ELLISON, SCHNEIDER & HARRIS L.L.P.

CHRISTOPHER T. ELLISON
ANNE J. SCHNEIDER
JEFFERY D. HARRIS
DOUGLAS K. KERNER
ROBERT E. DONLAN
ANDREW B. BROWN
GREGGORY L. WHEATLAND
CHRISTOPHER M. SANDERS
LYNN M. HAUG
PETER J. KIEL

ATTORNEYS AT LAW

2600 CAPITOL AVENUE, SUITE 400
SACRAMENTO, CALIFORNIA 95816
TELEPHONE (916) 447-2166 FAX (916) 447-3512

ELIZABETH P. EWENS, OF COUNSEL
BRIAN S. BIERING
TERESA W. CHAN
SHANE E. CONWAY
KATHRYN C. COTTER
JEDEDIAH J. GIBSON
CHASE B. KAPPEL
SAMANTHA G. POTTENGER

February 16, 2010

DOCKET
09-AFC-8
DATE FEB 16 2010
RECD. FEB 16 2010

Commissioner Anthony Eggert, Presiding Member
Vice Chair James D. Boyd, Associate Member
Mr. Craig Hoffman, Project Manager
Abengoa Mojave Solar Project (09-AFC-5)
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Re: Abengoa Mojave Solar Project (09-AFC-5): Second Supplemental Written Response to Data Request Set 1B (Nos. 1-86) for Water Resources

Dear Commissioners Eggert and Boyd:

Abengoa Solar Inc. ("the Applicant") hereby files these written responses to certain Data Requests in Set 1B promulgated by Staff on October 26, 2009. This supplemental response contains additional information requested by Staff regarding Soils and Water Resources associated with the following: Data Requests 21, 23, 31, 41, 44, and 45. In addition, several groundwater modeling files were requested which are provided as electronic files on CD accompanying these responses.

The Applicant appreciates Staff's time and efforts reviewing the enclosed materials. The Applicant looks forward to continuing to work with Staff as the project moves forward to achieve complete and satisfactory resolution of all issues in a timely manner.

Thank you for your time and consideration of this matter.

Sincerely,

Christopher T. Ellison
Shane E. Conway
Attorneys for Abengoa Solar Inc.

Attachment

STATE OF CALIFORNIA

Energy Resources Conservation
and Development Commission

Application for Certification for the ***ABENGOA MOJAVE SOLAR POWER PLANT***	))))	Docket No. 09-AFC-5

PROOF OF SERVICE

I, Karen A. Mitchell, declare that on February 16, 2010, I served the attached *Second Supplemental Written Response to Data Request Set 1B (Nos. 1-86) for Water Resources* via electronic mail and United States Mail to all parties on the attached service list.

I declare under the penalty of perjury that the foregoing is true and correct.

Karen A. Mitchell

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION
FOR THE ***ABENGOA MOJAVE SOLAR POWER PLANT***

Docket No. 09-AFC-5
PROOF OF SERVICE
(Revised 2/9/2010)

APPLICANT
Emiliano Garcia Sanz
General Manager
Abengoa Solar Inc.
11500 West 13th Avenue
Lakewood, CO 80215
emiliano.garcia@solar.abengoa.com

Scott D. Frier
Chief Operating Officer
Abengoa Solar Inc.
13911 Park Ave., Ste. 206
Victorville, CA 92392
scott.Frier@solar.abengoa.com

Tandy McMannes
2030 Addison Street, Suite 420
Berkeley, CA 94704
tandy.mcmannes@solar.abengoa.com

APPLICANT'S CONSULTANTS
Frederick H. Redell, PE
Engineering Manager
Abengoa Solar, Inc.
11500 West 13th Avenue
Lakewood, CO 80215
frederick.redell@solar.abengoa.com

COUNSEL FOR APPLICANT
Christopher T. Ellison
Ellison, Schneider & Harris
2600 Capitol Ave.
Sacramento, CA 95816
cte@eslawfirm.com

INTERESTED AGENCIES
California ISO
e-recipient@caiso.com

INTERVENORS
California Unions for Reliable Energy ("CURE")
Tanya A. Gulesserian
Marc D. Joseph
Elizabeth Klebaner
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080
E-mail Preferred
tgulesserian@adamsbroadwell.com
eklebaner@adamsbroadwell.com

Luz Solar Partners Ltd., VIII
Luz Solar Partners Ltd., IX
Jennifer Schwartz
700 Universe Blvd
Juno Beach, FL 33408
jennifer.schwartz@nexteraenergy.com

ENERGY COMMISSION
*ANTHONY EGGERT
Commissioner and Presiding Member
aeggert@energy.state.ca.us

JAMES D.BOYD
Vice Chairman and Associate Member
jboyd@energy.state.ca.us

Paul Kramer
Hearing Officer
pkramer@energy.state.ca.us

Craig Hoffman
Project Manager
choffman@energy.state.ca.us

Christine Hammond
Staff Counsel
chammond@energy.state.ca.us

Jennifer Jennings
Public Adviser's Office
publicadviser@energy.state.ca.us

*indicates change

Soils and Water Resources (21-61)

Background

Extending the model time over the predictive period

In our previous submittal, we adapted the USGS model of the Mojave basin (Stamos, et al. 2001). We have further adapted that model in response to Staff requests made during the review process:

1. The input files for the steady "pre-development" model erroneously had a well that added 60 cfs to the model instead of the 10 cfs called for in the text of the Stamos Report (WRIR 01-4002). The steady model was re-run and its results were used as initial conditions for the transient 1931-2050 predictive models.
2. There were a few inconsistencies identified between the USGS reported pumping rates for some wells in the transient simulation. The corrected rates were provided by CEC Staff consultant, HydroFocus.
3. When Groundwater Vistas imported the transient recharge data, a constant recharge rate was added across the entire model after 2010. This was corrected by re-copying the recharge array in the predictive model.

In addition, we expanded the sensitivity analysis to include the sensitivity of the model to the transmissivity and storage coefficient within the Harper Valley as shown below.

Run Name	Description
pre	Transient 1931-2050 simulation without Abengoa wells
dev1	Transient 1931-2050 simulation with Abengoa wells, based on the calibrated model
dev2	Transient 1931-2050 simulation with Abengoa wells and with increased pumpage by other Harper Valley wells after 2010
dev1-hi-k	Transient 1931-2050 simulation with Abengoa wells, with transmissivity within Harper Valley increased by 50%
dev1-lo-k	Transient 1931-2050 simulation with Abengoa wells, with transmissivity within Harper Valley decreased by 50%
dev1-hi-s	Transient 1931-2050 simulation with Abengoa wells, with storage coefficient within Harper Valley increased by 25%
dev1-lo-s	Transient 1931-2050 simulation with Abengoa wells, with storage coefficient within Harper Valley decreased by 25%

It is noted that for each scenario that requires a change to the aquifer properties, a “pre” and a “dev1” scenario were run. This ensures that in all cases the development scenario is compared to a compatible “non-development” scenario.

Figures B-1 and B-2 (attached at the end of these responses) were updated to reflect the pumping rates changes provided by HydroFocus. Although the discrepancies between the our previous submittal and the results of Stamos were small and mostly located outside of the Harper Valley basin, the revised model matches more closely.

A map showing the locations of all wells discussed in these responses is attached.

Item 21:

Additional Information Required:

A. TDS hydrographs for wells near the Abengoa Solar Project Site.
B. A table of available water-quality results for the Harper Valley Groundwater Basin.

Response:

A. Attached Figures 21-3, 21-4, and 21-5 are TDS hydrographs for wells that had more than three data points and are near the Abengoa Solar Project Site. The TDS data was obtained from the USGS. TDS concentrations are shown to generally increase from historical levels (either 1950s or 1980s).
B. Table 21-1 provides the water-quality results for wells within the Harper Valley Groundwater Basin and is found on the following pages.

Table21-1. Water quality data for wells in the Harper Valley Groundwater Basin. Data from USGS National Water Information System.

State ID	Sampling Date	Ammonia[1] (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Iron (µg/L)	Magnesium (mg/L)	Manganese (µg/L)	Nitrite[1] (mg/L)	Potassium (mg/L)	Sulfate (mg/L)
09N04W34D													
	8/2/1994	0.02	-	860	13	150	0.5	100	0.16	4	0.01	1.7	220
09N03W21K													
	5/29/1987	-	2	180	140	200	0.4	5	24	3	0.01	3.6	380
	5/19/1988	-	2	260	120	170	0.5	3	20	2	0.01	2.8	270
	10/26/1988	-	1	260	93	160	0.4	8	18	4	0.01	3.2	200
	11/2/1989	-	2	250	91	160	0.5	25	16	3	0.01	2.2	200
	11/2/1990	0.01	2	240	88	140	0.6	43	16	10	0.01	3.2	170
	5/28/1992	0.01	2	280	110	150	0.5	69	19	5	0.01	3.7	260
	5/19/1994	0.02	-	700	130	180	0.7	20	22	3	0.01	4.1	420
	10/8/1996	0.02	2	410	130	200	0.6	5	23	1	0.01	3.5	390
	10/21/1997	0.01	1	307	147	186	0.5	96	24.6	3.2	0.01	3.93	353
	4/8/1999	0.02	3	524	134	200	0.7	10	22.4	3	0.01	3.77	351
	4/17/2001	0.04	2	442	115	195	0.5	10	21.1	3.2	0.006	3.96	313
	10/18/2001	0.04	-	327	106	176	0.4	10	18.2	0.9	0.008	3.54	252
10N03W28M													

State ID	Sampling Date	Ammonia[1] (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Iron (µg/L)	Magnesium (mg/L)	Manganese (µg/L)	Nitrite[1] (mg/L)	Potassium (mg/L)	Sulfate (mg/L)
	5/21/1990	-	120	3800	93	530	3.2	10	17	10	0.01	4.1	860
	5/26/1992	0.01	100	3200	14	280	4.6	10	6.1	10	0.01	3.4	570
	5/16/1994	0.01	-	3200	21	230	4.6	20	6.8	10	0.01	2.8	560
	5/16/1996	0.02	120	3320	73	280	4.5	9	13	3	0.01	3.2	780
10N03W27F													
	5/21/1990	-	5	240	51	110	0.3	18	11	1	0.01	3.6	59
	5/27/1992	0.02	4	240	58	130	0.6	6	12	1	0.01	4	62
	5/20/1994	0.01	-	230	48	110	0.6	21	10	1	0.01	3.5	58
	5/16/1996	0.02	4	220	50	120	0.7	3	11	1	0.01	3.7	58
	4/11/1998	0.05	2	200	61.4	119	0.5	10	12.4	4	0.01	3.29	75.4
	4/11/2000	0.02	4	222	50.3	109	0.7	6	10.8	2.2	0.01	3.33	61.4
	4/19/2002	0.04	5	236	45	75.4	0.67	10	9.39	2	0.008	3.11	58
	5/16/2003	0.04	5	227	46	71.6	0.7	5	9.55	0.4	0.008	3.2	59.8
11N04W32L													
	6/12/1953	-	-	600	36	151	1	-	10	-	-	4.6	155
	8/5/1954	-	-	720	39	142	0.8	-	5	-	-	4	187

State ID	Sampling Date	Ammonia[1] (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Iron (µg/L)	Magnesium (mg/L)	Manganese (µg/L)	Nitrite[1] (mg/L)	Potassium (mg/L)	Sulfate (mg/L)
11N04W32A													
	6/30/1981	-	-	1100	68	400	0.6	10	10	-	-	5.5	250
	6/3/1982	-	-	1300	71	410	0.7	40	12	20	-	6.2	260
	8/10/1983	-	-	1300	69	390	0.7	0	11	-	-	6.1	240
	6/18/1984	-	-	1200	75	400	0.7	60	11	10	-	5.7	240
	6/26/1985	-	-	1200	70	390	0.6	30	11	1	-	5.8	240
	9/19/1986	-	-	1300	71	390	0.7	9	9.9	2	-	6.2	240
	6/25/1987	-	-	1200	78	430	0.6	3	11	1	-	5.8	250
	5/24/1990	-	12	1300	86	450	0.5	10	12	10	0.01	6	230
	5/26/1992	0.01	11	1300	92	450	0.8	80	13	10	0.01	6.5	250
	5/8/1995	0.01	12	1200	96	480	0.6	20	13	10	0.01	6.4	230
	4/21/2000	0.02	9	1370	124	673	0.7	30	18.8	2.2	0.01	6.86	285
	4/19/2002	0.04	9	1340	113	592	0.66	30	15.8	5	0.008	6.45	256
	5/17/2004	0.04	8	1400	129	628	0.6	19	16.4	2.4	0.008	7.6	261
11N03W28R													
	3/27/1980	-	-	6800	19	440	3.4	40	3.9	-	-	3.8	630

State ID	Sampling Date	Ammonia[1] (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Iron (µg/L)	Magnesium (mg/L)	Manganese (µg/L)	Nitrite[1] (mg/L)	Potassium (mg/L)	Sulfate (mg/L)
	5/24/1990	-	52	460	21	32	14	15	19	3	0.01	1.8	41
	5/27/1992	0.01	35	540	22	34	1.9	7	1.9	1	0.01	2	42
	5/16/1995	0.01	28	840	17	46	1.9	8	2.1	4	0.01	2	62
	4/11/1998	0.05	51	525	19.7	25.3	1.7	10	1.82	4	0.011	1.98	35.2
	4/11/2000	0.02	46	465	18.2	26.5	2.1	10	1.68	2.2	0.01	2.1	34.2
	4/19/2002	0.04	46	453	17.4	25.9	2.3	10	1.59	2	0.008	1.82	35.5
	5/16/2003	0.04	40	521	16.7	26.1	1.8	33	1.45	0.6	0.008	2.24	35.4
11N04W28N													
	2/6/1957	-	-	1400	147	750	1.6	-	22	-	-	5.4	261
	5/29/1968	-	-	1400	40	187	0.9	-	7	-	-	5.3	240
11N04W30N													
	6/12/1953	-	-	1340	66	280	0.8	-	12	-	-	5.8	246
	4/14/1961	-	-	1300	46	204	0.6	-	8	-	-	5.5	249
11N04W30N													
	4/23/1952	-	-	-	49	266	-	-	22	-	-	-	302
	6/10/1952	-	-	-	40	165	-	-	4	-	-	-	230

State ID	Sampling Date	Ammonia[1] (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Iron (µg/L)	Magnesium (mg/L)	Manganese (µg/L)	Nitrite[1] (mg/L)	Potassium (mg/L)	Sulfate (mg/L)
11N03W30A													
	3/16/1932	-	-	4780	3.4	44	-	-	7.5	-	-	45	111
	2/6/1952	-	-	3380	1.7	32	1.6	-	0.5	-	-	1.4	37
11N05W24P													
	3/10/1952	-	-	-	51	373	-	-	9	-	-	-	231
	6/10/1952	-	-	-	52	224	-	-	9	-	-	-	152

[1]Milligrams per liter as nitrogen

Item 23:

Information Required:

Please provide results of a MODPATH or similar particle tracking analysis to show the capture zones of the project wells (with simultaneous operation of wells at Luz Solar Energy Generation System (SEGS) XI and XII power plants) with continuous pumping at the maximum annual production rate for periods of 10, 20, and 30 years.

Response:

Figures 23A-1(a-c), show the results of a USGS MODPATH particle tracking analysis. As shown in Figure 23A-1(a-c), path lines that travel from and beneath Harper Lake terminate in the near vicinity of the proposed Abengoa wells.

Travel times are shown on the figure as arrows along the path lines; there is a 50-year travel time between each pair of arrows. It is noted that the travel time is dependent on two assumptions about the aquifer: (1) the aquifer porosity value, n; and (2) the thickness of the porous formation that is actively available for groundwater flow, H. To adjust the travel time for a different set of assumptions, use the formula below:

$t_{adj} = t_{pred} \times (T_{adj} n_{adj})/(T_{pred} n_{pred})$

Where $H_{pred} = 400\ ft$, $n_{pred} = 0.1$ and H_{adj} and n_{adj} are selected by the modeler. These values are considered to be conservative; Stamos et al. suggest that the porosity of the unconsolidated deposits is about 15%, and the thickness of the aquifer system is considered to be 700 ft. These assumptions are based on the possibility that 400 ft of the 700 ft section actually moves water and that the porosity is greatly reduced from the Stamos assumption. This will result in smaller travel times than for 700 ft thickness and 15% porosity. For example, if the thickness for flow were halved to 200 ft, the 50-year time-of-travel markers would become 25-year time-of-travel markers.

Based upon our assumptions of $H_{pred} = 400\ ft$, $n_{pred} = 0.1$ and H_{adj} and n_{adj} , taken from MODPATH, pathlines show particle travel times of 100 years or more to the Abengoa Wells.

It is noted that after a telephone discussion with John Fio (February 2010), it was determined that only the “dev1”, “dev1-hi-k”, and “dev2” scenarios would be executed for pathline tracing purposes. This suite of runs was chosen because the “hi-k” and “dev2” runs will tend to offer the shortest travel times of the various simulations. Long travel times are not considered to be an issue for the facility.

Item 31:

Information Required:

Please provide a revised drawdown and water budget analysis derived from a 640 sq mile basin

Response:

The following Tables 31-1 (a-g) present summary water budgets for the Harper Valley Basin, zone 16 of the file `zones2.txt` provided by HydroFocus.

Attached Figures 31-1 (a-f) provide basin-scale maps of the relative water level differences for all predictive scenarios, as compared to the runs that exclude the Abengoa wells. The relative water level difference is computed as the difference between the simulated water levels computed with the Abengoa wells included, or with the Abengoa wells excluded, with both simulations based on the same aquifer properties. This means that for each choice of hydraulic conductivity and storage coefficient values, two runs were made, one with the Abengoa wells included and one without. A contour plot of the difference in heads between those model runs was then prepared. The purpose is to provide an estimate of the impacts of the Abengoa wells, separate from the changes that will occur in the regional flow system if the project is not constructed and the water rights associated with the property are not otherwise exercised.

Table 31-1(a). Scenario 'pre' simulated HVGB groundwater budget in acre-ft/year, assuming Abengoa wells are not operating.

	2010 Current		2012		2042	
Budget Term	inflow	outflow	inflow	outflow	inflow	outflow
storage	1085.40	2001.41	860.04	1842.43	15.56	892.55
constant head	0.00	0.00	0.00	0.00	0.00	0.00
wells	1051.38	5487.47	1051.38	5487.47	1051.38	5487.47
drains	0.00	0.00	0.00	0.00	0.00	0.00
recharge	0.00	0.00	0.00	0.00	0.00	0.00
ET	0.00	0.00	0.00	0.00	0.00	0.00
stream leakage	0.00	0.00	0.00	0.00	0.00	0.00
stream flow out	0.00	0.00	0.00	0.00	0.00	0.00
head dep bounds	0.00	0.00	0.00	0.00	0.00	0.00
zone 0 to 16	5352.24	0.00	5418.55	0.00	5313.22	0.00
total	7489.02	7488.87	7329.97	7329.90	6380.16	6380.01
in - out	0.125		0.014		0.155	

Table 31-1(b). Scenario ‘dev1’ simulated HVGB groundwater budget in acre-ft/year, assuming Abengoa wells are operating in the calibrated model.

	2010 Current		2012		2042	
	inflow	outflow	inflow	outflow	inflow	outflow
storage	1085.40	2001.41	3255.20	675.23	762.02	18.29
constant head	0.00	0.00	0.00	0.00	0.00	0.00
wells	1051.38	5487.47	1051.38	9267.89	1051.38	7647.71
drains	0.00	0.00	0.00	0.00	0.00	0.00
recharge	0.00	0.00	0.00	0.00	0.00	0.00
ET	0.00	0.00	0.00	0.00	0.00	0.00
stream leakage	0.00	0.00	0.00	0.00	0.00	0.00
stream flow out	0.00	0.00	0.00	0.00	0.00	0.00
head dep bounds	0.00	0.00	0.00	0.00	0.00	0.00
zone 0 to 16	5352.24	0.00	5636.38	0.00	5852.70	0.00
total	7489.02	7488.87	9942.96	9943.11	7666.09	7665.99
in - out	0.125		-0.115		0.014	

Table 31-1(c). Scenario ‘dev1-hi-s’ simulated HVGB groundwater budget in acre-ft/year, assuming Abengoa wells are operating and the storage coefficient in Harper Valley is increased by 25%.

	2010 Current		2012		2042	
	inflow	outflow	inflow	outflow	inflow	outflow
storage	1085.48	2001.55	3255.34	675.07	762.09	18.29
constant head	0.00	0.00	0.00	0.00	0.00	0.00
wells	1051.38	5487.47	1051.38	9267.89	1051.3	7647.7
drains	0.00	0.00	0.00	0.00	0.00	0.00
recharge	0.00	0.00	0.00	0.00	0.00	0.00
ET	0.00	0.00	0.00	0.00	0.00	0.00
stream leakage	0.00	0.00	0.00	0.00	0.00	0.00
stream flow out	0.00	0.00	0.00	0.00	0.00	0.00
head dep bounds	0.00	0.00	0.00	0.00	0.00	0.00
zone 0 to 16	5352.16	0.00	5636.38	0.00	5852.6	0.00
total	7489.02	7489.02	9943.10	9942.96	7666.09	7665.99
in - out	-0.040		0.099		0.075	

Table 31-1(d). Scenario ‘dev1-lo-s’ simulated HVGB groundwater budget in acre-ft/year, assuming Abengoa wells are operating and the storage coefficient in Harper Valley is decreased by 25%.

	2010 Current		2012		2042	
	inflow	outflow	inflow	outflow	inflow	outflow
storage	1085.40	2001.41	3255.34	675.21	762.02	18.29
constant head	0.00	0.00	0.00	0.00	0.00	0.00
Wells	1051.38	5487.47	1051.38	9267.89	1051.38	7647.71
Drains	0.00	0.00	0.00	0.00	0.00	0.00
recharge	0.00	0.00	0.00	0.00	0.00	0.00
ET	0.00	0.00	0.00	0.00	0.00	0.00
stream leakage	0.00	0.00	0.00	0.00	0.00	0.00
stream flow out	0.00	0.00	0.00	0.00	0.00	0.00
head dep bounds	0.00	0.00	0.00	0.00	0.00	0.00
zone 0 to 16	5352.24	0.00	5636.38	0.00	5852.62	0.00
Total	7489.02	7488.87	9943.10	9943.10	7666.02	7665.99
in – out	0.139		0.019		0.003	

Table 31-1(e). Scenario ‘dev1-hi-k’ simulated HVGB groundwater budget in acre-ft/year, assuming Abengoa wells are operating and the transmissivity in Harper Valley is increased by 50%.

	2010 Current		2012		2042	
Budget Term	inflow	outflow	inflow	outflow	inflow	outflow
storage	384.51	1668.97	2878.46	686.78	399.30	18.79
constant head	0.00	0.00	0.00	0.00	0.00	0.00
Wells	1051.38	5487.47	1051.38	9267.89	1051.38	7647.71
Drains	0.00	0.00	0.00	0.00	0.00	0.00
recharge	0.00	0.00	0.00	0.00	0.00	0.00
ET	0.00	0.00	0.00	0.00	0.00	0.00
stream leakage	0.00	0.00	0.00	0.00	0.00	0.00
stream flow out	0.00	0.00	0.00	0.00	0.00	0.00
head dep bounds	0.00	0.00	0.00	0.00	0.00	0.00
zone 0 to 16	5720.43	0.00	6024.63	0.00	6215.90	0.00
Total	7156.32	7156.44	9954.47	9954.67	7666.57	7666.50
in - out	-0.129		-0.249		0.082	

Table 31-1(f). Scenario ‘dev1-lo-k’ simulated HVGB groundwater budget in acre-ft/year, assuming Abengoa wells are operating and the transmissivity in Harper Valley is decreased by 50%.

	2010 Current		2012		2042	
	inflow	outflow	inflow	outflow	inflow	outflow
storage	1085.40	2001.41	3255.3	675.21	762.02	18.31
constant head	0.00	0.00	0.00	0.00	0.00	0.00
Wells	1051.38	5487.47	1051.3	9267.89	1051.3	7647.7
Drains	0.00	0.00	0.00	0.00	0.00	0.00
recharge	0.00	0.00	0.00	0.00	0.00	0.00
ET	0.00	0.00	0.00	0.00	0.00	0.00
stream leakage	0.00	0.00	0.00	0.00	0.00	0.00
stream flow out	0.00	0.00	0.00	0.00	0.00	0.00
head dep bounds	0.00	0.00	0.00	0.00	0.00	0.00
zone 0 to 16	5352.24	0.00	5636.38	0.00	5852.62	0.00
Total	7489.02	7488.87	9943.1	9943.10	7666.0	7666.0
in - out	0.139		0.019		-0.003	

Table 31-1(g). Scenario ‘dev2’ simulated HVGB groundwater budget in acre-ft/year, assuming Abengoa wells are operating and the other remaining pumping in HVGB is increased by 10%.

	2010 Current		2012		2042	
Budget Term	inflow	outflow	inflow	outflow	inflow	outflow
storage	1087.50	2011.76	3638.81	646.98	1054.85	0.27
constant head	0.00	0.00	0.00	0.00	0.00	0.00
Wells	1051.31	5487.47	1159.68	9813.01	1159.68	8192.83
Drains	0.00	0.00	0.00	0.00	0.00	0.00
recharge	0.00	0.00	0.00	0.00	0.00	0.00
ET	0.00	0.00	0.00	0.00	0.00	0.00
stream leakage	0.00	0.00	0.00	0.00	0.00	0.00
stream flow out	0.00	0.00	0.00	0.00	0.00	0.00
head dep bounds	0.00	0.00	0.00	0.00	0.00	0.00
zone 0 to 16	5360.49	0.00	5661.58	0.00	5978.37	0.00
Total	7499.30	7499.23	10460.1	10460.0	8192.91	8192.83
in - out	0.057		0.064		-0.181	

Item 41:

Information Required:

Provide a tabulation of the simulated construction period and 30-year project pumping drawdown at key existing wells shown in *Figure 1-2*.

Response:

We provide drawdown values for all wells in the HVGB for each simulation in the following Tables 41-1(a-f). Drawdown values are computed as the simulated drawdown between the end of 2010 and 2042. Note that some drawdown values are negative. This indicates an increase in the water level, owing to the continued recovery in water levels that is presently occurring.

Table 41-1(a). Simulated time drawdowns (compared to 2010) in HVGB wells for scenario dev1-hi-k (Abengoa wells with increased transmissivity). Note that a negative drawdown indicates that the water level has increased.

Well	2010	2012		2042	
	Head	Head	Drawdown	Head	Drawdown
10N03W04J01	2154.0	2154.0	0.0	2154.0	0.0
10N03W04J02	2154.0	2154.0	0.0	2154.0	0.0
11N03W33G01	2018.5	2019.9	-1.4	2026.2	-7.7
11N03W33G02	2018.5	2019.9	-1.4	2026.2	-7.7
11N03W33H03	2020.1	2021.5	-1.4	2027.9	-7.9
11N04W19E01	1949.3	1948.3	1.0	1945.0	4.2
11N04W19E02	1949.8	1949.0	0.8	1945.7	4.1
11N04W19J01	1937.6	1935.6	2.0	1932.6	5.0
11N04W19Q02	1943.8	1941.6	2.1	1939.5	4.3
11N04W28R01	1961.3	1959.2	2.2	1958.3	3.1
11N04W29J01	1949.5	1945.8	3.7	1944.9	4.6
11N04W29P01	1945.0	1941.7	3.3	1942.8	2.2
11N04W30501	1948.9	1946.9	1.9	1944.8	4.1
11N04W30B01	1943.8	1941.7	2.1	1940.8	3.0
11N04W30D01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30E01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30M01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30N06	1948.9	1946.9	1.9	1944.8	4.1
11N04W30N07	1948.9	1946.9	1.9	1944.8	4.1
11N04W30P02	1948.9	1946.9	1.9	1944.8	4.1
11N04W30Q03	1943.3	1941.5	1.8	1943.8	-0.5
11N04W31J03	1964.7	1961.9	2.8	1960.0	4.7
11N04W32A02	1946.1	1942.4	3.7	1942.8	3.3
11N04W32D03	1946.0	1942.5	3.5	1943.7	2.3
11N04W33B02	1953.8	1952.7	1.1	1954.7	-0.9
11N04W33C02	1947.6	1946.7	0.9	1950.1	-2.5
11N04W33G04	1949.9	1951.0	-1.1	1956.4	-6.5
11N04W33J01	1962.7	1961.1	1.5	1961.8	0.9
11N05W24L01	1953.7	1953.5	0.1	1951.0	2.7
11N05W24P02	1953.9	1953.5	0.4	1951.1	2.8
11N05W24Q02	1952.3	1951.5	0.8	1948.9	3.4

Table 41-1(b). Simulated time drawdowns (compared to 2010) in HVGB wells for scenario dev1-hi-s (Abengoa wells with storage coefficient increased by 25%). Note that a negative drawdown indicates that the water level has increased.

Well	2010	2012		2042	
	Head	Head	Drawdown	Head	Drawdown
10N03W04J01	2154.0	2154.0	0.0	2154.0	0.0
10N03W04J02	2154.0	2154.0	0.0	2154.0	0.0
11N03W33G01	2018.6	2019.9	-1.4	2026.2	-7.7
11N03W33G02	2018.6	2019.9	-1.4	2026.2	-7.7
11N03W33H03	2020.1	2021.5	-1.4	2027.9	-7.9
11N04W19E01	1949.3	1948.3	1.0	1945.0	4.2
11N04W19E02	1949.8	1949.0	0.8	1945.7	4.1
11N04W19J01	1937.6	1935.6	2.0	1932.6	5.0
11N04W19Q02	1943.8	1941.6	2.1	1939.5	4.3
11N04W28R01	1961.3	1959.2	2.2	1958.3	3.1
11N04W29J01	1949.5	1945.8	3.7	1944.9	4.6
11N04W29P01	1945.0	1941.7	3.3	1942.8	2.2
11N04W30501	1948.9	1946.9	1.9	1944.8	4.1
11N04W30B01	1943.8	1941.7	2.1	1940.8	3.0
11N04W30D01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30E01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30M01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30N06	1948.9	1946.9	1.9	1944.8	4.1
11N04W30N07	1948.9	1946.9	1.9	1944.8	4.1
11N04W30P02	1948.9	1946.9	1.9	1944.8	4.1
11N04W30Q03	1943.3	1941.4	1.8	1943.8	-0.5
11N04W31J03	1964.7	1961.9	2.8	1960.0	4.7
11N04W32A02	1946.1	1942.4	3.7	1942.8	3.3
11N04W32D03	1946.0	1942.5	3.5	1943.7	2.3
11N04W33B02	1953.8	1952.7	1.1	1954.7	-0.9
11N04W33C02	1947.6	1946.7	0.9	1950.1	-2.5
11N04W33G04	1949.9	1951.0	-1.1	1956.4	-6.5
11N04W33J01	1962.7	1961.1	1.5	1961.8	0.9
11N05W24L01	1953.7	1953.5	0.1	1951.0	2.7
11N05W24P02	1953.9	1953.5	0.4	1951.1	2.8
11N05W24Q02	1952.3	1951.5	0.8	1948.9	3.4

Table 41-1(c). Simulated time drawdowns (compared to 2010) in HVGB wells for scenario dev1-lo-s (Abengoa wells with storage coefficient decreased by 25%). Note that a negative drawdown indicates that the water level has increased.

Well	2010	2012		2042	
	Head	Head	Drawdown	Head	Drawdown
10N03W04J01	2154.0	2154.0	0.0	2154.0	0.0
10N03W04J02	2154.0	2154.0	0.0	2154.0	0.0
11N03W33G01	2018.6	2019.9	-1.4	2026.2	-7.7
11N03W33G02	2018.6	2019.9	-1.4	2026.2	-7.7
11N03W33H03	2020.1	2021.5	-1.4	2027.9	-7.9
11N04W19E01	1949.3	1948.3	1.0	1945.0	4.2
11N04W19E02	1949.8	1949.0	0.8	1945.7	4.1
11N04W19J01	1937.6	1935.6	2.0	1932.6	5.0
11N04W19Q02	1943.8	1941.6	2.1	1939.5	4.3
11N04W28R01	1961.3	1959.2	2.2	1958.3	3.1
11N04W29J01	1949.5	1945.8	3.7	1944.9	4.6
11N04W29P01	1945.0	1941.7	3.3	1942.8	2.2
11N04W30501	1948.9	1946.9	1.9	1944.8	4.1
11N04W30B01	1943.8	1941.7	2.1	1940.8	3.0
11N04W30D01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30E01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30M01	1948.9	1946.9	1.9	1944.8	4.1
11N04W30N06	1948.9	1946.9	1.9	1944.8	4.1
11N04W30N07	1948.9	1946.9	1.9	1944.8	4.1
11N04W30P02	1948.9	1946.9	1.9	1944.8	4.1
11N04W30Q03	1943.3	1941.4	1.8	1943.8	-0.5
11N04W31J03	1964.7	1961.9	2.8	1960.0	4.7
11N04W32A02	1946.1	1942.4	3.7	1942.8	3.3
11N04W32D03	1946.0	1942.5	3.5	1943.7	2.3
11N04W33B02	1953.8	1952.7	1.1	1954.7	-0.9
11N04W33C02	1947.6	1946.7	0.9	1950.1	-2.5
11N04W33G04	1949.9	1951.0	-1.1	1956.4	-6.5
11N04W33J01	1962.7	1961.1	1.5	1961.8	0.9
11N05W24L01	1953.7	1953.5	0.1	1951.0	2.7
11N05W24P02	1953.9	1953.5	0.4	1951.1	2.8
11N05W24Q02	1952.3	1951.5	0.8	1948.9	3.4

Table 41-1(d). Simulated time drawdowns (compared to 2010) in HVGB wells for scenario dev1-hi-k (Abengoa wells with transmissivity increased by 50%). Note that a negative drawdown indicates that the water level has increased.

Well	2010	2012		2042	
	Head	Head	Drawdown	Head	Drawdown
10N03W04J01	2154.0	2154.0	0.0	2154.0	0.0
10N03W04J02	2154.0	2154.0	0.0	2154.0	0.0
11N03W33G01	2007.0	2008.5	-1.4	2014.5	-7.4
11N03W33G02	2007.0	2008.5	-1.4	2014.5	-7.4
11N03W33H03	2008.3	2009.8	-1.5	2015.9	-7.6
11N04W19E01	1960.8	1959.4	1.5	1955.9	4.9
11N04W19E02	1961.1	1959.8	1.4	1956.1	5.0
11N04W19J01	1954.1	1952.3	1.8	1949.9	4.2
11N04W19Q02	1957.4	1955.6	1.8	1953.5	3.9
11N04W28R01	1966.7	1965.1	1.6	1965.1	1.6
11N04W29J01	1960.0	1957.6	2.3	1957.6	2.4
11N04W29P01	1957.4	1955.4	2.0	1956.4	0.9
11N04W30501	1960.5	1958.7	1.9	1956.2	4.3
11N04W30B01	1957.3	1955.6	1.7	1954.4	2.9
11N04W30D01	1960.5	1958.7	1.9	1956.2	4.3
11N04W30E01	1960.5	1958.7	1.9	1956.2	4.3
11N04W30M01	1960.5	1958.7	1.9	1956.2	4.3
11N04W30N06	1960.5	1958.7	1.9	1956.2	4.3
11N04W30N07	1960.5	1958.7	1.9	1956.2	4.3
11N04W30P02	1960.5	1958.7	1.9	1956.2	4.3
11N04W30Q03	1956.7	1955.4	1.3	1956.5	0.2
11N04W31J03	1974.0	1972.0	2.0	1970.2	3.8
11N04W32A02	1958.0	1955.8	2.2	1956.8	1.3
11N04W32D03	1957.9	1955.8	2.1	1956.9	1.0
11N04W33B02	1962.5	1961.6	0.9	1963.3	-0.8
11N04W33C02	1959.0	1958.3	0.7	1960.8	-1.8
11N04W33G04	1960.5	1960.8	-0.3	1964.3	-3.8
11N04W33J01	1967.7	1966.4	1.2	1967.4	0.3
11N05W24L01	1963.8	1962.8	1.1	1958.9	5.0
11N05W24P02	1964.0	1962.8	1.2	1959.0	5.0
11N05W24Q02	1962.9	1961.5	1.4	1957.9	5.0

Table 41-1(e). Simulated time drawdowns (compared to 2010) in HVGB wells for scenario dev1-lo-k (Abengoa wells with transmissivity decreased by 50%). Note that a negative drawdown indicates that the water level has increased.

Well	2010.0	2012.0		2042	
	Head	Head	Drawdown	Head	Drawdown
10N03W04J01	2154.0	2154.0	0.0	2154.0	0.0
10N03W04J02	2154.0	2154.0	0.0	2154.0	0.0
11N03W33G01	2029.3	2030.5	-1.3	2036.6	-7.3
11N03W33G02	2029.3	2030.5	-1.3	2036.6	-7.3
11N03W33H03	2030.9	2032.2	-1.3	2038.4	-7.5
11N04W19E01	1932.3	1932.2	0.1	1931.5	0.8
11N04W19E02	1933.3	1933.4	-0.1	1932.8	0.4
11N04W19J01	1911.6	1909.8	1.8	1907.9	3.6
11N04W19Q02	1922.9	1920.7	2.2	1920.2	2.8
11N04W28R01	1953.9	1951.3	2.7	1950.2	3.7
11N04W29J01	1933.7	1928.8	4.9	1927.4	6.4
11N04W29P01	1926.5	1921.9	4.7	1923.8	2.8
11N04W30501	1931.6	1929.9	1.7	1930.1	1.4
11N04W30B01	1923.4	1920.9	2.5	1922.1	1.4
11N04W30D01	1931.6	1929.9	1.7	1930.1	1.4
11N04W30E01	1931.6	1929.9	1.7	1930.1	1.4
11N04W30M01	1931.6	1929.9	1.7	1930.1	1.4
11N04W30N06	1931.6	1929.9	1.7	1930.1	1.4
11N04W30N07	1931.6	1929.9	1.7	1930.1	1.4
11N04W30P02	1931.6	1929.9	1.7	1930.1	1.4
11N04W30Q03	1923.2	1921.1	2.1	1926.5	-3.3
11N04W31J03	1951.7	1948.4	3.3	1947.1	4.7
11N04W32A02	1928.1	1922.7	5.4	1923.0	5.1
11N04W32D03	1928.4	1923.6	4.8	1925.7	2.8
11N04W33B02	1941.3	1939.9	1.4	1943.5	-2.3
11N04W33C02	1930.5	1929.6	0.9	1935.3	-4.8
11N04W33G04	1934.3	1936.7	-2.5	1946.2	-12.0
11N04W33J01	1956.0	1954.1	1.9	1955.4	0.5
11N05W24L01	1939.7	1940.7	-1.0	1942.4	-2.7
11N05W24P02	1939.8	1940.5	-0.7	1942.2	-2.5
11N05W24Q02	1937.1	1937.3	-0.2	1938.2	-1.1

Table 41-1(f). Simulated time drawdowns (compared to 2010) in HVGB wells for scenario dev2 (Abengoa wells with other HVGB pumping increased 10% after 2010). Note that a negative drawdown indicates that the water level has increased.

Well	2010	2012		2042	
	Head	Head	Drawdown	Head	Drawdown
10N03W04J01	2154.0	2154.0	0.0	2154.0	0.0
10N03W04J02	2154.0	2154.0	0.0	2154.0	0.0
11N03W33G01	2018.6	2020.0	-1.4	2025.6	-7.0
11N03W33G02	2018.6	2020.0	-1.4	2025.6	-7.0
11N03W33H03	2020.1	2021.6	-1.5	2027.3	-7.2
11N04W19E01	1949.0	1947.6	1.4	1942.4	6.6
11N04W19E02	1949.5	1948.3	1.2	1943.1	6.4
11N04W19J01	1936.5	1933.9	2.6	1928.9	7.6
11N04W19Q02	1943.3	1940.7	2.7	1936.4	6.9
11N04W28R01	1961.3	1958.9	2.4	1956.2	5.0
11N04W29J01	1949.2	1945.1	4.1	1942.2	7.1
11N04W29P01	1944.8	1941.1	3.7	1940.1	4.7
11N04W30501	1948.8	1946.4	2.3	1942.3	6.5
11N04W30B01	1943.5	1940.9	2.6	1937.9	5.6
11N04W30D01	1948.8	1946.4	2.3	1942.3	6.5
11N04W30E01	1948.8	1946.4	2.3	1942.3	6.5
11N04W30M01	1948.8	1946.4	2.3	1942.3	6.5
11N04W30N06	1948.8	1946.4	2.3	1942.3	6.5
11N04W30N07	1948.8	1946.4	2.3	1942.3	6.5
11N04W30P02	1948.8	1946.4	2.3	1942.3	6.5
11N04W30Q03	1943.2	1941.0	2.2	1941.2	2.0
11N04W31J03	1964.6	1961.5	3.1	1957.9	6.7
11N04W32A02	1945.5	1941.4	4.2	1939.9	5.7
11N04W32D03	1945.9	1942.0	3.9	1941.1	4.8
11N04W33B02	1953.6	1952.2	1.4	1952.5	1.2
11N04W33C02	1947.3	1946.0	1.2	1947.5	-0.3
11N04W33G04	1949.8	1950.6	-0.8	1954.3	-4.5
11N04W33J01	1962.5	1960.8	1.7	1959.8	2.7
11N05W24L01	1953.6	1953.2	0.4	1948.8	4.8
11N05W24P02	1953.8	1953.2	0.6	1948.9	4.9
11N05W24Q02	1952.2	1951.1	1.1	1946.6	5.6

Item 44:

Information Required:

Please identify and explain the thresholds employed to conclude impact significance (or lack thereof).

Response:

We have chosen to use the modeled water levels for the calibrated model at each HVGB well in 1995 as the indicator for impacts. In a particular predictive scenario, a well is considered to have experienced a significant impact in 2042 if its simulated water level is below the simulated 1995 water level for that well assuming the hydraulic properties for that scenario.

The year 1995 was chosen as a benchmark for impacts because regional water levels were beginning to rebound in response to reduced water use at that time and wells that exist at present were capable of operating at that time. Therefore, if modeled water levels do not fall below the 1995 water levels, adverse impacts in other wells such as a decline in groundwater level requiring the lowering of pump intake devices are not expected to occur.

Item 45:

Information Required:

Please provide a table that summarizes the range in simulated impacts at the existing wells tabulated above to represent a plausible range in aquifer property values from previous studies, the literature, and model calibration.

Response:

Attached Figures 31-3(a-f) provide simulated water-level declines as compared to the case where the Abengoa wells are not pumped for the six predictive scenarios described previously.

The following Tables 45-1(a-f) provide tabular impact summaries for all wells in the HVGB for each predictive scenario. The impact is presented as the difference in the water level between the predictive scenario and the case where the Abengoa wells are not included (the 'pre' scenario). As shown in the tables, for all scenarios, there are no impacts to any existing wells due to pumping the Abengoa wells. In no instance does the predicted water level in 2042 fall below the benchmark 1995 level. In fact, in most cases the water level is predicted to rise from 1995 levels.

Table 45-1(a). Well impacts for scenario ‘dev1’ (Abengoa wells in the calibrated model). Impacts are noted if the 2042 water level falls below the “benchmark” 1995 water level.

Well	1995 Head	2042 Head	Impact?
10N03W04J01	2154.0	2154.0	no
10N03W04J02	2154.0	2154.0	no
11N03W33G01	2018.6	2026.2	no
11N03W33G02	2018.6	2026.2	no
11N03W33H03	2019.5	2027.9	no
11N04W19E01	1925.6	1945.0	no
11N04W19E02	1927.7	1945.7	no
11N04W19J01	1920.6	1932.6	no
11N04W19Q02	1912.2	1939.5	no
11N04W28R01	1931.0	1958.3	no
11N04W29J01	1919.5	1944.9	no
11N04W29P01	1910.6	1942.8	no
11N04W30501	1917.9	1944.8	no
11N04W30B01	1911.2	1940.8	no
11N04W30D01	1917.9	1944.8	no
11N04W30E01	1917.9	1944.8	no
11N04W30M01	1917.9	1944.8	no
11N04W30N06	1917.9	1944.8	no
11N04W30N07	1917.9	1944.8	no
11N04W30P02	1917.9	1944.8	no
11N04W30Q03	1911.8	1943.8	no
11N04W31J03	1942.1	1960.0	no
11N04W32A02	1924.4	1942.8	no
11N04W32D03	1915.7	1943.7	no
11N04W33B02	1929.4	1954.7	no
11N04W33C02	1930.1	1950.1	no
11N04W33G04	1934.7	1956.4	no
11N04W33J01	1941.6	1961.8	no
11N05W24L01	1931.9	1951.0	no
11N05W24P02	1930.0	1951.1	no
11N05W24Q02	1926.8	1948.9	no

Table 45-1(b). Well impacts for scenario ‘dev1-hi-s’ (Abengoa wells with storage coefficient increased by 25%). Impacts are noted if the 2042 water level falls below the “benchmark” 1995 water level.

Well	1995 Head	2042 Head	Impact?
10N03W04J01	2154.0	2154.0	no
10N03W04J02	2154.0	2154.0	no
11N03W33G01	2018.6	2026.2	no
11N03W33G02	2018.6	2026.2	no
11N03W33H03	2019.5	2027.9	no
11N04W19E01	1925.6	1945.0	no
11N04W19E02	1927.7	1945.7	no
11N04W19J01	1920.6	1932.6	no
11N04W19Q02	1912.2	1939.5	no
11N04W28R01	1931.0	1958.3	no
11N04W29J01	1919.5	1944.9	no
11N04W29P01	1910.6	1942.8	no
11N04W30501	1917.9	1944.8	no
11N04W30B01	1911.2	1940.8	no
11N04W30D01	1917.9	1944.8	no
11N04W30E01	1917.9	1944.8	no
11N04W30M01	1917.9	1944.8	no
11N04W30N06	1917.9	1944.8	no
11N04W30N07	1917.9	1944.8	no
11N04W30P02	1917.9	1944.8	no
11N04W30Q03	1911.8	1943.8	no
11N04W31J03	1942.1	1960.0	no
11N04W32A02	1924.4	1942.8	no
11N04W32D03	1915.7	1943.7	no
11N04W33B02	1929.4	1954.7	no
11N04W33C02	1930.1	1950.1	no
11N04W33G04	1934.7	1956.4	no
11N04W33J01	1941.6	1961.8	no
11N05W24L01	1931.9	1951.0	no
11N05W24P02	1930.0	1951.1	no
11N05W24Q02	1926.8	1948.9	no

Table 45-1(c). Well impacts for scenario ‘dev1-lo-s’ (Abengoa wells with storage coefficient decreased by 25%). Impacts are noted if the 2042 water level falls below the “benchmark” 1995 water level.

Well	1995 Head	2042 Head	Impact?
10N03W04J01	2154.0	2154.0	no
10N03W04J02	2154.0	2154.0	no
11N03W33G01	2018.6	2026.2	no
11N03W33G02	2018.6	2026.2	no
11N03W33H03	2019.5	2027.9	no
11N04W19E01	1925.6	1945.0	no
11N04W19E02	1927.7	1945.7	no
11N04W19J01	1920.6	1932.6	no
11N04W19Q02	1912.2	1939.5	no
11N04W28R01	1931.0	1958.3	no
11N04W29J01	1919.5	1944.9	no
11N04W29P01	1910.6	1942.8	no
11N04W30501	1917.9	1944.8	no
11N04W30B01	1911.2	1940.8	no
11N04W30D01	1917.9	1944.8	no
11N04W30E01	1917.9	1944.8	no
11N04W30M01	1917.9	1944.8	no
11N04W30N06	1917.9	1944.8	no
11N04W30N07	1917.9	1944.8	no
11N04W30P02	1917.9	1944.8	no
11N04W30Q03	1911.8	1943.8	no
11N04W31J03	1942.1	1960.0	no
11N04W32A02	1924.4	1942.8	no
11N04W32D03	1915.7	1943.7	no
11N04W33B02	1929.4	1954.7	no
11N04W33C02	1930.1	1950.1	no
11N04W33G04	1934.7	1956.4	no
11N04W33J01	1941.6	1961.8	no
11N05W24L01	1931.9	1951.0	no
11N05W24P02	1930.0	1951.1	no
11N05W24Q02	1926.8	1948.9	no

Table 45-1(d). Well impacts for scenario ‘dev1-hi-k’ (Abengoa wells with transmissivity increased by 50%). Impacts are noted if the 2042 water level falls below the “benchmark” 1995 water level.

Well	1995 Head	2042 Head	Impact?
10N03W04J01	2154.0	2154.0	no
10N03W04J02	2154.0	2154.0	no
11N03W33G01	2005.6	2014.5	no
11N03W33G02	2005.6	2014.5	no
11N03W33H03	2006.5	2015.9	no
11N04W19E01	1945.8	1955.9	no
11N04W19E02	1946.8	1956.1	no
11N04W19J01	1943.2	1949.9	no
11N04W19Q02	1939.0	1953.5	no
11N04W28R01	1947.9	1965.1	no
11N04W29J01	1942.6	1957.6	no
11N04W29P01	1938.0	1956.4	no
11N04W30501	1942.1	1956.2	no
11N04W30B01	1938.5	1954.4	no
11N04W30D01	1942.1	1956.2	no
11N04W30E01	1942.1	1956.2	no
11N04W30M01	1942.1	1956.2	no
11N04W30N06	1942.1	1956.2	no
11N04W30N07	1942.1	1956.2	no
11N04W30P02	1942.1	1956.2	no
11N04W30Q03	1938.9	1956.5	no
11N04W31J03	1961.1	1970.2	no
11N04W32A02	1945.0	1956.8	no
11N04W32D03	1940.6	1956.9	no
11N04W33B02	1947.1	1963.3	no
11N04W33C02	1947.7	1960.8	no
11N04W33G04	1950.0	1964.3	no
11N04W33J01	1953.7	1967.4	no
11N05W24L01	1949.0	1958.9	no
11N05W24P02	1948.1	1959.0	no
11N05W24Q02	1946.5	1957.9	no

Table 45-1(e). Well impacts for scenario ‘dev1-lo-k’ (Abengoa wells with transmissivity decreased by 50%). Impacts are noted if the 2042 water level falls below the “benchmark” 1995 water level.

Well	1995 Head	2042 Head	Impact?
10N03W04J01	2154.0	2154.0	no
10N03W04J02	2154.0	2154.0	no
11N03W33G01	2029.3	2036.6	no
11N03W33G02	2029.3	2036.6	no
11N03W33H03	2030.2	2038.4	no
11N04W19E01	1900.5	1931.5	no
11N04W19E02	1904.5	1932.8	no
11N04W19J01	1890.3	1907.9	no
11N04W19Q02	1875.2	1920.2	no
11N04W28R01	1910.7	1950.2	no
11N04W29J01	1887.8	1927.4	no
11N04W29P01	1872.7	1923.8	no
11N04W30501	1885.8	1930.1	no
11N04W30B01	1873.4	1922.1	no
11N04W30D01	1885.8	1930.1	no
11N04W30E01	1885.8	1930.1	no
11N04W30M01	1885.8	1930.1	no
11N04W30N06	1885.8	1930.1	no
11N04W30N07	1885.8	1930.1	no
11N04W30P02	1885.8	1930.1	no
11N04W30Q03	1875.3	1926.5	no
11N04W31J03	1919.1	1947.1	no
11N04W32A02	1897.5	1923.0	no
11N04W32D03	1882.6	1925.7	no
11N04W33B02	1907.6	1943.5	no
11N04W33C02	1908.2	1935.3	no
11N04W33G04	1917.1	1946.2	no
11N04W33J01	1929.0	1955.4	no
11N05W24L01	1913.8	1942.4	no
11N05W24P02	1910.2	1942.2	no
11N05W24Q02	1903.6	1938.2	no

Table 45-1(f). Well impacts for scenario ‘dev2’ (Abengoa wells with other HVGB pumping increased by 10% after 2010). Impacts are noted if the 2042 water level falls below the “benchmark” 1995 water level.

Well	1995 Head	2042 Head	Impact?
10N03W04J01	2154.0	2154.0	no
10N03W04J02	2154.0	2154.0	no
11N03W33G01	2018.6	2025.6	no
11N03W33G02	2018.6	2025.6	no
11N03W33H03	2019.5	2027.3	no
11N04W19E01	1925.6	1942.4	no
11N04W19E02	1927.7	1943.1	no
11N04W19J01	1920.6	1928.9	no
11N04W19Q02	1912.2	1936.4	no
11N04W28R01	1931.0	1956.2	no
11N04W29J01	1919.5	1942.2	no
11N04W29P01	1910.6	1940.1	no
11N04W30501	1917.9	1942.3	no
11N04W30B01	1911.2	1937.9	no
11N04W30D01	1917.9	1942.3	no
11N04W30E01	1917.9	1942.3	no
11N04W30M01	1917.9	1942.3	no
11N04W30N06	1917.9	1942.3	no
11N04W30N07	1917.9	1942.3	no
11N04W30P02	1917.9	1942.3	no
11N04W30Q03	1911.8	1941.2	no
11N04W31J03	1942.1	1957.9	no
11N04W32A02	1924.4	1939.9	no
11N04W32D03	1915.7	1941.1	no
11N04W33B02	1929.4	1952.5	no
11N04W33C02	1930.1	1947.5	no
11N04W33G04	1934.7	1954.3	no
11N04W33J01	1941.6	1959.8	no
11N05W24L01	1931.9	1948.8	no
11N05W24P02	1930.0	1948.9	no
11N05W24Q02	1926.8	1946.6	no

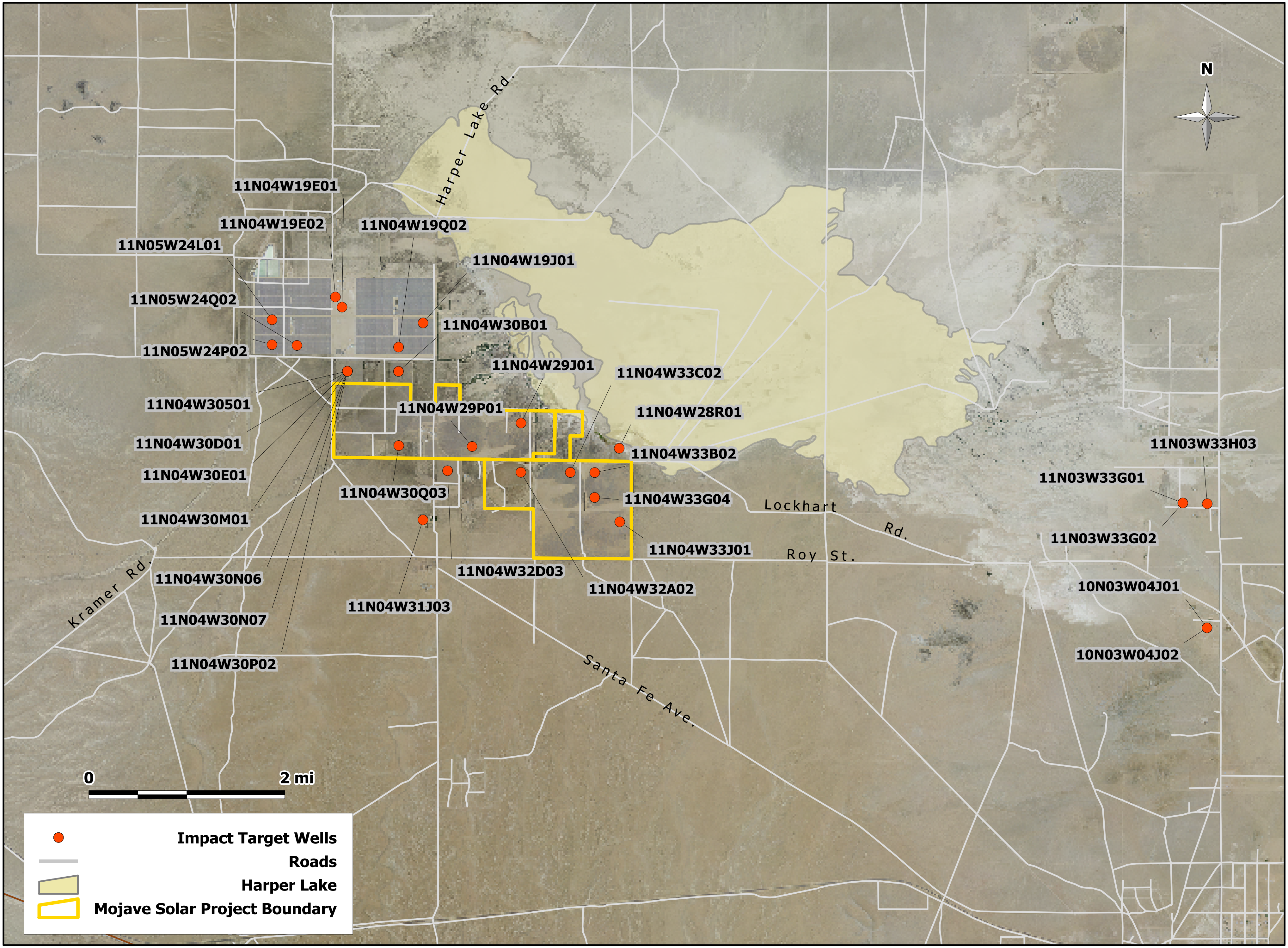
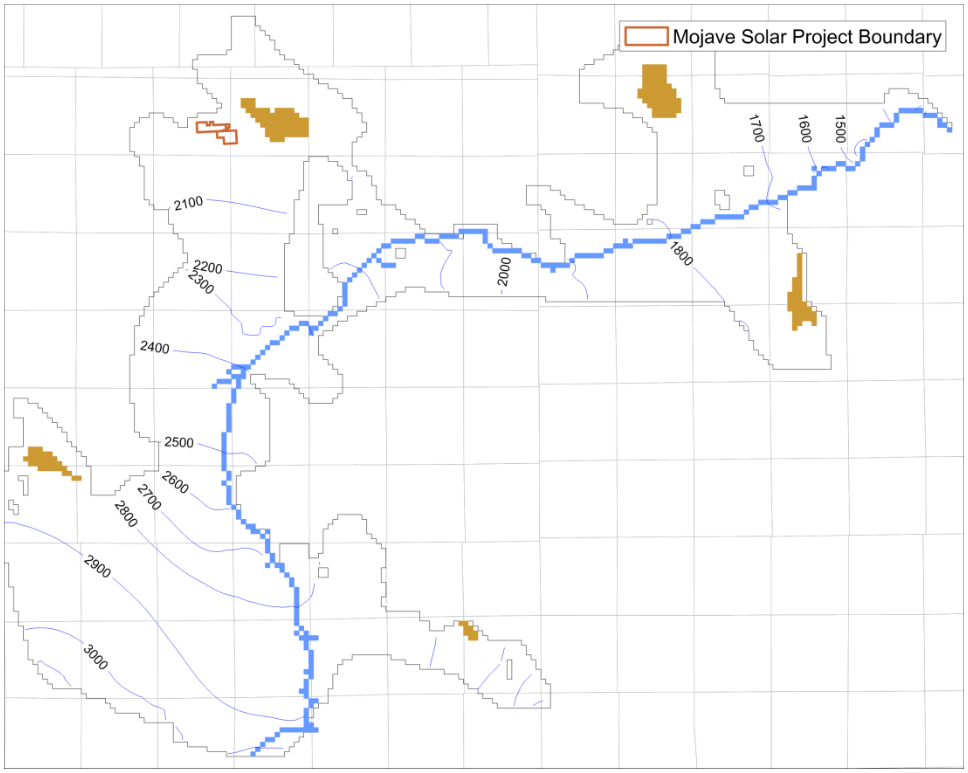
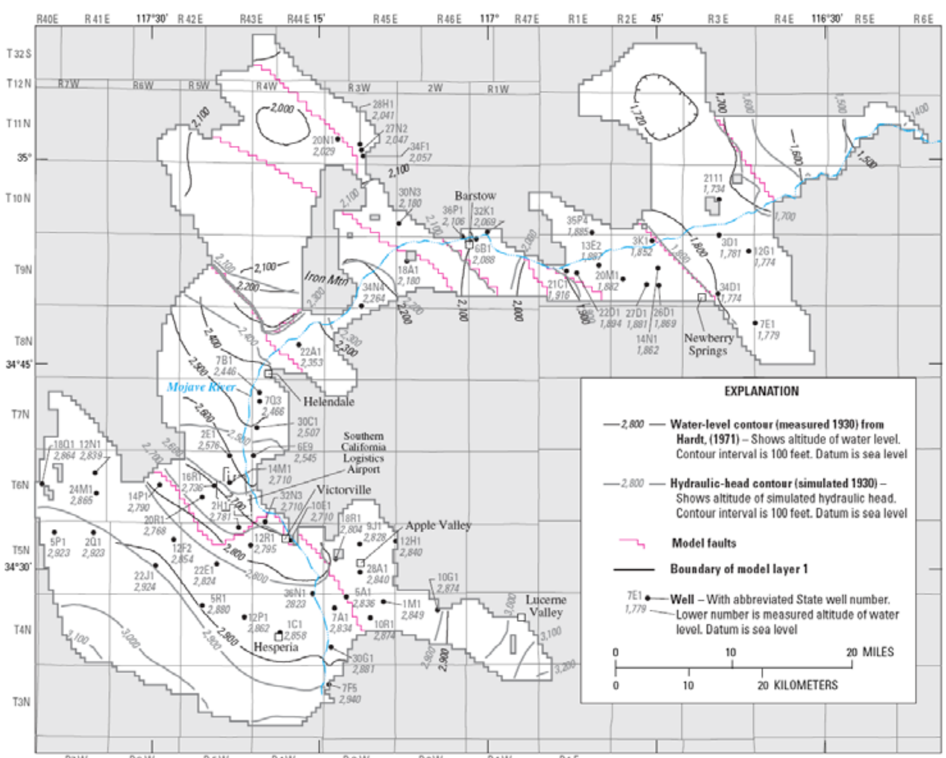


Figure 45. Location of wells evaluated for impact by model simulations, as described on the impact summary tables.



(a)



(b)

Figure B-1. Comparison of steady-state model results for 1931: (a) from the updated model in Groundwater Vistas; (b) from Stamos et al. (2001).

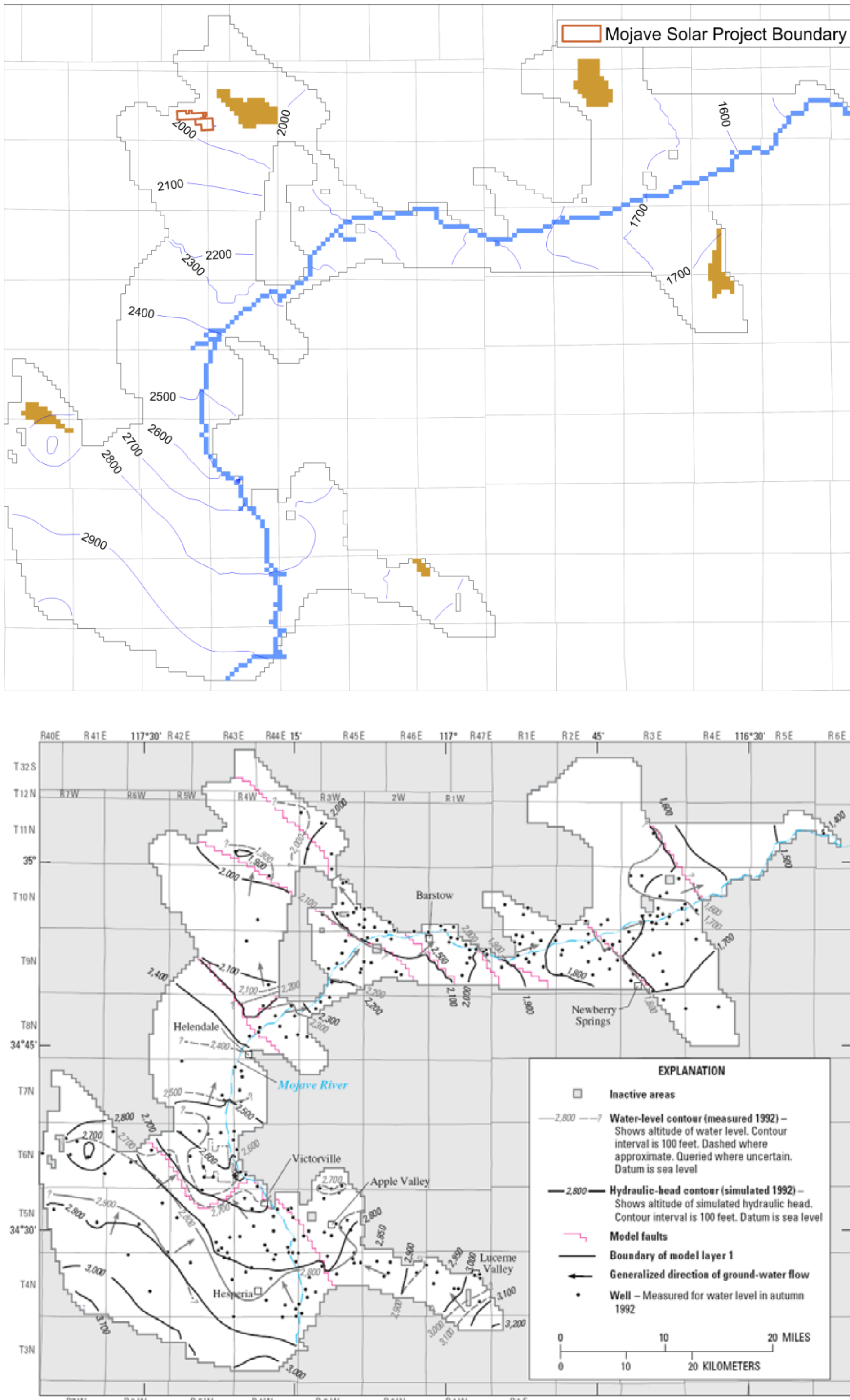


Figure B-2. Comparison of transient model results for 1992: (a) from the updated model in Groundwater Vistas; (b) from Stamos et al. (2001).

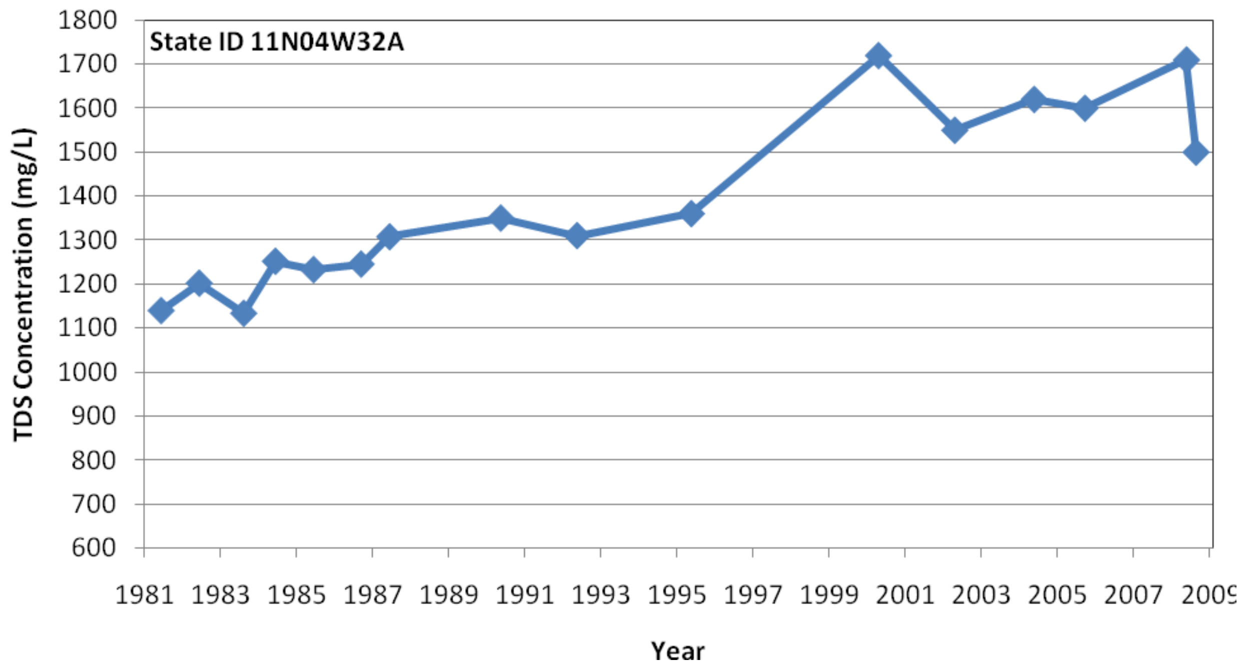


Figure 21-3. Total dissolved solids concentrations (mg/L) for well 11N04W32A that is near the Abengoa Solar Energy Project proposed wells.

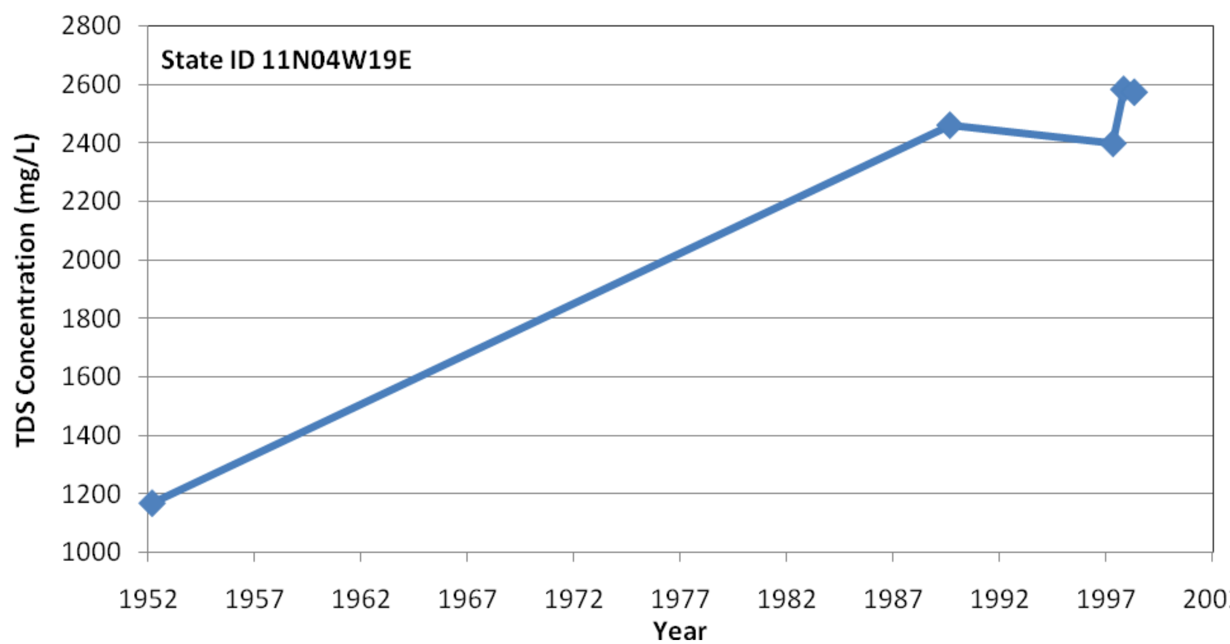


Figure 21-4. Total dissolved solids concentrations (mg/L) for well 11N04W19E that is near the Abengoa Solar Energy Project proposed wells.

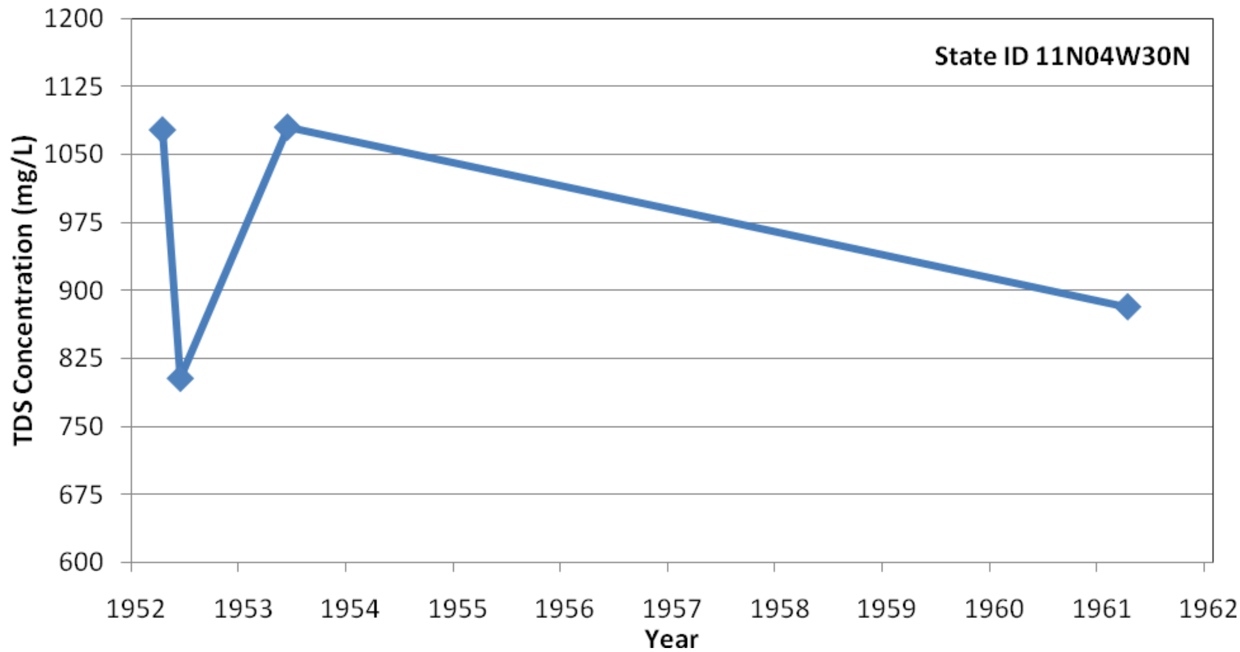


Figure 21-5. Total dissolved solids concentrations (mg/L) for well 11N04W30N that is near the Abengoa Solar Energy Project proposed wells.

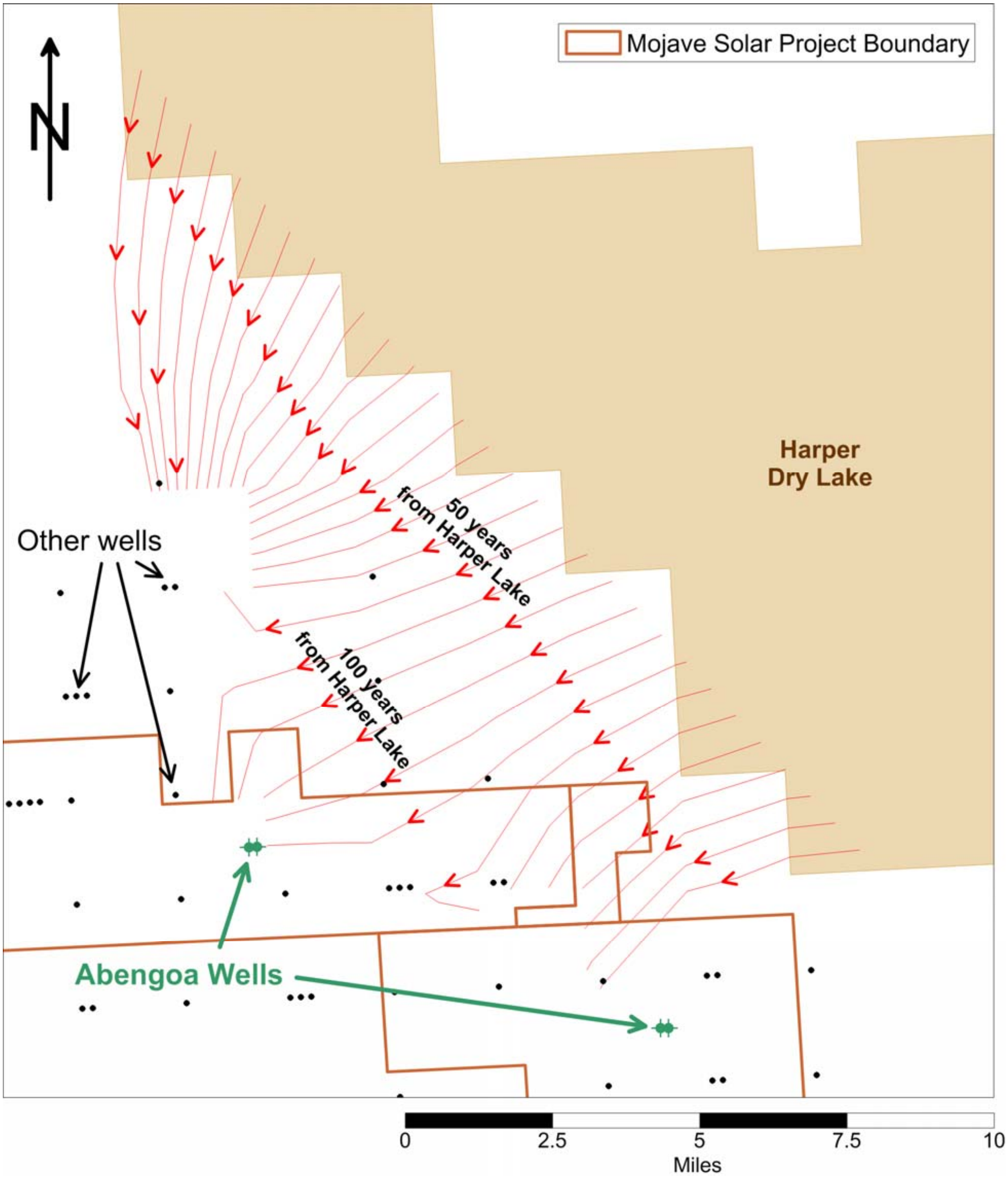


Figure 23A-1(a). Pathlines originating from Harper Dry Lake (yellow area) to Abengoa Solar Energy Project proposed wells. Model simulation dev1 (calibrated model).

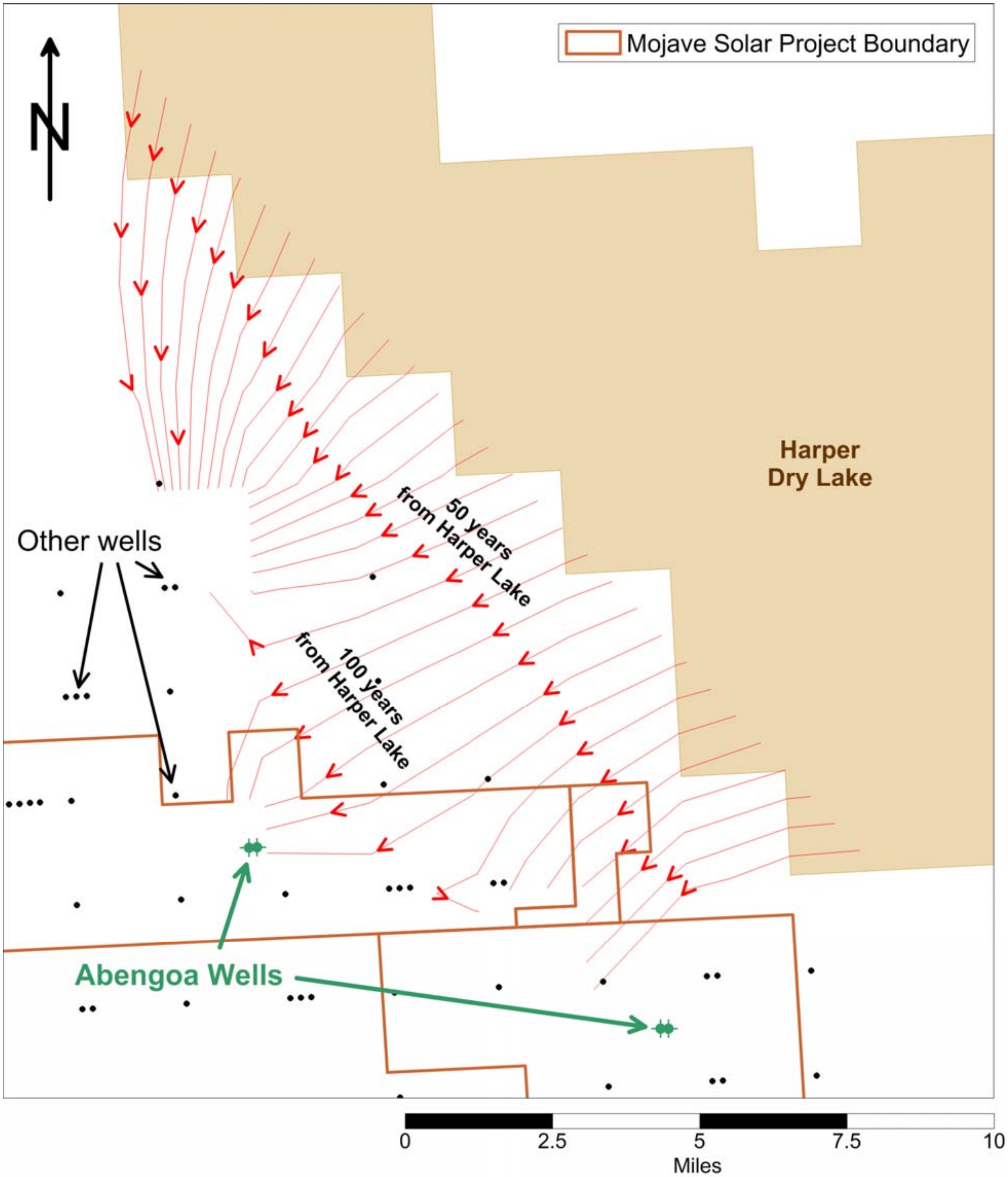


Figure 23A-1(b). Pathlines originating from Harper Dry Lake (yellow area) to Abengoa Solar Energy Project proposed wells. Model simulation dev1-hi-k (increased transmissivity in Harper Valley).

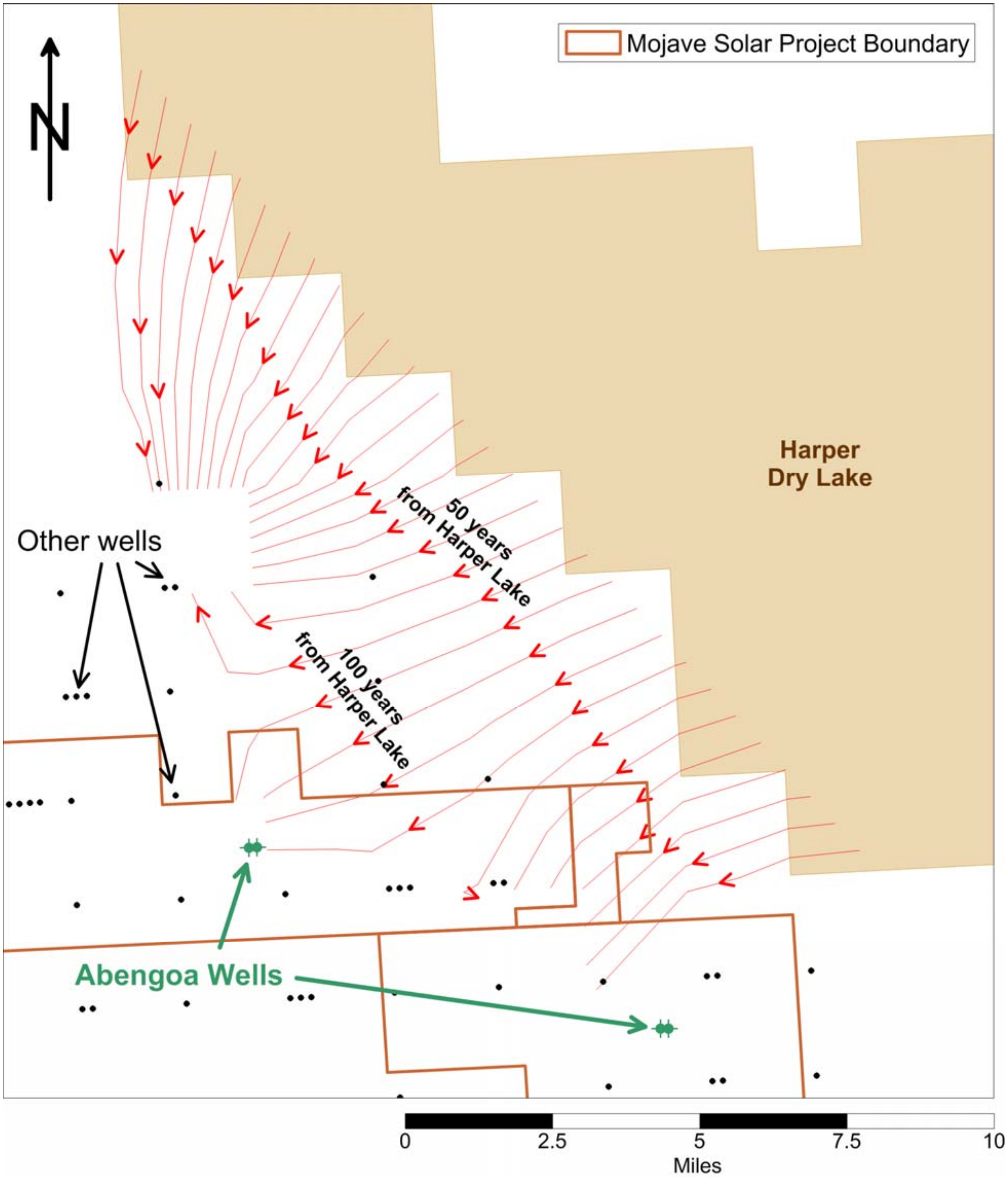


Figure 23A-1(c). Pathlines originating from Harper Dry Lake (yellow area) to Abengoa Solar Energy Project proposed wells. Model simulation dev2 (calibrated model with 10% increased Harper Valley pumping).

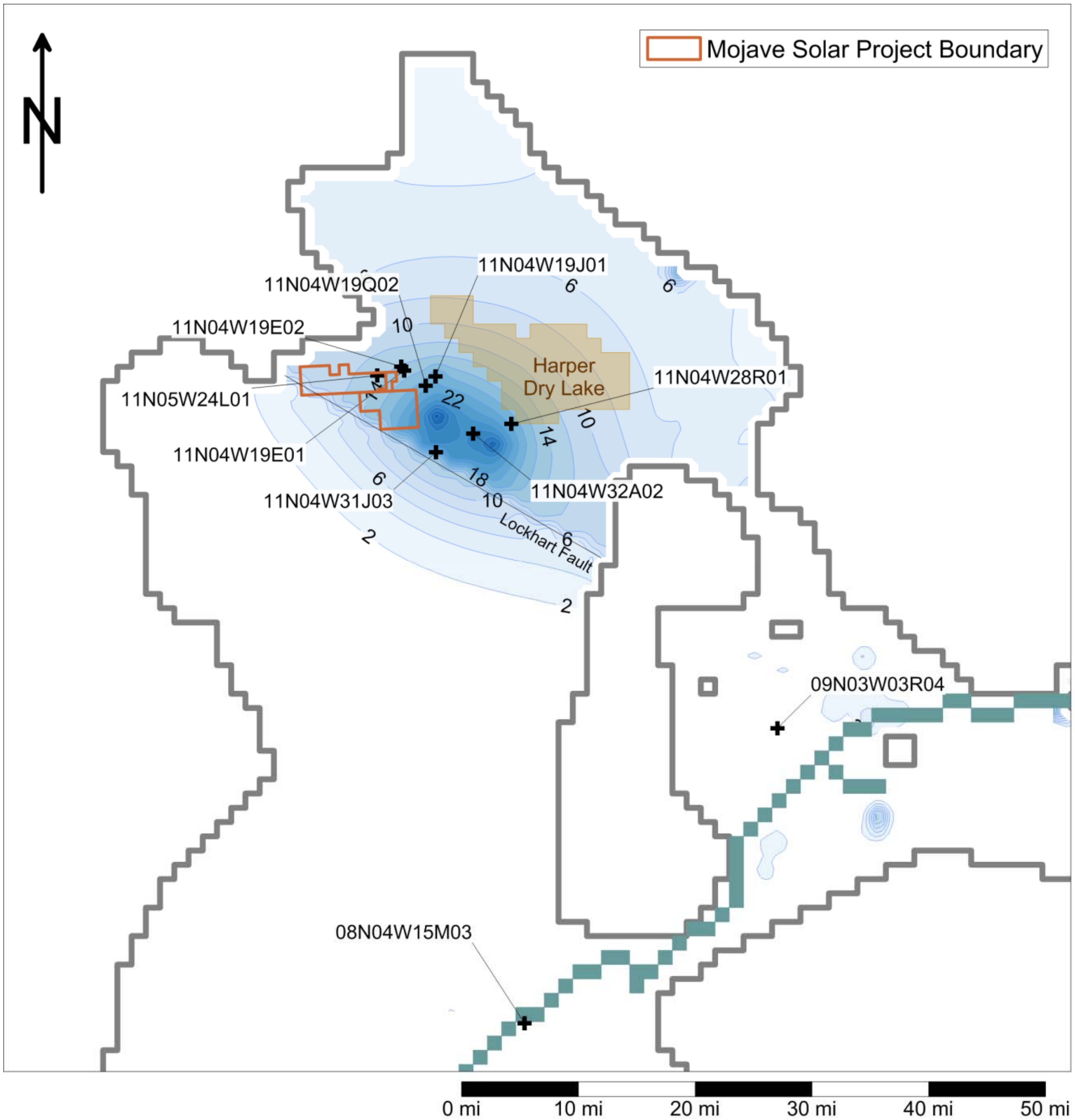


Figure 31-3(a). Water-level declines in 2042 for the 'dev1' case (calibrated model with all Abengoa wells pumping). The decline is compared to the calibrated model without the Abengoa wells.

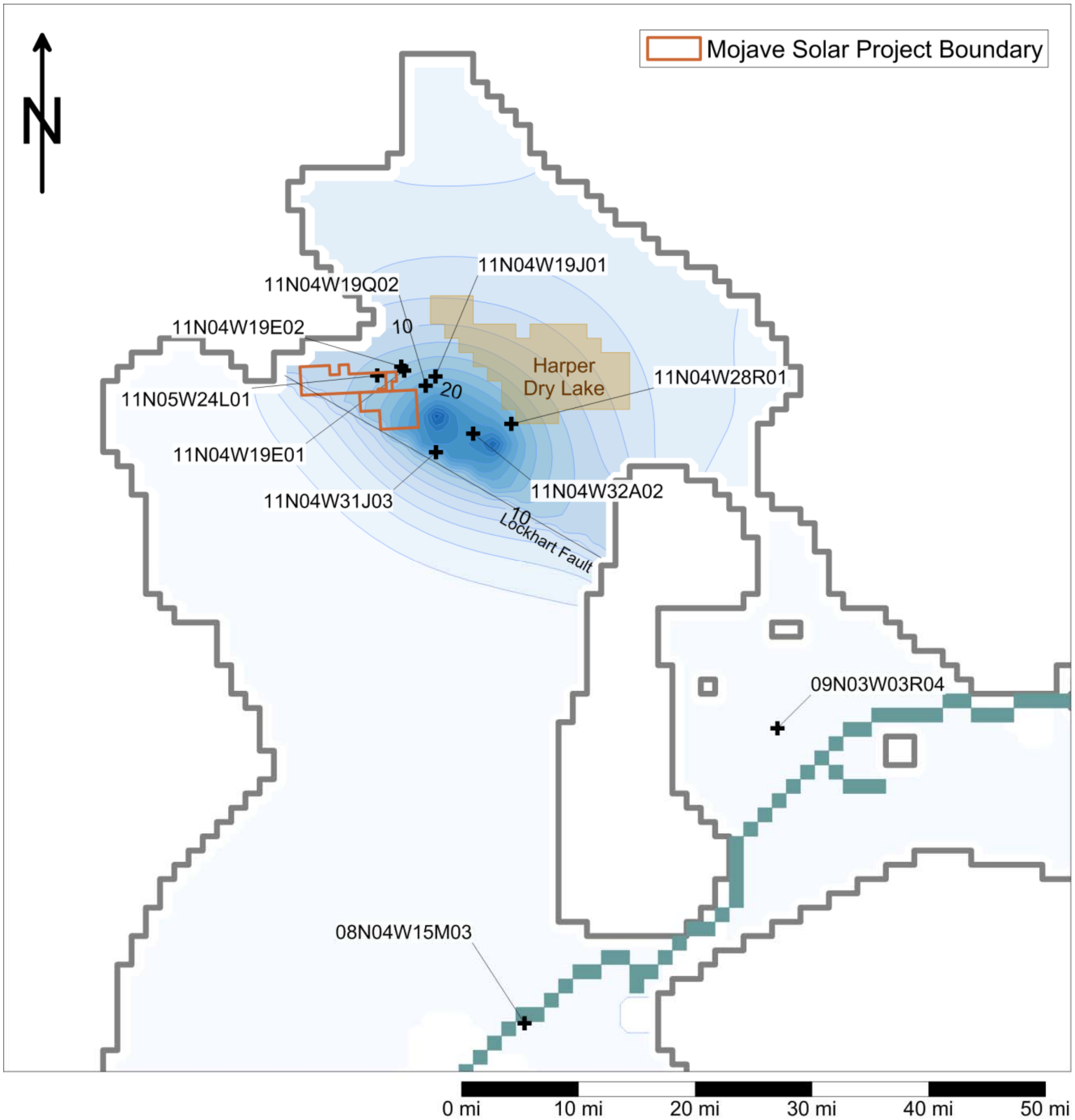


Figure 31-3(b). Water-level declines in 2042 for the 'dev1-hi-s' case (all Abengoa wells pumping with storage coefficient increased by 25%). The decline is compared to the comparable model without the Abengoa wells.

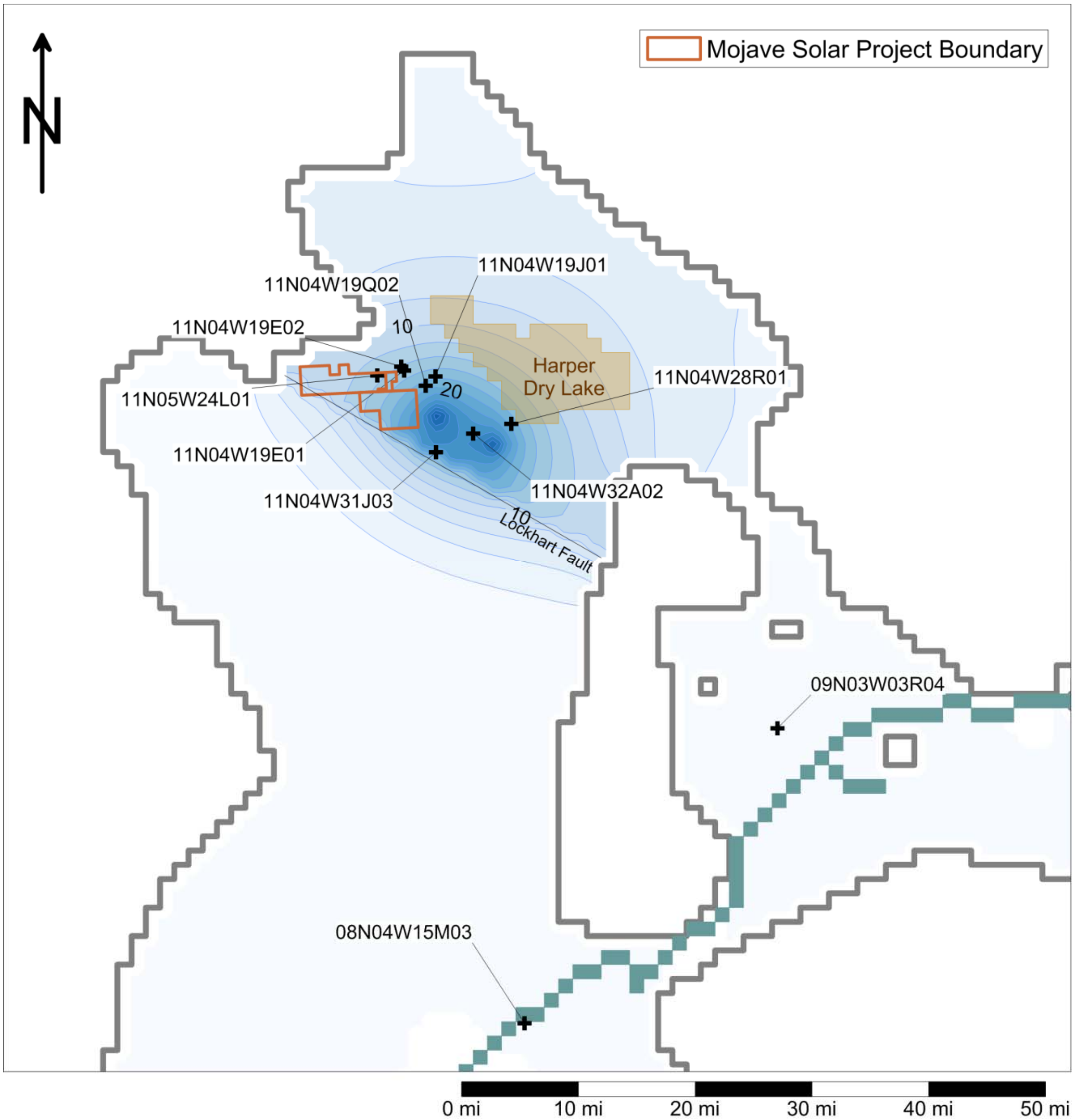


Figure 31-3(c). Water-level declines in 2042 for the 'dev1-lo-s' case (all Abengoa wells pumping with storage coefficient decreased by 25%). The decline is compared to the comparable model without the Abengoa wells.

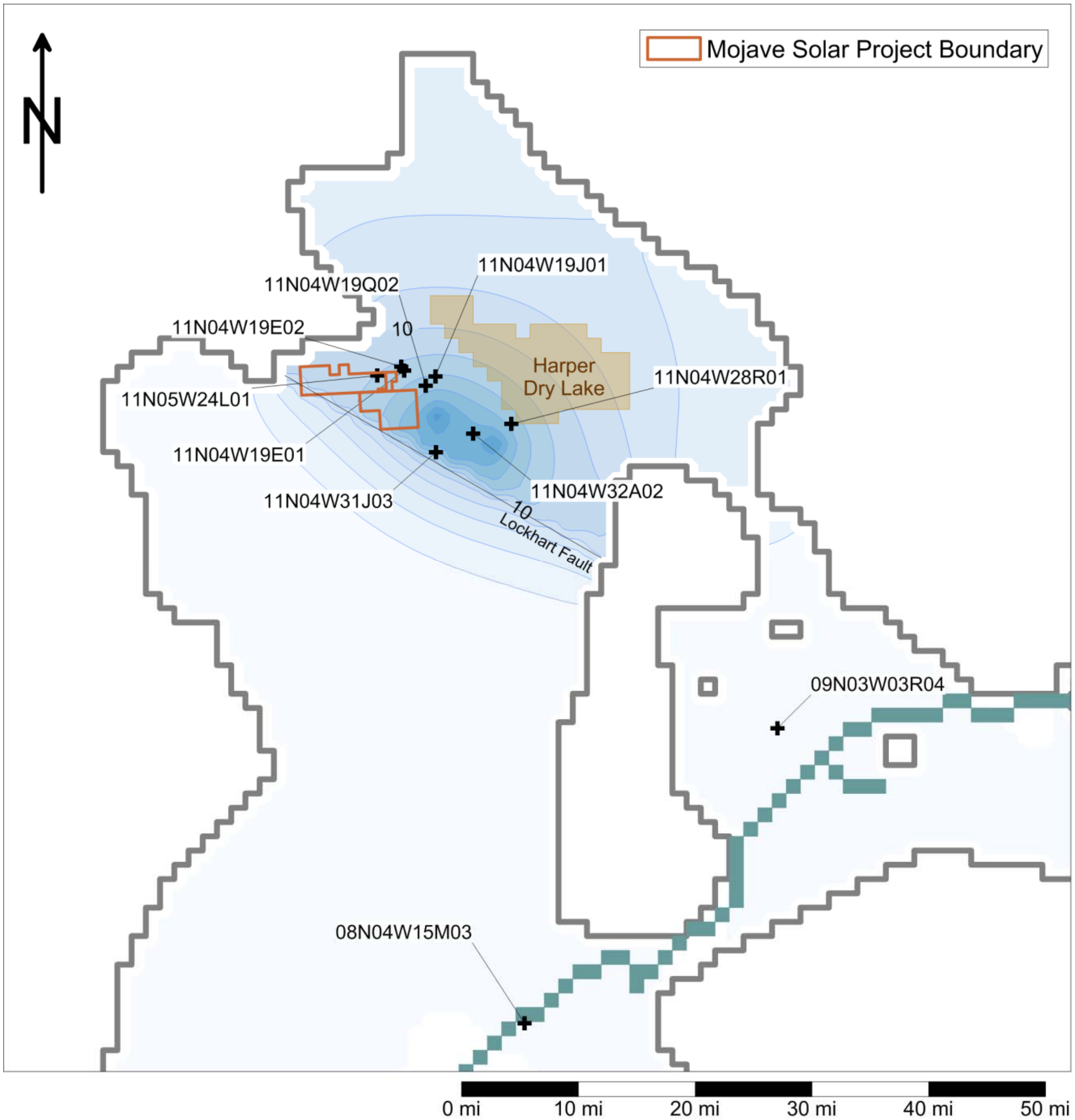


Figure 31-3(d). Water-level declines in 2042 for the 'dev1-hi-k' case (all Abengoa wells pumping with transmissivity increased by 50%). The decline is compared to the comparable model without the Abengoa wells.

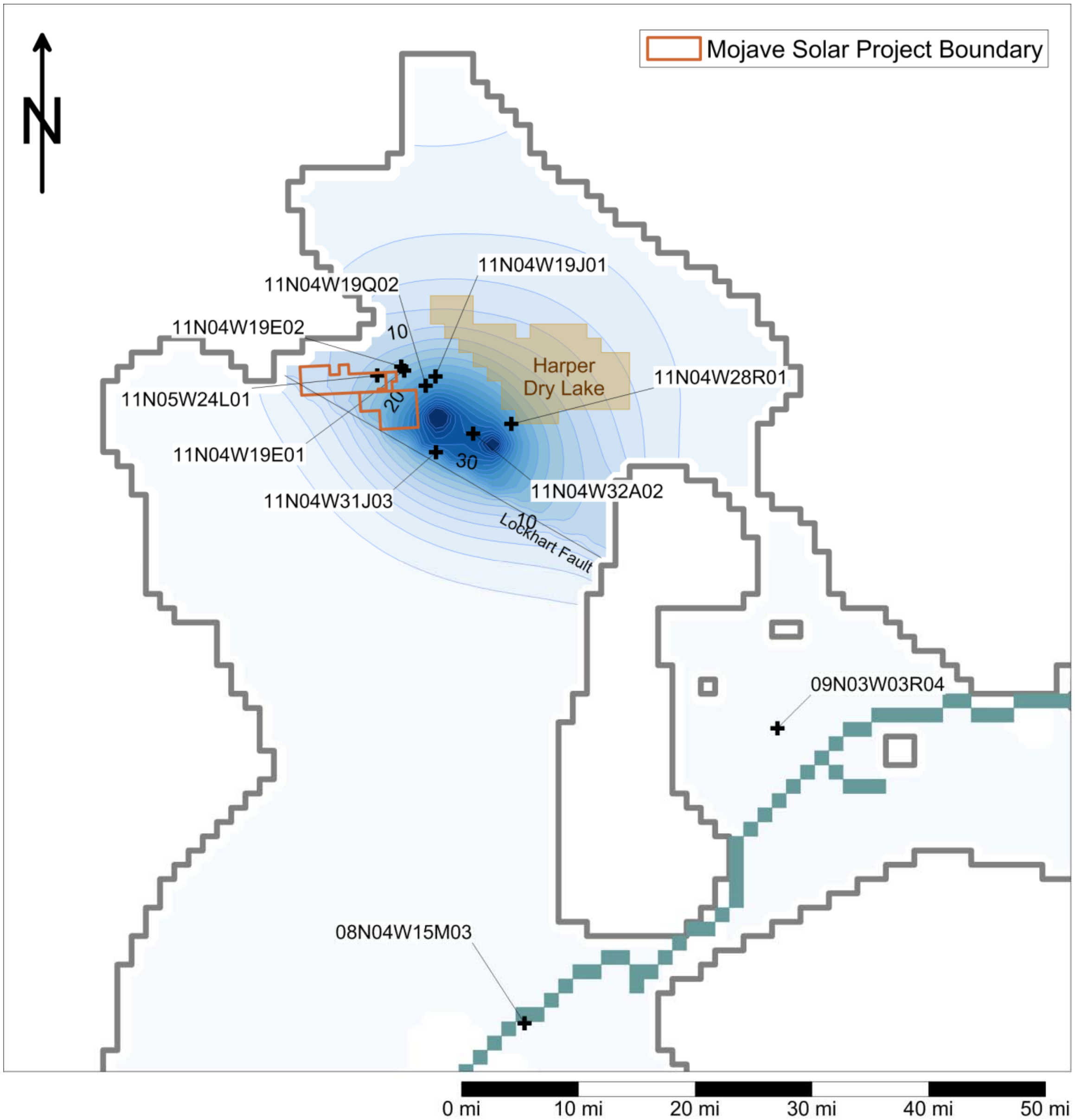


Figure 31-3(e). Water-level declines in 2042 for the ‘dev1-lo-k’ case (all Abengoa wells pumping with transmissivity decreased by 50%). The decline is compared to the comparable model without the Abengoa wells.

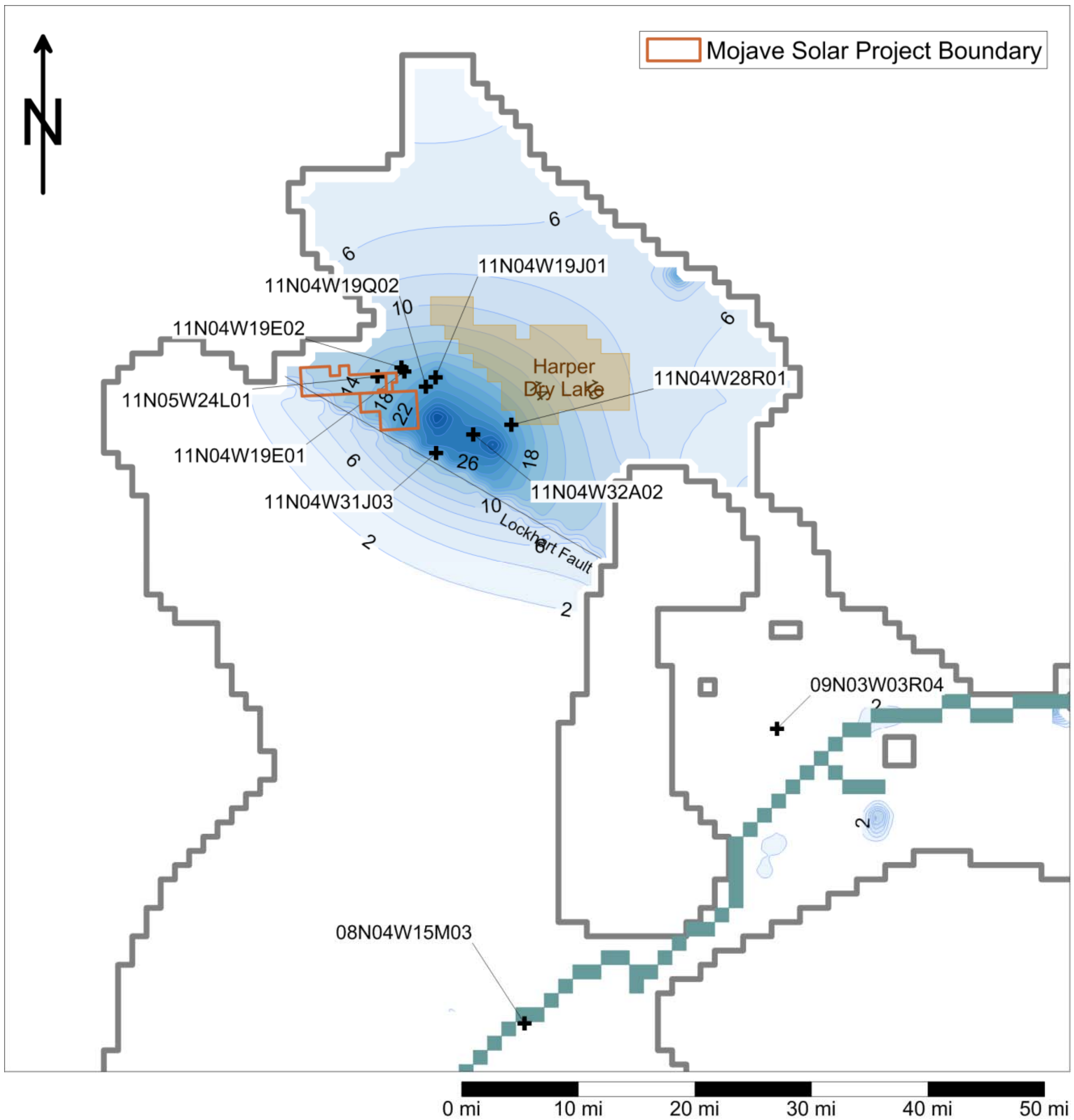


Figure 31-3(f). Water-level declines in 2042 for the ‘dev2’ case (all Abengoa wells pumping with all other HVGB pumping increased by 10% after 2010). The decline is compared to the calibrated model without the Abengoa wells.