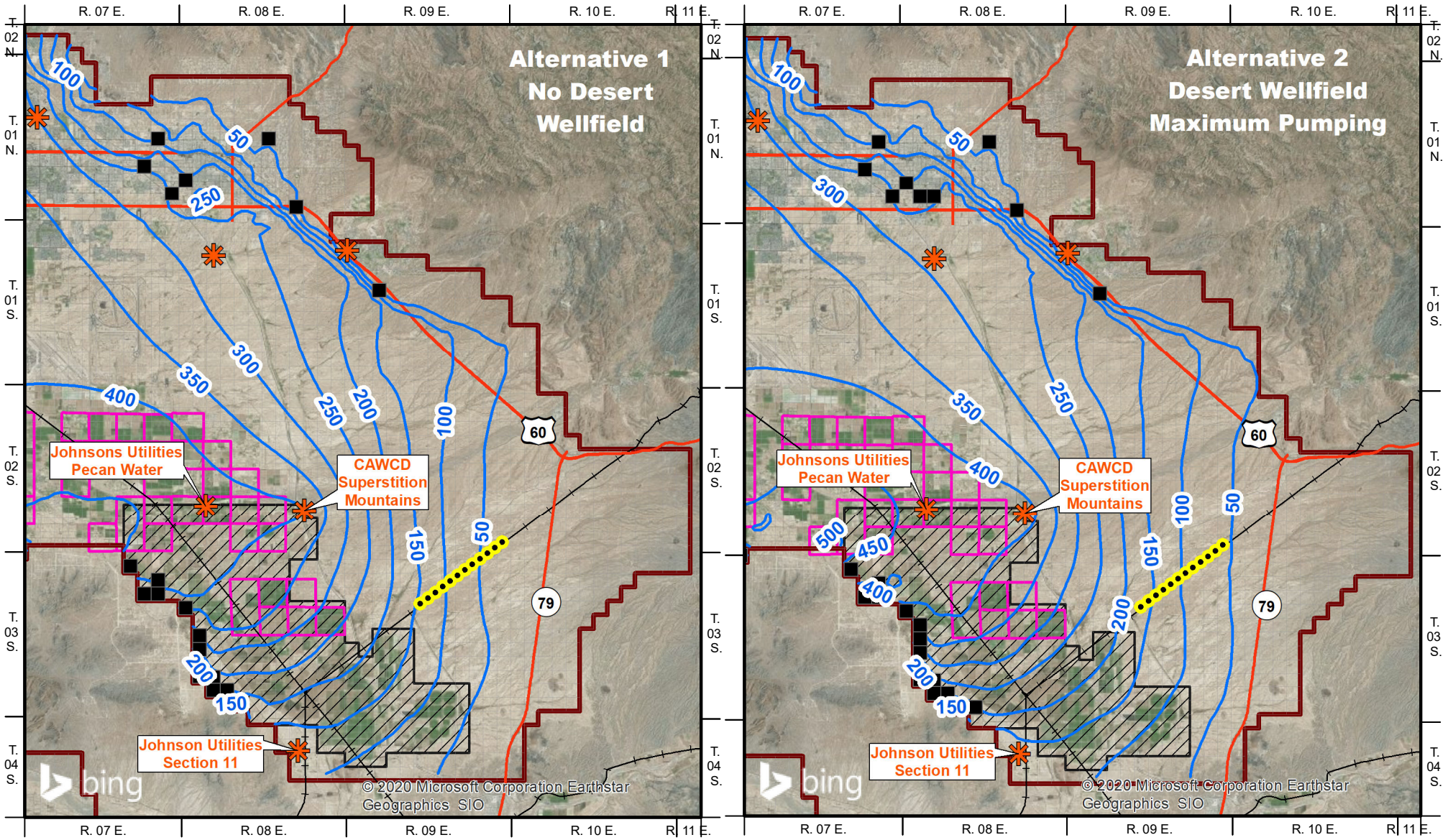

EXPLANATION

- Proposed Desert Wellfield Well Location
- Underground Storage Facility
- Projected Drawdown, in feet
- Active Model Domain
- NMIDD Area
- Areas with New AWS Permits
- Layer 3 Dry Cells

N

0 1 2 3

Miles

FIGURE 5. PROJECTED DRAWDOWN IN EAST SALT RIVER VALLEY AFTER 100 YEARS (2118)

G:\GIS-Tuc\Projects\605\605.7506\DDprojected_EastSRV_100years_2118.mxd 14 Jan2020

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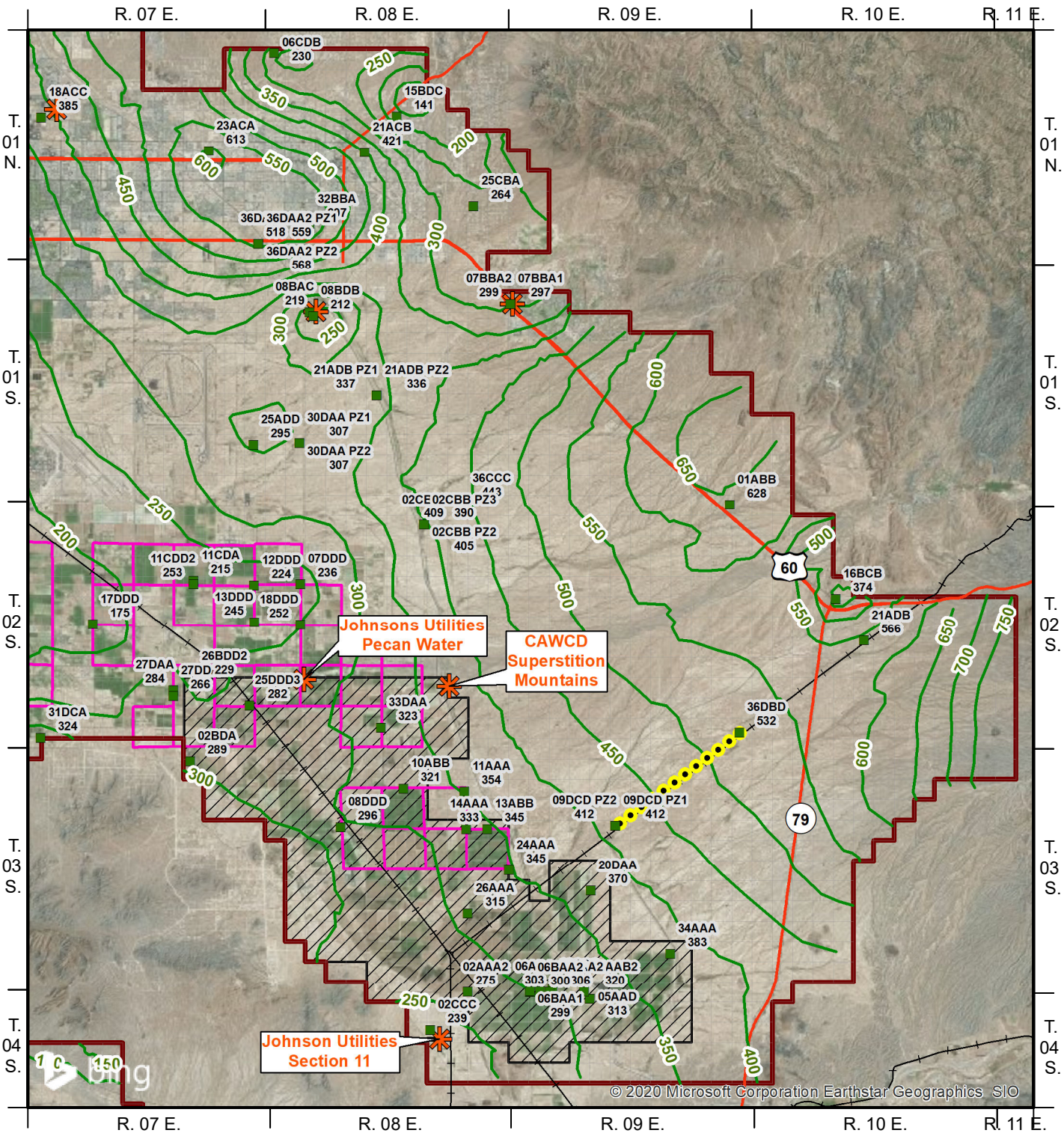

EXPLANATION

- Proposed Desert Wellfield Well Location
- Underground Storage Facility
- GWSI Well Location, Identification, and Measured Depth to Water in Winter of 2017, in ft bls (depth to water calculated using measured 2017 depth to water)
- Depth to Water for 2017 Winter, in ft. bls
- Active Model Domain
- NMIDD Area
- Areas with New AWS Permits

N

0 1 2 3

Miles

FIGURE 6. MEASURED DEPTH TO WATER IN EAST SALT RIVER VALLEY (2017)

G:\GIS-Tuc\Projects\605\605.7506\MeasuredDTW_Winter2017.mxd 14Jan2020

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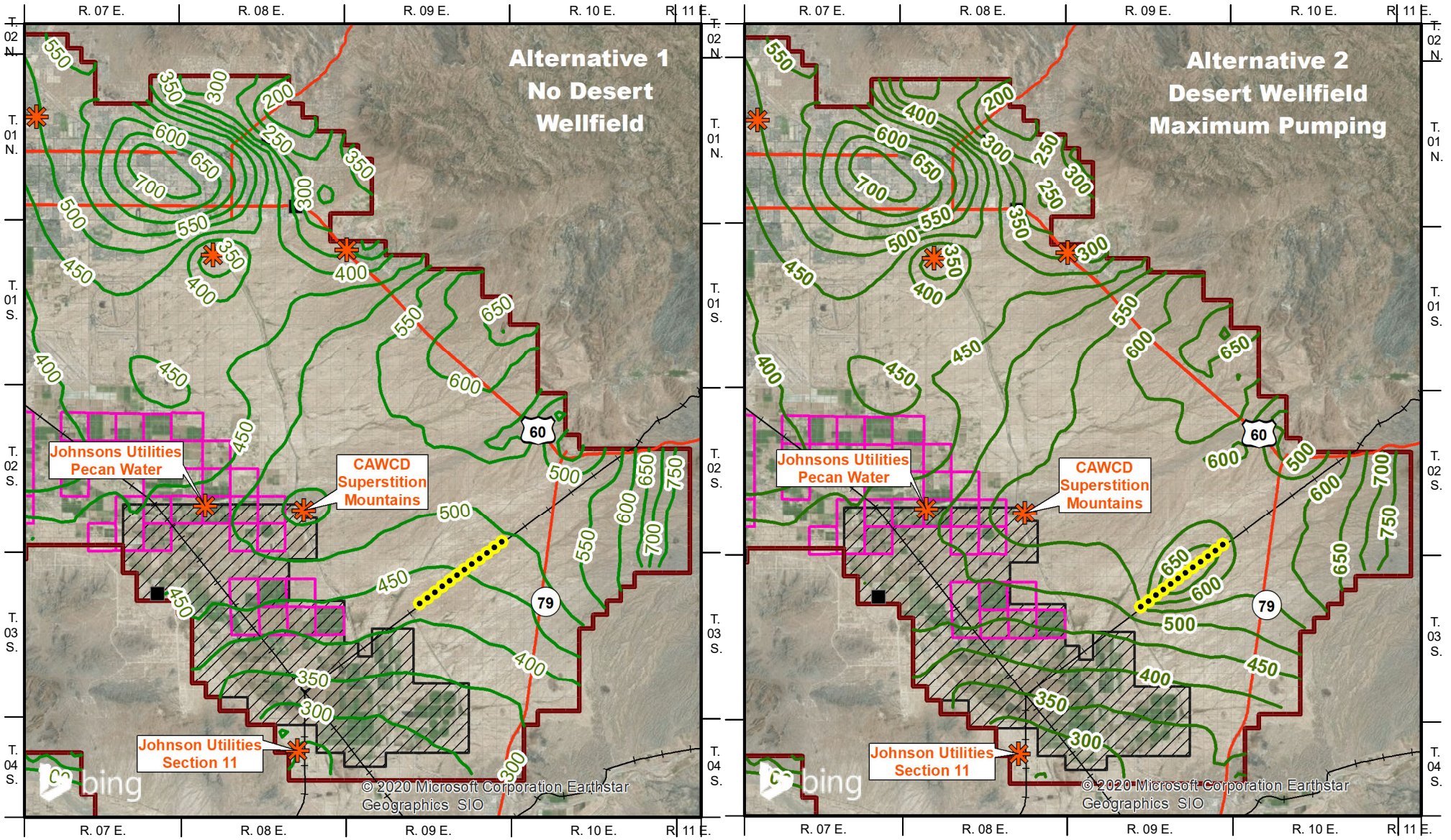

EXPLANATION

- Proposed Desert Wellfield Well Location
- Underground Storage Facility
- Projected Depth to Water, ft. bls
- Active Model Domain
- NMIDD Area
- Areas with New AWS Permits
- Layer 3 Dry Cells

N

0 1 2 3

Miles

FIGURE 7. PROJECTED DEPTH TO WATER IN EAST SALT RIVER VALLEY AFTER 40 YEARS (2058)

G:\GIS-Tuc\Projects\605\605.7506\DTWprojected_40years_2058.mxd 14Jan2020

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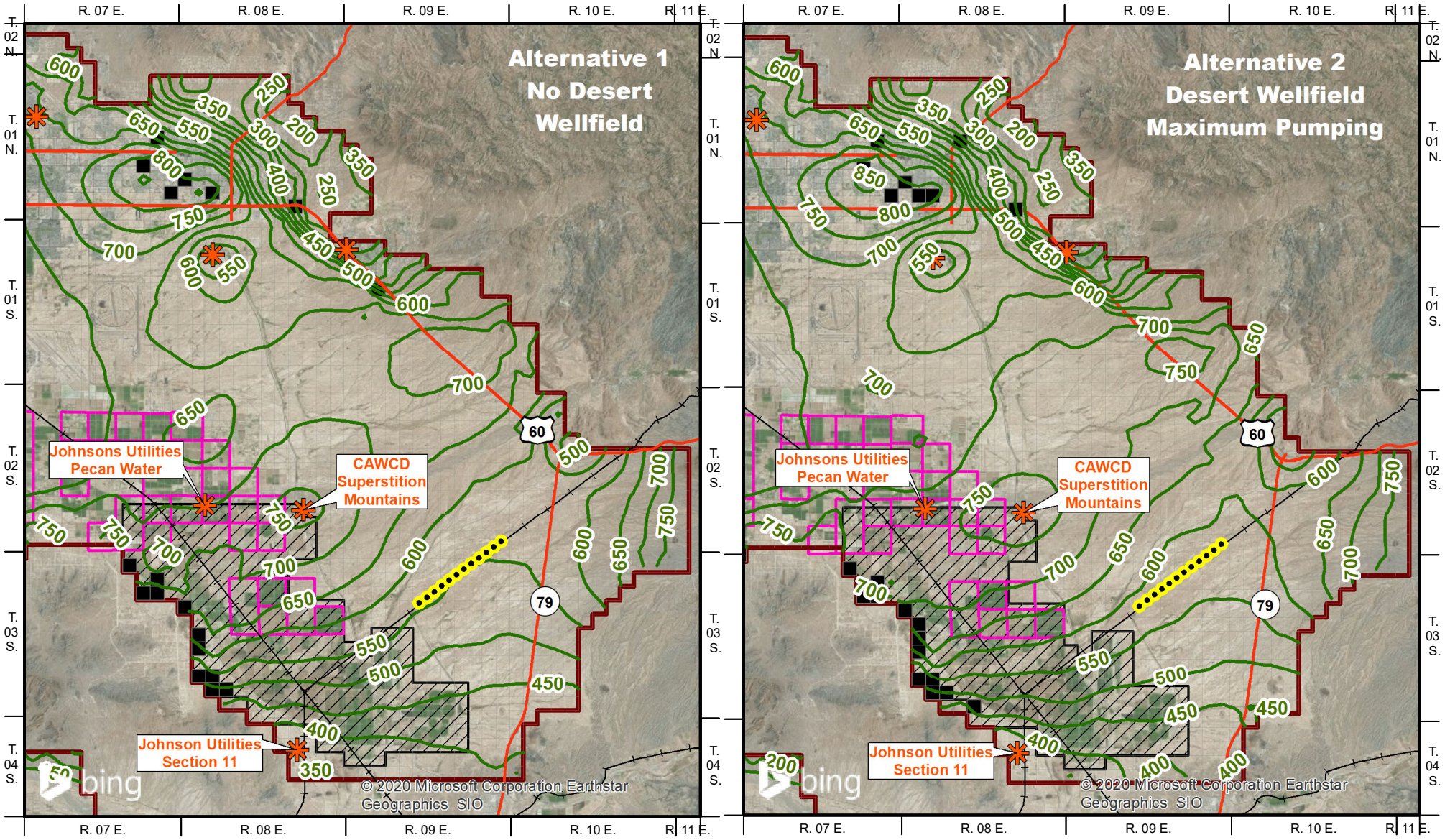

EXPLANATION

- Proposed Desert Wellfield Well Location
- Underground Storage Facility
- Projected Depth to Water, ft. bls
- Active Model Domain
- NMIDD Area
- Areas with New AWS Permits
- Layer 3 Dry Cells

N

0 1 2 3

Miles

FIGURE 8. PROJECTED DEPTH TO WATER IN EAST SALT RIVER VALLEY AFTER 100 YEARS (2118)

G:\GIS-Tuc\Projects\605\605.7506\DTWprojected_100years_2118.mxd 14Jan2020

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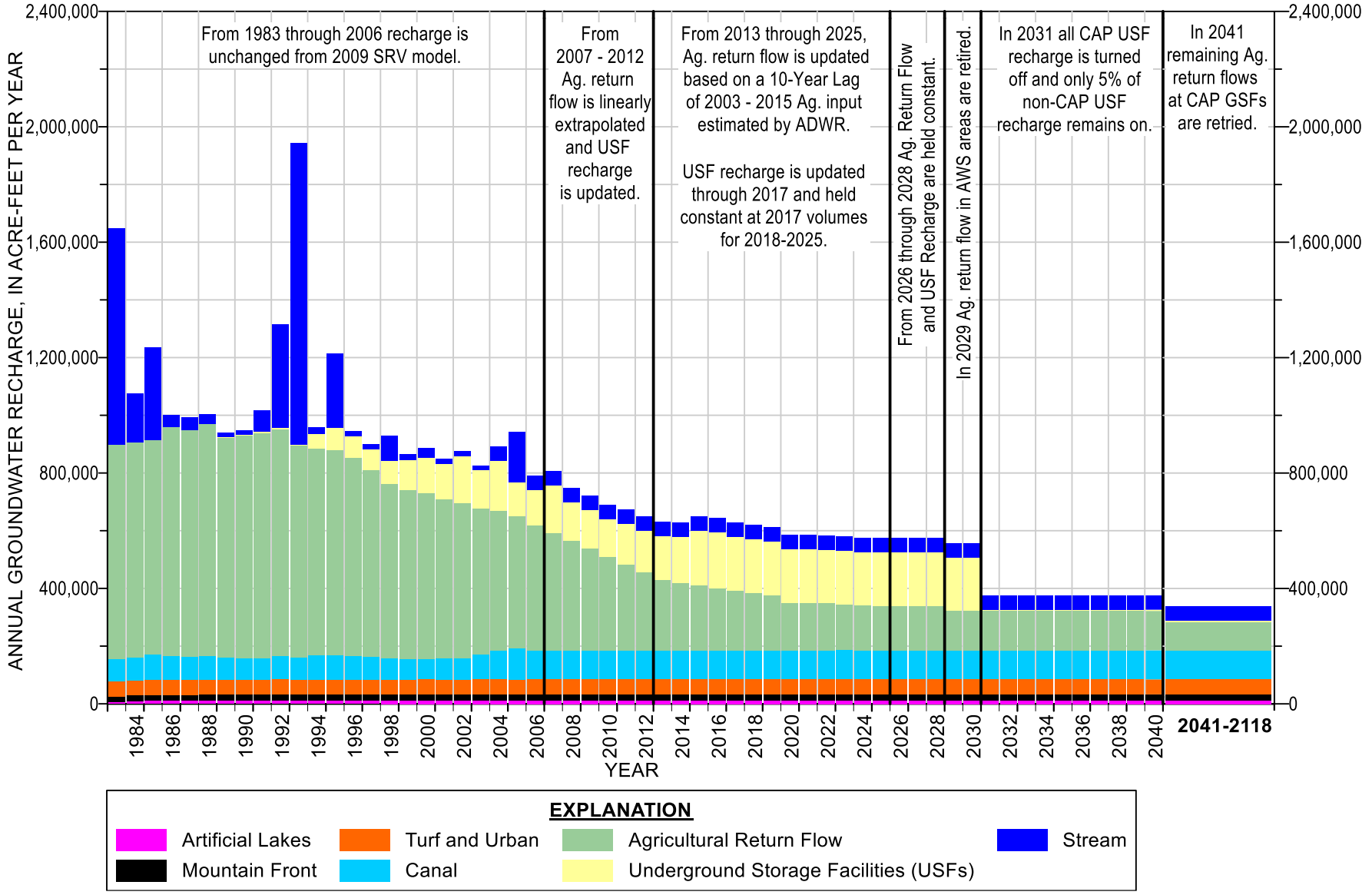

FIGURE 9 . SIMULATED RECHARGE 1983 THROUGH 2118

Gis-Tuc\Drafting\605.7506\RechargeSummaryGraph.ppt\14Jan2020

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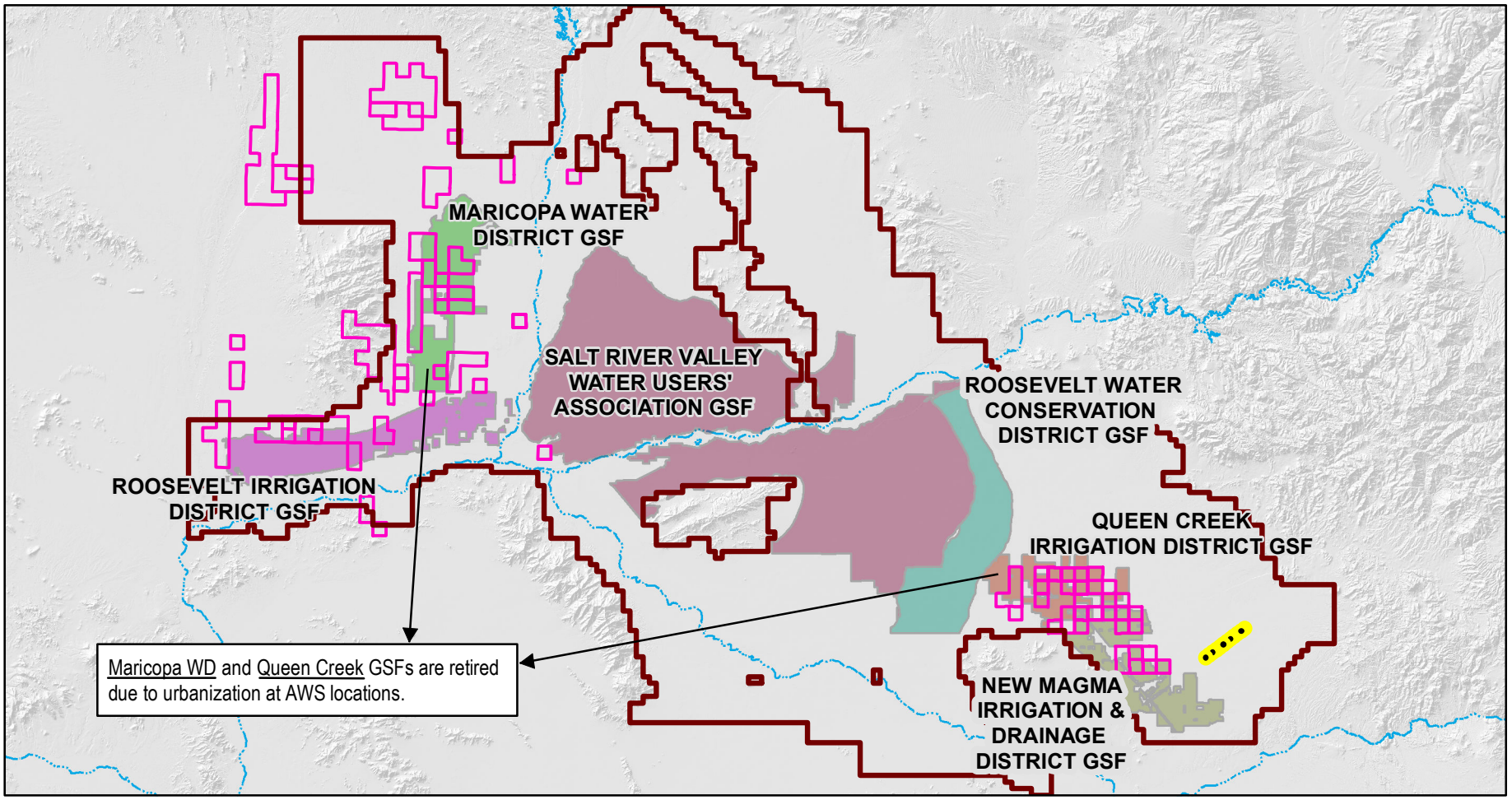

EXPLANATION

- Proposed Desert Wellfield Well Location
- Active Model Domain
- Areas with New AWS Permits (Pumping added to model starting in 2019)
- GSFs

N

0 5

Miles

FIGURE 10. RETIRED AGRICULTURAL RETURN FLOWS RECHARGE AT NEW AWS PERMIT AREAS, AFTER 2028 (USING A 10-YEAR LAG)

G:\GIS-Tuc\Projects\605\605.7506\AWS_RetiredReturnFlows_wGSF2028.mxd 14Jan2020

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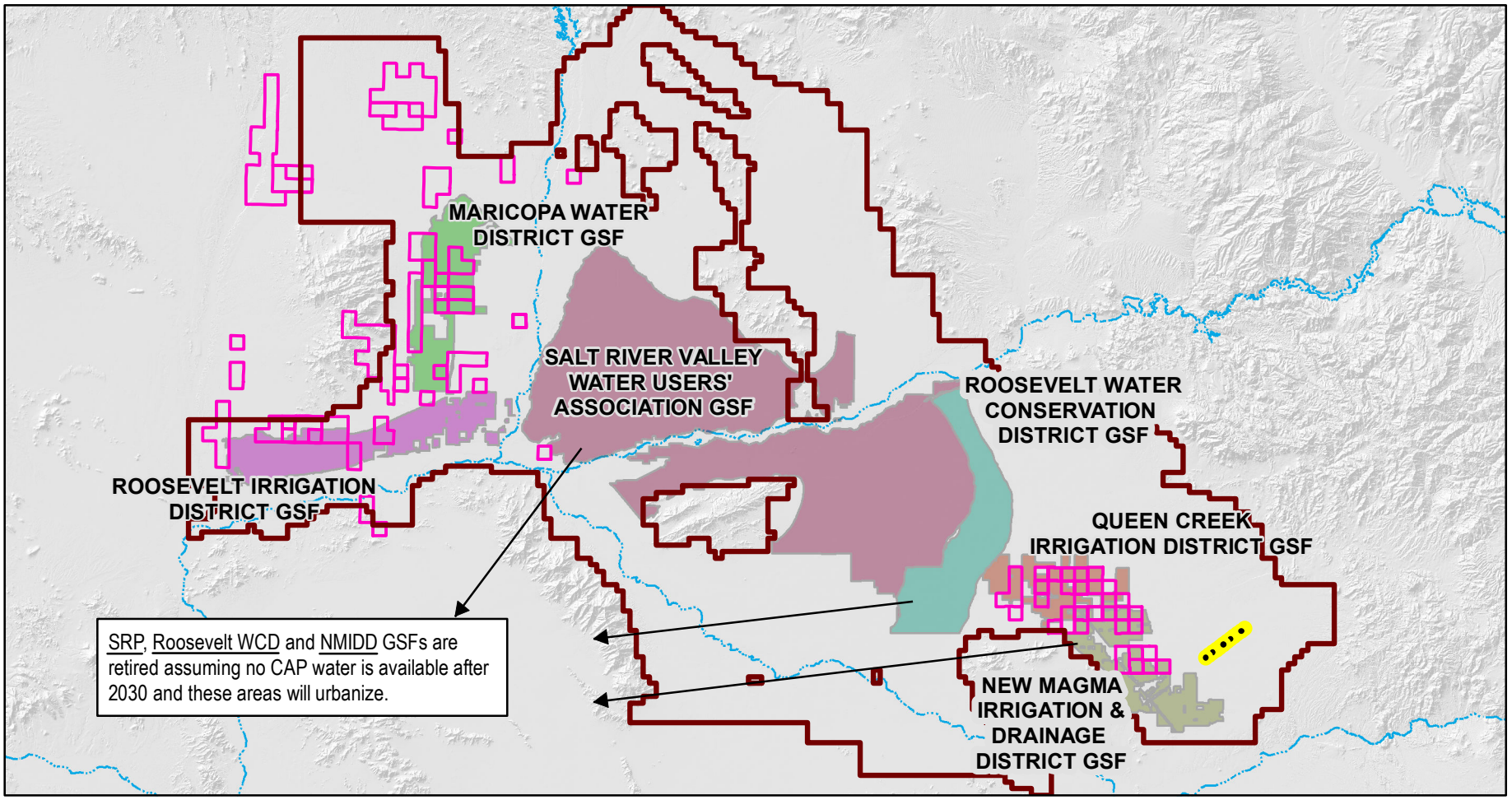

EXPLANATION

- Proposed Desert Wellfield Well Location
- Active Model Domain
- Areas with New AWS Permits (Pumping added to model starting in 2019)
- GSFs

N

0 5

Miles

FIGURE 11. RETIRED CAP GSF AGRICULTURAL RETURN FLOWS RECHARGE, AFTER 2040 (USING A 10-YEAR LAG)

G:\GIS-Tuc\Projects\605\605.7506\AWS_Demands_wGSF2040.mxd 14Jan2020

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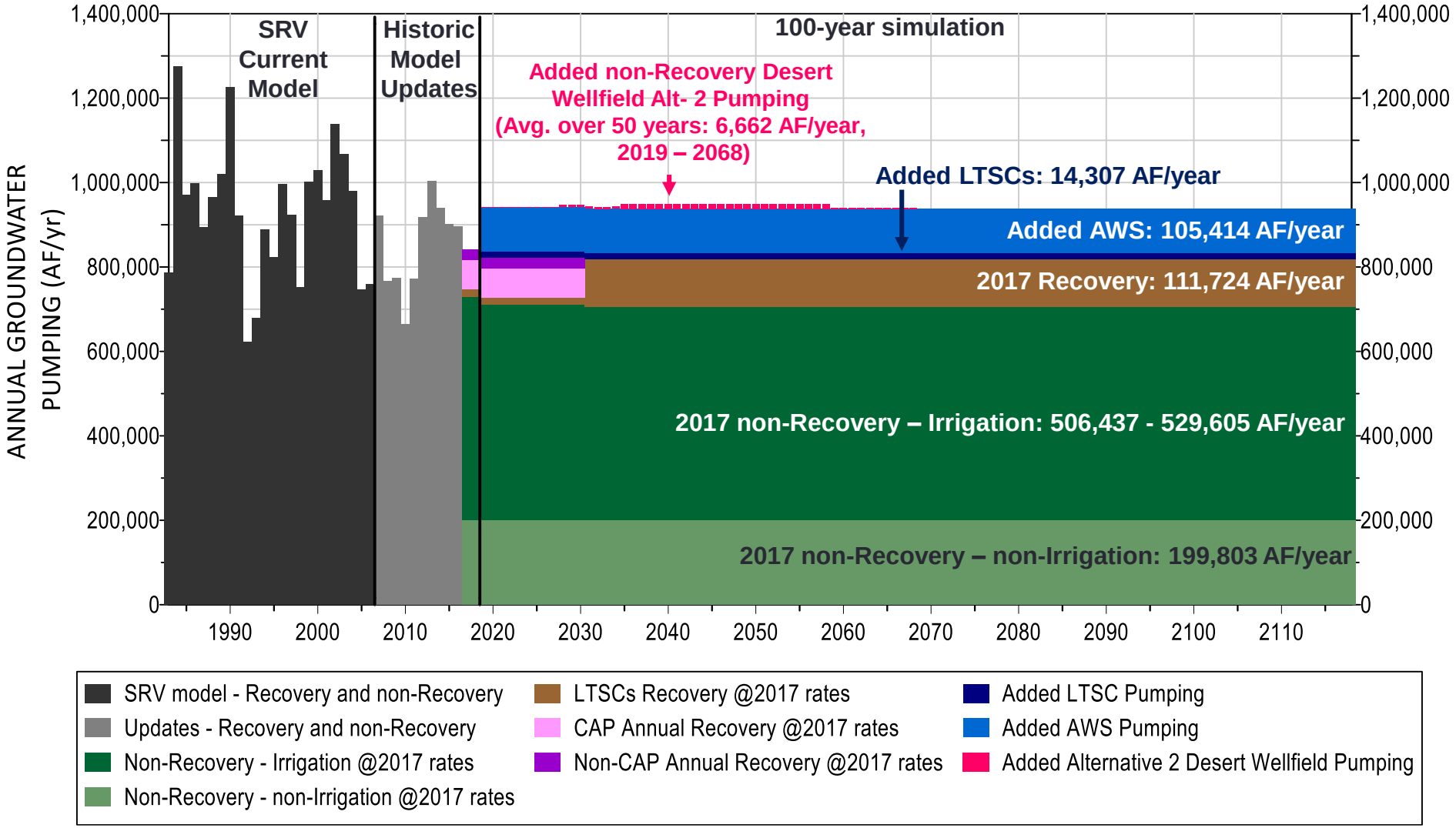
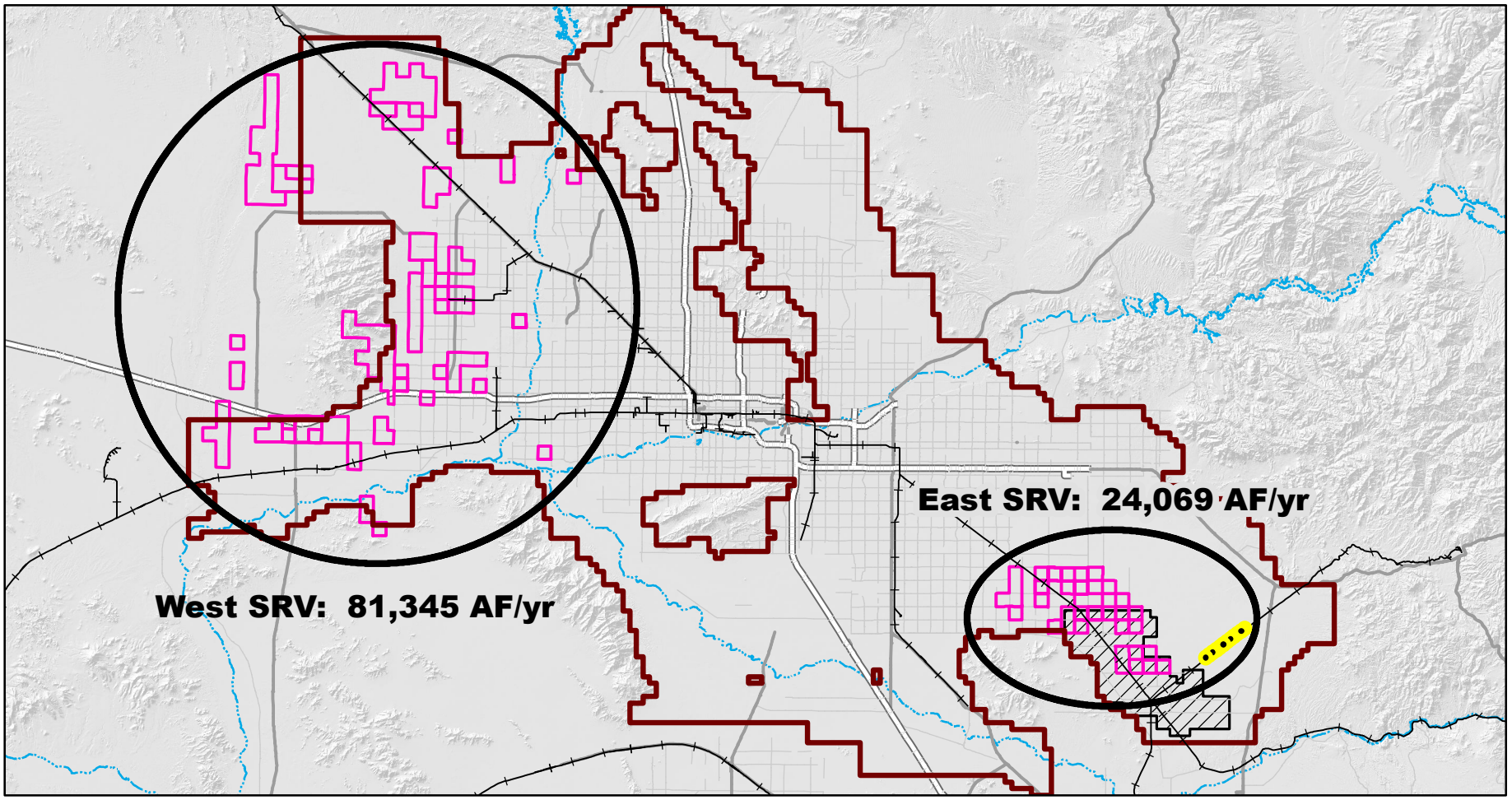


FIGURE 12 . SIMULATED PUMPING 1983 THROUGH 2118

Gis-Tuc\Drafting\605.7506\SimulatedPumpingSummary.ppt\14Jan2020

MONTGOMERY & ASSOCIATES



EXPLANATION

- Proposed Desert Wellfield Well Location
- Active Model Domain
- Areas with New AWS Permits (Pumping added to model starting in 2019)

N

0 5

Miles

FIGURE 13. NEW AWS PUMPING ADDED TO MODEL, FOR PERMITS DATED IN LAST 10 YEARS

G:\GIS-Tuc\Projects\605\605.7506\AWS_PumpingDetails.mxd 14Jan2020

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