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# BEACON SOLAR ENERGY PROJECT

## Supplemental Response to CEC Data Requests 96, 98, 101-103, 112, 114-116, 118, 119, 121 Docket No. 08-AFC-2

**Submitted by:**

***Beacon Solar, LLC***

**Submitted to:**

**California Energy Commission**

**December 9, 2008**

**Prepared by:**

ENSR | AECOM

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**96, 98, 101-103, 112, 114-116, 118, 119, 121**
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The following supplemental responses were prepared to address the CEC comments that were provided at the CEC Staff Data Response and Issue Resolution Workshop held on November 6, 2008. These responses provide additional information to the data request responses provided on October 13 and 23, 2008. To facilitate review and understanding of the supplemental information, we have provided a summary of the workshop requests with each response. We have placed a "W" after each data request number to indicate that the supplemental data request came from the workshop.

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**Data Request 96W:**

Provide additional analysis of use of poor water quality (high TDS) water as an alternative water source.

**Supplemental Response:**

In response to the request posed at the public meeting on November 6, 2008, Figure DR-96W1 was prepared and is provided in Attachment A. This figure shows historic water quality data from Appendix J-4 of the AFC for all wells with TDS information beyond 1976. The trends from these data were used to interpret the limits of the poor water quality (defined here as > 1,000 milligrams per liter [mg/L] total dissolved solids [TDS]) in the Koehn Sub-basin in 2008. Based on these data, the limits of the poor water quality are interpreted to be generally similar to those from 1976 (see Figure DR-96W1). As noted in the prior responses (submitted on October 13), the limits of poor water quality are found immediately in the vicinity of Koehn Lake. There is uncertainty where the boundary between poor and good quality water would be north and south of the playa, as there is limited information from wells in these areas.

Although not specifically requested, the groundwater model was used to evaluate the influence from a hypothetical water supply well within an area interpreted to potentially contain poor quality water. Figure DR-96W2 (Attachment A) shows the model prediction for a well at the southwestern edge of the lake within the area of potential poor water quality. This area was selected as it is the closest portion of the area of potentially poor water quality to the project site.

The predictive simulation was run identical to those provided for the Project assuming the same annual yield and duration of pumping (i.e., 1600 acre-feet per year [AFY] and 30 years). As shown on Figure DR-96W2, the cone of depression is elongated in a northeast-southwest direction within the alluvial sediments between the Randsburg-Mojave Fault and Koehn Lake. The northeast-southwest elongation is expected since there is a significant hydraulic conductivity contrast between alluvial sediments and the fine-grained Koehn Lake sediments and the hydraulic barrier that is the Randsburg-Mojave Fault. A well simulated at this location would preferentially pump water from the higher hydraulic conductivity alluvium in contrast to the lower conductivity Koehn Lake sediments. The simulation also shows that water would be drawn from

the "good water quality" in the alluvium outside the area of potential poor water quality in a direction southwest of the lake. As such, at this location, water from the well would probably be a blend of water quality with TDS concentrations above and below 1,000 mg/L. The simulation suggests that pumping within the potential area of poor water quality at this location would not necessarily yield poor water quality.

This illustration supports the rationale provided in the earlier data response that pumping in the area of potential poor water quality immediately adjacent to Koehn Lake is uncertain, both in terms of the surety of long-term supply, well yield and water chemistry. Such uncertainty has been noted as one of several criterion which precluded consideration of water supply from this portion of the Koehn Sub-basin as an environmentally preferable alternative.

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**Data Request 98W:**

> Revisit the responses to data requests 98, 101, 102 and 103 once the information from the report by Psomas for the hydrogeologic investigation of the Fremont Ranch is reviewed.

**Supplemental Response:**

The following tables have been revised to reflect the information contained in the Draft Initial Study/Proposed Negative Declaration – SAMDA Water Exploration Fremont Valley Ranch, Water Management Project December 2, 1997 (SAMDA Study):

- AFC, Table 5.17-5, Well Completion Data for Water Supply Wells on the Plant Site
- Appendix J-1, Table J.1-2, Plant Site Well Details
- Appendix J-3, Table J.3-1, Plant Site Well Details

The figures previously provided in response to data requests have not been changed as they reference the above-mentioned tables for information on the well details. Additionally, water level data provided in the SAMDA Study has been added to Table J.1-2 and J.3-1.

The Earth Satellite (EarthSat) report included as Appendix A of the SAMDA Study provided additional information on subsurface conditions below the project site that had not previously been reviewed. The additional data and conclusions provided in the EarthSat report did not significantly change the interpretation and evaluation provided in the AFC. In fact, in many cases the information provided supported the interpretation of site conditions as provided in the AFC. A summary of data provided in the SAMDA Study (Appendix A – EarthSat Report, Hydrogeologic Assessment of the Fremont Valley) and comparison to the interpretation and conclusions provided in the AFC is provided below:

- The SAMDA Study summarized recharge estimates reported by others. Values reported ranged from about 10,000 acre-feet per year (AFY) (Koehler 1977) to 42,000 AFY (GSi, 1993) (Table 2-5, Appendix A). In their analysis of recharge, EarthSat concluded that average annual precipitation infiltration rates are between 10,000 to 25,000 AFY. EarthSat further concluded that the proposed usage of 10,000 AFY of groundwater was within the safe yield of the Koehn Sub-basin. They estimated that there was an excess of between about 15,000 to 19,000 AFY of water available beyond the usage in the Koehn Sub-basin in 1997. The estimates of recharge tend to be generally higher that those estimated for the AFC and used in the numerical groundwater model.

- The evaluation of subsurface conditions provided in the SAMDA Study showed that the Fremont Valley Ranch is underlain by a heterogeneous mixture of sands, gravels and clays. Cross sections showed the clay layers as discontinuous lenses below the site. The data revealed that the thickness of alluvial sediments varied widely across the site, with the thickest section being located in the area of well No. 63. EarthSat concluded that the depth to bedrock varied from 500 feet south of the Cantil Fault to over 1,790 feet north of the fault in the area of Well No. 63. EarthSat also concluded that the Cantil Fault was a barrier to groundwater flow (see Appendix A – page 9 and Figures F.2 and F.3). Their conclusions regarding heterogeneity was reflected in the numerical groundwater model wherein a range of hydraulic conductivities were modeled for the project site and the Cantil Fault was depicted as being a barrier to groundwater flow.

- The results of a pumping test for Well No. 63 provided in the SAMDA Study (Appendix C of the EarthSat report) yielded transmissivity (92,619 gallons per day per foot [gpd/ft]), storativity (0.00242) and specific capacity (85.2 gallons per minute/ foot of drawdown [gpm/ft]). These values are within the ranges estimated from the pumping tests provided in the AFC for Wells No. 43, 48 and 63.

- Well data provided in the SAMDA Study showed that wells north of the Cantil Fault on the Fremont Valley Ranch have pumping capacity between 2,000 and 4,600 gallons per minute (gpm). They further indicated that between 1973 and 1986, wells on the Femont Valley Ranch pumped between 12,000 and 17,000 AFY. These data substantiate the AFC conclusion that there is sufficient sustainable yield from wells on the site to support project water requirements. Further, by comparison, the proposed project will pump significantly less groundwater (proposed 1,600 AFY) than has been used previously for the Fremont Valley Ranch.

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**Data Request 101W:**

Revisit the responses to data requests 98, 101, 102 and 103 once the information from the report by Psomas for the hydrogeologic investigation of the Fremont Ranch is reviewed.

**Supplemental Response:**

The additional data provided in the SAMDA Study does not directly address the original data request 101 from the CEC regarding the monitoring of offsite wells during pumping. Similarly, pumping tests conducted as part of the SAMDA Study did not monitor wells off the project site, as such no additional information is provided on the radius of influence in the direction of the Cantil Fault during short-term pumping tests. However, Figure F-2, Fremont Valley Study Area, Potentiometric Surface – 1985 and Figure F-3, Fremont Valley Study Area, Potentiometoric Surface – 1997 in the SAMDA Study both show that the Cantil Fault is interpreted to be a barrier to groundwater flow.

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**Data Request 102W:**

> Revisit the responses to data requests 98, 101, 102 and 103 once the information from the report by Psomas for the hydrogeologic investigation of the Fremont Ranch is reviewed.

**Supplemental Response:**

Figure F.2 (Potentiometric Surface 1985) of the SAMDA Study shows a difference of groundwater elevations across the Cantil Fault of about 200 to 320 feet, with water levels being lower north of the fault. Figure F.3 (Potentiometric Surface 1997) of the same report shows groundwater elevations north of the Cantil Valley Fault about 120 feet to 300 feet lower than those on the south side of the fault in the area of the project site. This off-set is still apparent to the northeast of Koehn Lake; however, not nearly to the same degree (about 40 to 100 feet difference) as that seen near the project site. To the northeast water levels differ by 40 to 100 feet, with the lower levels to the north of the Cantil Fault.

These data and interpretation support the response previously provided to DR-102 that the Cantil Fault is a barrier to groundwater flow.

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**Data Request 103W:**

> Revisit the responses to data requests 98, 101, 102 and 103 once the information from the report by Somis for the hydrogeologic investigation of the Fremont Ranch is reviewed.

**Supplemental Response:**

Other than what has been provided in response to Data Requests 101 and 102, there was no data provided in the SAMDA Study to add to the interpretation of flux across the Cantil Fault or to add or change the response to Data Request 103 previously provided.

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**Data Request 112W:**

In Table DR112, please explain footnote 4 and provide a revised table (and discussion) that includes the recharge/flux numbers for calibration of the model. This refers to the flux from the NE into Koehn Lake.

**Supplemental Response:**

Table DR-112W has been modified to remove footnote number 4, and Table DR-112W is attached for reference. The foot note was replaced by the model input value for recharge of 3,450 acre-feet per year (AFY).

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**Data Request 114W:**

Review the hydrographs to evaluate model sensitivity from the perspective of changes over time. Also perform a sensitivity analysis on recharge.

In Table DR-114 (Table 4-1) why are the coefficients needed. Please explain why would storage coefficients have different values.

**Supplemental Response:**

In response to this request, recharge was added to the sensitivity analysis. The range in recharge values for the model varied between 10,000 AFY and 25,000 AFY. The ranges were drawn from values provided by others and consistent with ranges reported by GSi and Earthsat in the SAMDA Study. Figures DR-114W1 and DR-114W2 (Attachment B) show the results of the sensitivity study for recharge showing the simulated response from pumping for both well No. 48 and No. 63 assuming the same pumping parameters and duration as modeled in the AFC.

As requested, hydrographs showing simulated vs. measured water levels over time were included in an expansion of the sensitivity analysis (see DR-115W below). The model sensitivity analysis comparing simulated vs. measured water levels for selected wells in the Koehn Sub-basin included parameters previously evaluated under Data Request 115, and also included recharge, both ½ and 2 times the modeled value.

Table 4.1 lists specific yield and storage coefficient values for zones 7 through 10 (on-site zones). The specific yield values were all 0.11 and were derived from Kohler's report of the area. These values are representative of the long-term decline and recovery of the water table in the valley due to agricultural pumping. The value of 0.11 was confirmed by comparison of several hydrographs in the area during model calibration. The storage coefficient values are smaller and represent values obtained from the calibration to short-term pumping tests at the project site. The aquifer tests were not long enough to provide estimates of storage coefficient, which is the reason these values are different from the specific yield values.

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**Data Request 115W:**

Please provide the model output as a table.

**Supplemental Response:**

As requested Table DR-115W was prepared from the sensitivity analysis showing the drawdown at the end of the simulation and comparison to the measured drawdown from pumping tests conducted in Wells No. 43, No. 48 and No. 63.

Additionally, an expansion of the sensitivity analyses was performed comparing simulated vs. measured water levels for 14 wells within the Koehn Sub-basin. The sensitivity analysis included recharge in addition to the previously evaluated model parameters of specific yield, hydraulic conductivity and fault conductance. The wells used in the sensitivity analysis were located both on the east and west side of the Cantil Fault, and northeast and southwest of Koehn Lake, The results of the sensitivity analysis are shown on Figures DR-115W(a) through DR-115W(d) and DR-115W(f) through DR-115W(h) (see Attachment C).

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**Data Request 116W:**

Provide the expected water levels below the lake. Discuss the evaporation losses from the lake due to capillary action.

**Supplemental Response:**

Figure DR-116W was created to show hydrographs for wells with available water level data since 1976 in close proximity of the playa (see Attachment D). As shown, well 30S/38E-03K002 is the closest well to the lake, located on the north side of the playa. Water levels in this well since 1976 have been consistently greater than 10 feet below the surface of the lake. At this depth there would not be significant wicking of water up through the lake bed sediments, and as such,

yielding significant evaporative losses. The height of capillary rise is nearly inversely proportional to the grain size of the wetted material. Subsurface materials at Koehn Lake consist of fine-grained materials such as silts and clays. Based on the Atterberg study cited in Lohman (1972) and Todd (1980), a 3.5 to 6.5 foot capillary rise is expected for unconsolidated silt with 41 percent porosity. These data would support the conclusion that there is not significant wicking water up through the playa sediments.

Given the consistent water depth below the lake and absence of significant evaporative loss, the treatment of the lake as a drain appears to be appropriate.

References:

Lohman, S. W., 1972, Ground-Water Hydraluics: Geological Survey Professional Paper 708: United States Geological Survey, Alexandria, Virginia.

Todd, D. K., 1980, Groundwater Hydrology, Second Edition: John Wiley and Sons, New York, New York.

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**Data Request 118W:**

Explain the inconsistencies in the apparent gradient between Figure DR-106 and Figure DR-102b.

**Supplemental Response:**

The steady state calibration was designed to represent conditions prior to major agricultural pumping the area. The year 1958 was chosen because to maximize the number of water level measurements for the calibration. While the basin as a whole was relatively undeveloped, there were some localized areas of drawdown east of the site. These are obvious on Kohler's contour map of the 1958 water levels. However, there are just a few measurements available that show these cones of depression and we discounted these because we did not know the location and rate of pumping for agricultural wells in the area. In addition, these wells were not pumping for very long so that the water levels are not indicative of steady state conditions.

To test this point, pumping wells were added to the model in 1959 in the areas of Kohler's cones of depression. Figure 118W1 shows the simulated 1959 water levels and Kohler's 1958 contours. The match is better, but without more detailed knowledge of pumping rates and locations it would be nearly impossible to get a more accurate match. In addition to obtaining a better match to Kohler's 1958 contours, adjustments were also made to the model to better match the long-term hydrographs for the basin. This calibration involved some local adjustment of the specific yield (Sy) to 0.2 in outer areas of the basin and the addition of several pumping wells near observation wells that showed anomalous water level response. The results of this

calibration are provided in Figure-118W1 (simulated vs. 1958 water levels from Koehler 1977) and on the hydrographs shown on Figure-118W2, which show hydrographs for 15 wells within the Koehn Sub-basin and the simulated vs. observed water levels over time (see Attachment E).

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**Data Request 119W:**

Please provide an explanation for why there are differences in the simulated and observed results (i.e., heterogeneity) and why the parameter values used were selected.

**Supplemental Response:**

Model parameters, such as hydraulic conductivity and specific yield, were derived through calibration to three different types of data. The first was a collection of water level measurements from 1958, thought to be close to equilibrium conditions. This was the steady-state calibration. The second set of measurements was drawdown measured during three short-term aquifer tests conducted at the Beacon Solar site. The steady-state simulation and aquifer test simulations were calibrated together so that a consistent set of parameters could be derived.

The philosophy used was to keep the hydraulic conductivity values between the major faults homogeneous. During calibration of the aquifer tests, however, it became apparent that local heterogeneities could be identified by the aquifer tests. In order to better match these tests, four additional zones of hydraulic conductivity were added around each test well.

In addition, water levels at the northeast end of the valley were much higher than those to the west. The decision was made to keep the water budget for the valley at the initial estimate and adjust hydraulic conductivity downward in that area to increase water table elevations to match those northeastern wells.

The third type of calibration was to long-term hydrographs from 1958 through 2007. The purpose of this calibration was simply to confirm Kohler's specific yield estimate of 0.11. A detailed calibration to these hydrographs was not possible because pumping data for the area is only known in general. Kohler presents estimated total pumping for the valley from 1960 to 1976. Kohler did not give any indication as to the distribution of this pumping and no other data exist on pumping in the valley. Consequently, the pumping was distributed in the valley such that the total pumping rates matched Kohler's data and the locations were placed based on observed drawdown in the hydrographs from a few wells in the area. This calibration did corroborate Kohler's specific yield value and in a regional sense showed that the transmissivity in the model is reasonable.

Obviously no calibration is perfect and so there will always be mismatches between the model results and water levels measured in the field. The mismatch in the case of the Fremont Valley

model is primarily due to lack of data on pumping locations and rates. This is most obvious in the 15 hydrographs that have been presented. For example, a couple of the hydrographs show steep recovery that the model cannot match because we did not place a pumping well at that location. Mismatch in the steady state calibration is also related to lack of pumping knowledge. In the area between the Beacon Solar site and Koehn Lake, some water levels show indications that pumping was occurring in that area. Other water levels do not show such affects. It is likely that 1958 was close to the time when agricultural pumping was just starting to increase significantly so there are local drawdown affects that the model cannot match because we have no knowledge of where those wells might have been and what rate they might have pumped.

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**Data Request 121W:**

> Please provide hydrographs on either side of the fault (i.e., like DR-103). No additional analysis is required – simply show the graphs (as was done for DR-103).

**Supplemental Response:**

Additional sensitivity analyses in response to DR-115W and revisions to the model calibration in response to DR-118W provided hydrographs in the figure format as requested. The hydrographs provided in the response to DR-121 have similarly been plotted onto a map of the Koehn Sub-basin, as was done for DR-103 (and DR-115W and DR-118W). Please see Figure DR-121W, showing the hydrographs and distribution of well used in the verification run (Attachment F).

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# Tables

**Table 5.17-5 Well Completion Data for Water Supply Wells on the Plant Site**

| Well Number | Well Construction | | Screen Interval | | Specific Capacity (1980)[5] (gpm/ft) |
|---|---|---|---|---|---|
| | Ground Surface[1] (ft msl) | Total Depth[2] (ft bgs) | Top (ft bgs) | Bottom[4] (ft bgs) | |
| Domestic | 2178 | 505 | 220[3] | 505 | -- |
| USGS | 2104 | -- | -- | -- | -- |
| Well No. 41 | 2176 | 800 | 260[4] | 795 | 131 |
| Well No. 42 | 2173 | 603 | -- | 603 | 17 |
| Well No. 43 | 2069 | 864 | 300[3] | 806 | 31 |
| Well No. 44 | 2134 | 800 | -- | 800 | 69 |
| Well No. 45A | 2117 | 620 | -- | 620 | 49 |
| Well No. 45B | 2115 | -- | -- | -- | -- |
| Well No. 46 | 2050 | 830 | 275[4] | 320 | 31 |
| Well No. 47 | 2252 | 887 | -- | 887 | 147 |
| Well No. 48 | 2223 | 904 | 250[3] | 813 | 139 |
| Well No. 49 | 2145 | 800 | -- | 800 | 124 |
| Well No. 50 | 2081 | 950 | -- | 950 | 3 |
| Well No. 51 | 2083 | 785 | 295[4] | 785 | 29 |
| Well No. 63 | 2131 | 1740 | 500[3] | 1730 | -- |

[1] Wells resurveyed October 2, 2007.

[2] Total depth as reported by Earth Satellite (EarthSat) Corporation (1997). Depths confirmed for well nos. 43 and 48 during pumping test program. Debris in well no. 63 blocked measurement of TD.

[3] Top of screen confirmed by video logging performed during pumping test. Switzer (2007) reported that the top of the screen in all wells was between 300-400 feet bgs.

[4] Top and bottom of screen confirmed from the Table 2.2 and drillers logs provided in the EarthSat (1997) report.

[5] Specific Capacity measured during pumping test 1980. EarthSat (1997) reported a value of 85 gpm/ft for well No. 63 from a pumping test performed in July 1997.

Key:
ft msl – feet above mean sea level
ft bgs – feet below ground surface
gpm/ft – gallons per minute per foot of drawdown
-- no reported data

**TABLE J.1-2**
**PLANT SITE WELL DETAILS**
**(REVISED DECEMBER 2008)**
**BEACON SOLAR ENERGY PROJECT**
**KERN COUNTY, CALIFORNIA**

| Well Number[1] | Northing[2] | Easting[2] | Top of Casing[2] | Top of Screen[10] | Bottom of Screen[10] | Saturated thickness | Ground Surface Elevation[2] | Total Depth[3] | Depth to Water[4] | | Groundwater Elevation[5] | Pumping Rate[4] | Pumping Water Level[4] | Drawdown[4] | Specific Capacity[6] | Estimate of Transmissivity[7] | Pump[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | feet-msl | feet-msl | feet-msl | feet-msl | feet-msl | feet-bgs | Date | feet-bgs | | Apr-80 gpm | Apr-80 feet-bgs | Apr-80 feet-bgs | Apr-80 gpm/ft | Apr-80 $ft^2$/day | HP |
| **Domestic** | -- | -- | 2180 | 220 | 505 | 285 | -- | 505 | 1973 | 190 | 1990.0 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Jul-97 | 420 | 1760.0 | -- | -- | -- | -- | -- | |
| | 2279600.94 | 6550585.41 | 2178.50 | | | | 2177.72 | | Oct-07 | -- | -- | -- | -- | -- | -- | -- | 5 |
| **USGS** | 2280021.34 | 6559139.44 | 2105.14 | -- | -- | -- | 2104.00 | -- | Oct-07 | 294.31 | 1810.83 | -- | -- | -- | -- | -- | -- |
| **41** | -- | -- | 2174.5 | 260 | 795 | 535 | | 800 | 1973 | 210.0 | 1964.50 | -- | -- | -- | -- | -- | |
| | | | | | | | 2160 | | Jan-80 | 397.3 | 1762.7 | -- | -- | -- | -- | -- | 200 |
| | | | | | | | | | Apr-80 | 397.3 | 1762.7 | 1693 | 410.2 | 12.9 | 131 | 26,318 | |
| | | | | | | | | | Feb-81 | 410.0 | 1750.0 | -- | -- | -- | -- | -- | |
| | 2277255.98 | 6553083.68 | 2177.33 | | | | 2175.82 | | Oct-07 | 357.78 | 1819.6 | -- | -- | -- | -- | -- | |
| **42** | -- | -- | 2172.50 | | | | | 603 | 1954 | 149.0 | 2023.5 | -- | -- | -- | -- | -- | |
| | | | | | | | | | 1970's | 418.0 | 1754.5 | -- | -- | -- | -- | -- | |
| | | | | | | | 2175 | | Jan-80 | 393.5 | 1781.5 | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | Apr-80 | 393.5 | 1781.5 | 1391 | 476.0 | 82.5 | 17 | 3,381 | |
| | | | | | | | | | Feb-81 | 409.0 | 1766.0 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 395.8 | 1776.66 | -- | -- | -- | -- | -- | |
| | 2278636.34 | 6551678.11 | 2174.16 | | | | 2172.92 | | Oct-07 | 355.91 | 1818.2 | -- | -- | -- | -- | -- | |
| **43** | -- | -- | 2067.5 | 300[8] | 806 | 506 | | 864 | 1973 | 160.0 | 1907.5 | -- | -- | -- | -- | -- | |
| | | | | | | | 2060 | | Jan-80 | 350.0 | 1710.0 | -- | -- | -- | -- | -- | 200 |
| | | | | | | | | | Apr-80 | 350.0 | 1710.0 | 1568 | 400.0 | 50.0 | 31 | 6,289 | |
| | | | | | | | | | Feb-81 | 313.4 | 1746.6 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Apr-86 | 350.2 | 1717.3 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Apr-93 | 306.3 | 1761.2 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 281.4 | 1786.1 | -- | -- | -- | -- | -- | |
| | 2281995.44 | 6560367.11 | 2070.73 | | | | 2069.39 | | Oct-07 | -- | -- | -- | -- | -- | -- | -- | Pump Removed |
| **44** | -- | -- | 2133.4 | --[9] | 800 | -- | | 800 | 1974 | 260.0 | 1873.4 | -- | -- | -- | -- | -- | |
| | | | | | | | 2145 | | Jan-80 | 361.1 | 1783.9 | -- | -- | -- | -- | -- | 200 |
| | | | | | | | | | Apr-80 | 361.1 | 1783.9 | 1507 | 383.0 | 21.9 | 69 | 13,799 | |
| | | | | | | | | | Feb-81 | 372.0 | 1773.0 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 356.4 | 1776.99 | -- | -- | -- | -- | -- | |
| | 2278583.88 | 6555376.36 | 2135.57 | | | | 2134.38 | | Oct-07 | 317.52 | 1818.1 | -- | -- | -- | -- | -- | |
| **45A** | -- | -- | 2114.1 | --[9] | 620 | -- | | 620 | 1974 | 215.00 | 1899.1 | -- | -- | -- | -- | -- | |
| | | | | | | | 2125 | | Jan-80 | 344.2 | 1780.8 | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | Apr-80 | 344.2 | 1780.8 | 1514 | 375.0 | 30.8 | 49 | 9,857 | |
| | | | | | | | | | Feb-81 | 336.8 | 1788.2 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 339.8 | 1774.3 | -- | -- | -- | -- | -- | |
| | 2280169.10 | 6555537.87 | 2117.53 | | | | 2116.67 | | -- | -- | -- | -- | -- | -- | -- | -- | |

**TABLE J.1-2**
**PLANT SITE WELL DETAILS**
**(REVISED DECEMBER 2008)**
**BEACON SOLAR ENERGY PROJECT**
**KERN COUNTY, CALIFORNIA**

| Well Number[1] | Northing[2] | Easting[2] | Top of Casing[2] | Top of Screen[10] | Bottom of Screen[10] | Saturated thickness | Ground Surface Elevation[2] | Total Depth[3] | Depth to Water[4] | | Groundwater Elevation[5] | Pumping Rate[4] | Pumping Water Level[4] | Drawdown[4] | Specific Capacity[6] | Estimate of Transmissivity[7] | Pump[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | feet-msl | feet-msl | feet-msl | feet-msl | feet-msl | feet-bgs | Date | feet-bgs | | Apr-80 gpm | Apr-80 feet-bgs | Apr-80 feet-bgs | Apr-80 gpm/ft | Apr-80 $ft^2$/day | HP |
| **45B** | -- | -- | -- | -- | -- | -- | -- | -- | Jan-80 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | Apr-80 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | Feb-81 | -- | -- | -- | -- | -- | -- | -- | -- |
| | 2280268.84 | 6555538.15 | 2116.41 | | | | 2115.19 | | Oct-07 | 298.05 | 1818.36 | -- | -- | -- | -- | -- | |
| **46** | -- | -- | 2047.5 | 275 | 320 | 45 | | 830 | 1974 | 235 | 1812.50 | -- | -- | -- | -- | -- | |
| | | | | | | | 2040 | | Jan-80 | 350.0 | 1690.0 | -- | -- | -- | -- | -- | 150 |
| | | | | | | | | | Apr-80 | 350.0 | 1690.0 | 1286 | 391.0 | 41.0 | 31 | 6,290 | |
| | | | | | | | | | Feb-81 | 335.3 | 1704.7 | -- | -- | -- | -- | -- | |
| | 2283302.96 | 6561922.49 | 2050.49 | -- | -- | -- | 2050.09 | | Oct-07 | 210.22 | 1840.3 | -- | -- | -- | -- | -- | |
| **47** | -- | -- | 2252.50 | -- | -- | -- | | 887 | 1974 | 290.00 | 1962.5 | -- | -- | -- | -- | -- | |
| | | | | | | | 2255 | 887 | Jan-80 | 470.2 | 1784.8 | -- | -- | -- | -- | -- | 150 |
| | | | | | | | | | Apr-80 | 470.2 | 1784.8 | 1584 | 481.0 | 10.8 | 147 | 29,412 | |
| | | | | | | | | | Feb-81 | 487.2 | 1767.8 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 469.4 | 1783.1 | -- | -- | -- | -- | -- | |
| | 2276132.32 | 6549327.05 | 2254.34 | | | | 2251.57 | | Oct-07 | 435.74 | 1818.6 | -- | -- | -- | -- | -- | |
| **48** | -- | -- | -- | 250[8] | 813 | 563 | | 904 | 1973 | 260.00 | 1960.5 | -- | -- | -- | -- | -- | |
| | | | | | | | 2215 | | Jan-80 | 441.4 | 1773.6 | -- | -- | -- | -- | -- | 200 |
| | | | | | | | | | Apr-80 | 441.4 | 1773.6 | 1419 | 451.6 | 10.2 | 139 | 27,898 | |
| | | | | | | | | | Feb-81 | 455.8 | 1759.2 | -- | -- | -- | -- | -- | |
| | 2275598.60 | 6551058.74 | 2223.23 | | | | 2222.73 | | Oct-07 | 404.95 | 1818.3 | -- | -- | -- | -- | -- | Pump Removed |
| **49** | -- | -- | 2146.1 | -- | -- | -- | | 800 | 1974 | 260.0 | 1886.1 | -- | -- | -- | -- | -- | |
| | | | | | | | 2165 | | Jan-80 | 371.0 | 1794.0 | -- | -- | -- | -- | -- | 150 |
| | | | | | | | | | Apr-80 | 371.0 | 1794.0 | 1114 | 380.0 | 9.0 | 124 | 24,822 | |
| | | | | | | | | | Feb-81 | 383.0 | 1782.0 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Jul-97 | 375.0 | 1771.1 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 370.4 | 1775.7 | -- | -- | -- | -- | -- | |
| | 2278867.08 | 6553918.23 | 2146.13 | | | | 2145.15 | | Oct-07 | 310.82 | 1835.3 | -- | -- | -- | -- | -- | |
| **50** | -- | -- | 2080 | --[9] | --[9] | -- | | 950 | 1973 | 245.00 | 1835.0 | -- | -- | -- | -- | -- | |
| | | | | | | | 2085 | | Jan-80 | 303.4 | 1781.6 | -- | -- | -- | -- | -- | 125 |
| | | | | | | | | | Apr-80 | 303.4 | 1781.6 | 500 | 471.5 | 168.1 | 3 | 596 | |
| | | | | | | | | | Feb-81 | 304.2 | 1780.8 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 293.9 | 1786.1 | -- | -- | -- | -- | -- | |
| | 2282504.17 | 6557805.80 | 2081.95 | | | | 2081.20 | | Oct-07 | 256.8 | 1825.1 | -- | -- | -- | -- | -- | |
| **51** | -- | -- | 2080.6 | 295 | 785 | 490 | | 785 | 1976 | 185.0 | 1895.6 | -- | -- | -- | -- | -- | |
| | | | | | | | 2085 | | Jan-80 | 324.0 | 1761.0 | -- | -- | -- | -- | -- | 150 |
| | | | | | | | | | Apr-80 | 324.0 | 1761.0 | 965 | 357.7 | 33.7 | 29 | 5,742 | |
| | | | | | | | | | Feb-81 | 301.0 | 1784.0 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 303.9 | 1776.7 | -- | -- | -- | -- | -- | |
| | 2283866.63 | 6555448.03 | 2083.24 | | | | 2082.84 | | Oct-07 | -- | -- | -- | -- | -- | -- | -- | |

**TABLE J.1-2**
**PLANT SITE WELL DETAILS**
**(REVISED DECEMBER 2008)**
**BEACON SOLAR ENERGY PROJECT**
**KERN COUNTY, CALIFORNIA**

| Well Number[1] | Northing[2] | Easting[2] | Top of Casing[2] | Top of Screen[10] | Bottom of Screen[10] | Saturated thickness | Ground Surface Elevation[2] | Total Depth[3] | Depth to Water[4] | | Groundwater Elevation[5] | Pumping Rate[4] | Pumping Water Level[4] | Drawdown[4] | Specific Capacity[6] | Estimate of Transmissivity[7] | Pump[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | feet-msl | feet-msl | feet-msl | feet-msl | feet-msl | feet-bgs | Date | feet-bgs | | Apr-80 | Apr-80 | Apr-80 | Apr-80 | Apr-80 | HP |
| | | | | | | | | | | | | gpm | feet-bgs | feet-bgs | gpm/ft | $ft^2$/day | |
| **63** | | | -- | 500[8] | 1730 | 1230 | -- | 1740 | -- | -- | -- | -- | -- | -- | -- | -- | no pump |
| | | | 2130.1 | | | | | | 1981 | 404 | 1726.1 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Jul-97 | 349 | 1781.1 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 354 | 1776.1 | -- | -- | -- | -- | -- | |
| | 2279660.56 | 6554343.52 | 2132.16 | | | | 2131.00 | | Oct-07 | 313.25 | 1818.9 | -- | -- | -- | -- | -- | |
| | | | | | | | | | | | | | **Average** | **43** | **70** | **14,037** | |

**Notes:**

1 Wells shown on **Figure 5.17-8**.
2 Survey conducted October 2, 2007 to provide coordinates, ground surface elevation and top of casing. Survey conducted by WM Holdings Incorporated (William Meagher, Liscense 5948). Ground surface elevations for January 1980 provided by Switzer (2007). Elevations resurveyed October 2007.
3 Total depth of the well as provided by Switzer (2007). Well depth taken from Figure 4, "Fremont Valley Ranch - Groundwater Well Map". Figure provide by Switzer (2007) as part of the Phase I ESA.
4 Information provided by Switzer (2007) from a pumping test performed by Southern California Edison April 1980
5 January 1980, April 1980 and February 1981 estimated from ground surface elevation data. October 2007 elevations estimated from top of casing elevation that was resurveyed October 2, 2007.
6 Specific Capacity (Q/ds) estimated as the rate of water pumped divided by the drawdown (gpm/ft).
7 Transmissivity estimated after Driscoll (1986, pg. 1021). Q/ds = Transmissivity/1,500 (assuming an unconfined aquifer).
8 Top of screen confirmed by video logging performed during pumping test.
9 Well data not complete due to poor data quality in provided records.
10 Top and bottom of screen confirmed from the Table 2.2 and drillers logs provided in the EarthSat (1997) report.

**Definitions:**

bgs below ground surface
$ft^2$/day feet squared per day
gpm gallons per minute
gpm/ft gallons per minute per foot of drawdown
Hp horse power
msl mean sea level
-- unknown or information not provided

**Table J.3-1**
**Well Details - Water Supply Wells on The Plant Site**
**(REVISED DECEMBER 2008)**
**Beacon Solar Energy Project**

| Well Number[1] | Northing[2] | Easting[2] | Top of Casing[2] | Top of Screen[10] | Bottom of Screen[10] | Saturated thickness | Ground Surface Elevation[2] | Total Depth[3] | Depth to Water[4] | | Groundwater Elevation[5] | Saturated Thickness | Pumping Rate[4] | Pumping Water Level[4] | Drawdown[4] | Specific Capacity[6] | Estimate of Transmissivity[7] | Pump[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | feet-msl | feet-msl | feet-msl | feet-msl | feet-msl | feet-bgs | Date | feet-bgs | | feet (Oct-07) | Apr-80 gpm | Apr-80 feet-bgs | Apr-80 feet-bgs | Apr-80 gpm/ft | Apr-80 $ft^2$/day | HP |
| **Domestic** | -- | -- | 2180 | 220 | 505 | 285 | -- | 505 | 1973 | 190 | 1990.0 | 315 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Jul-97 | 420 | 1760.0 | 85 | -- | -- | -- | -- | -- | |
| | 2279600.94 | 6550585.41 | 2178.50 | | | | 2177.72 | | Oct-07 | -- | -- | -- | -- | -- | -- | -- | -- | 5 |
| **USGS** | 2280021.34 | 6559139.44 | 2105.14 | -- | -- | -- | 2104.00 | -- | Oct-07 | 294.31 | 1810.83 | -- | -- | -- | -- | -- | -- | -- |
| **41** | -- | -- | 2174.5 | 260 | 795 | 535 | | 800 | 1973 | 210.0 | 1964.50 | 590 | -- | -- | -- | -- | -- | |
| | | | | | | | 2160 | | Jan-80 | 397.3 | 1762.7 | 403 | -- | -- | -- | -- | -- | 200 |
| | | | | | | | | | Apr-80 | 397.3 | 1762.7 | 403 | 1693 | 410.2 | 12.9 | 131 | 26,318 | |
| | | | | | | | | | Feb-81 | 410.0 | 1750.0 | 390 | -- | -- | -- | -- | -- | |
| | 2277255.98 | 6553083.68 | 2177.33 | | | | 2175.82 | | Oct-07 | 357.78 | 1819.6 | 442 | -- | -- | -- | -- | -- | |
| **42** | -- | -- | 2172.50 | | | | | 603 | 1954 | 149.0 | 2023.5 | 454 | -- | -- | -- | -- | -- | |
| | | | | | | | | | 1970's | 418.0 | 1754.5 | 185 | -- | -- | -- | -- | -- | |
| | | | | | | | 2175 | | Jan-80 | 393.5 | 1781.5 | 210 | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | Apr-80 | 393.5 | 1781.5 | 210 | 1391 | 476.0 | 82.5 | 17 | 3,381 | |
| | | | | | | | | | Feb-81 | 409.0 | 1766.0 | 194 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 395.8 | 1776.66 | 207 | -- | -- | -- | -- | -- | |
| | 2278636.34 | 6551678.11 | 2174.16 | | | | 2172.92 | | Oct-07 | 355.91 | 1818.2 | 247 | -- | -- | -- | -- | -- | |
| **43** | -- | -- | 2067.5 | 300[8] | 806 | 506 | | 864 | 1973 | 160.0 | 1907.5 | 704 | -- | -- | -- | -- | -- | |
| | | | | | | | 2060 | | Jan-80 | 350.0 | 1710.0 | 514 | -- | -- | -- | -- | -- | 200 |
| | | | | | | | | | Apr-80 | 350.0 | 1710.0 | 514 | 1568 | 400.0 | 50.0 | 31 | 6,289 | |
| | | | | | | | | | Feb-81 | 313.4 | 1746.6 | 551 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Apr-86 | 350.2 | 1717.3 | 514 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Apr-93 | 306.3 | 1761.2 | 558 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 281.4 | 1786.1 | 583 | -- | -- | -- | -- | -- | |
| | 2281995.44 | 6560367.11 | 2070.73 | | | | 2069.39 | | Oct-07 | -- | -- | -- | -- | -- | -- | -- | -- | Pump Removed |
| **44** | -- | -- | 2133.4 | --[9] | 800 | -- | | 800 | 1974 | 260.0 | 1873.4 | 540 | -- | -- | -- | -- | -- | |
| | | | | | | | 2145 | | Jan-80 | 361.1 | 1783.9 | 439 | -- | -- | -- | -- | -- | 200 |
| | | | | | | | | | Apr-80 | 361.1 | 1783.9 | 439 | 1507 | 383.0 | 21.9 | 69 | 13,799 | |
| | | | | | | | | | Feb-81 | 372.0 | 1773.0 | 428 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 356.4 | 1776.99 | 444 | -- | -- | -- | -- | -- | |
| | 2278583.88 | 6555376.36 | 2135.57 | | | | 2134.38 | | Oct-07 | 317.52 | 1818.1 | 482 | -- | -- | -- | -- | -- | |
| **45A** | -- | -- | 2114.1 | --[9] | 620 | -- | | 620 | 1974 | 215.00 | 1899.1 | 405 | -- | -- | -- | -- | -- | |
| | | | | | | | 2125 | | Jan-80 | 344.2 | 1780.8 | 276 | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | Apr-80 | 344.2 | 1780.8 | 276 | 1514 | 375.0 | 30.8 | 49 | 9,857 | |
| | | | | | | | | | Feb-81 | 336.8 | 1788.2 | 283 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 339.8 | 1774.3 | 280 | -- | -- | -- | -- | -- | |
| | 2280169.10 | 6555537.87 | 2117.53 | | | | 2116.67 | | -- | -- | -- | -- | -- | -- | -- | -- | -- | |

**Table J.3-1**
**Well Details - Water Supply Wells on The Plant Site**
**(REVISED DECEMBER 2008)**
**Beacon Solar Energy Project**

| Well Number[1] | Northing[2] | Easting[2] | Top of Casing[2] | Top of Screen[10] | Bottom of Screen[10] | Saturated thickness | Ground Surface Elevation[2] | Total Depth[3] | Depth to Water[4] | | Groundwater Elevation[5] | Saturated Thickness | Pumping Rate[4] | Pumping Water Level[4] | Drawdown[4] | Specific Capacity[6] | Estimate of Transmissivity[7] | Pump[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | feet-msl | feet-msl | feet-msl | feet-msl | feet-msl | feet-bgs | Date | feet-bgs | | feet (Oct-07) | Apr-80 gpm | Apr-80 feet-bgs | Apr-80 feet-bgs | Apr-80 gpm/ft | Apr-80 $ft^2$/day | HP |
| **45B** | -- | -- | -- | -- | -- | -- | -- | -- | Jan-80 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | Apr-80 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | Feb-81 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 2280268.84 | 6555538.15 | 2116.41 | | | | 2115.19 | | Oct-07 | 298.05 | 1818.36 | -- | -- | -- | -- | -- | -- | |
| **46** | -- | -- | 2047.5 | 275 | 320 | 45 | | 830 | 1974 | 235 | 1812.50 | 595 | -- | -- | -- | -- | -- | |
| | | | | | | | 2040 | | Jan-80 | 350.0 | 1690.0 | 480 | -- | -- | -- | -- | -- | 150 |
| | | | | | | | | | Apr-80 | 350.0 | 1690.0 | 480 | 1286 | 391.0 | 41.0 | 31 | 6,290 | |
| | | | | | | | | | Feb-81 | 335.3 | 1704.7 | 495 | -- | -- | -- | -- | -- | |
| | 2283302.96 | 6561922.49 | 2050.49 | -- | -- | -- | 2050.09 | | Oct-07 | 210.22 | 1840.3 | 620 | -- | -- | -- | -- | -- | |
| **47** | -- | -- | 2252.50 | -- | -- | -- | | 887 | 1974 | 290.00 | 1962.5 | 597 | -- | -- | -- | -- | -- | |
| | | | | | | | 2255 | 887 | Jan-80 | 470.2 | 1784.8 | 417 | -- | -- | -- | -- | -- | 150 |
| | | | | | | | | | Apr-80 | 470.2 | 1784.8 | 417 | 1584 | 481.0 | 10.8 | 147 | 29,412 | |
| | | | | | | | | | Feb-81 | 487.2 | 1767.8 | 400 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 469.4 | 1783.1 | 418 | -- | -- | -- | -- | -- | |
| | 2276132.32 | 6549327.05 | 2254.34 | | | | 2251.57 | | Oct-07 | 435.74 | 1818.6 | 451 | -- | -- | -- | -- | -- | |
| **48** | -- | -- | -- | 250[8] | 813 | 563 | | 904 | 1973 | 260.00 | 1960.5 | 644 | -- | -- | -- | -- | -- | |
| | | | | | | | 2215 | | Jan-80 | 441.4 | 1773.6 | 463 | -- | -- | -- | -- | -- | 200 |
| | | | | | | | | | Apr-80 | 441.4 | 1773.6 | 463 | 1419 | 451.6 | 10.2 | 139 | 27,898 | |
| | | | | | | | | | Feb-81 | 455.8 | 1759.2 | 448 | -- | -- | -- | -- | -- | |
| | 2275598.60 | 6551058.74 | 2223.23 | | | | 2222.73 | | Oct-07 | 404.95 | 1818.3 | 499 | -- | -- | -- | -- | -- | Pump Removed |
| **49** | -- | -- | 2146.1 | -- | -- | -- | | 800 | 1974 | 260.0 | 1886.1 | 540 | -- | -- | -- | -- | -- | |
| | | | | | | | 2165 | | Jan-80 | 371.0 | 1794.0 | 429 | -- | -- | -- | -- | -- | 150 |
| | | | | | | | | | Apr-80 | 371.0 | 1794.0 | 429 | 1114 | 380.0 | 9.0 | 124 | 24,822 | |
| | | | | | | | | | Feb-81 | 383.0 | 1782.0 | 417 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Jul-97 | 375.0 | 1771.1 | 425 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 370.4 | 1775.7 | 430 | -- | -- | -- | -- | -- | |
| | 2278867.08 | 6553918.23 | 2146.13 | | | | 2145.15 | | Oct-07 | 310.82 | 1835.3 | 489 | -- | -- | -- | -- | -- | |
| **50** | -- | -- | 2080 | --[9] | --[9] | -- | | 950 | 1973 | 245.00 | 1835.0 | 705 | -- | -- | -- | -- | -- | |
| | | | | | | | 2085 | | Jan-80 | 303.4 | 1781.6 | 647 | -- | -- | -- | -- | -- | 125 |
| | | | | | | | | | Apr-80 | 303.4 | 1781.6 | 647 | 500 | 471.5 | 168.1 | 3 | 596 | |
| | | | | | | | | | Feb-81 | 304.2 | 1780.8 | 646 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 293.9 | 1786.1 | 656 | -- | -- | -- | -- | -- | |
| | 2282504.17 | 6557805.80 | 2081.95 | | | | 2081.20 | | Oct-07 | 256.8 | 1825.1 | 693 | -- | -- | -- | -- | -- | |
| **51** | -- | -- | 2080.6 | 295 | 785 | 490 | | 785 | 1976 | 185.0 | 1895.6 | 600 | -- | -- | -- | -- | -- | |
| | | | | | | | 2085 | | Jan-80 | 324.0 | 1761.0 | 461 | -- | -- | -- | -- | -- | 150 |
| | | | | | | | | | Apr-80 | 324.0 | 1761.0 | 461 | 965 | 357.7 | 33.7 | 29 | 5,742 | |
| | | | | | | | | | Feb-81 | 301.0 | 1784.0 | 484 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 303.9 | 1776.7 | 481 | -- | -- | -- | -- | -- | |
| | 2283866.63 | 6555448.03 | 2083.24 | | | | 2082.84 | | Oct-07 | -- | -- | -- | -- | -- | -- | -- | -- | |

**Table J.3-1**
**Well Details - Water Supply Wells on The Plant Site**
**(REVISED DECEMBER 2008)**
**Beacon Solar Energy Project**

| Well Number[1] | Northing[2] | Easting[2] | Top of Casing[2] | Top of Screen[10] | Bottom of Screen[10] | Saturated thickness | Ground Surface Elevation[2] | Total Depth[3] | Depth to Water[4] | | Groundwater Elevation[5] | Saturated Thickness | Pumping Rate[4] | Pumping Water Level[4] | Drawdown[4] | Specific Capacity[6] | Estimate of Transmissivity[7] | Pump[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | feet-msl | feet-msl | feet-msl | feet-msl | feet-msl | feet-bgs | Date | feet-bgs | | feet (Oct-07) | Apr-80 | Apr-80 | Apr-80 | Apr-80 | Apr-80 | HP |
| | | | | | | | | | | | | | gpm | feet-bgs | feet-bgs | gpm/ft | $ft^2$/day | |
| **63** | | | -- | 500[8] | 1730 | 1230 | -- | 1740 | -- | -- | -- | -- | -- | -- | -- | -- | -- | no pump |
| | | | 2130.1 | | | | | | 1981 | 404 | 1726.1 | 1336 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Jul-97 | 349 | 1781.1 | 1391 | -- | -- | -- | -- | -- | |
| | | | | | | | | | Nov-97 | 354 | 1776.1 | 1386 | -- | -- | -- | -- | -- | |
| | 2279660.56 | 6554343.52 | 2132.16 | | | | 2131.00 | | Oct-07 | 313.25 | 1818.9 | 1427 | -- | -- | -- | -- | -- | |
| | | | | | | | | | | | | | | **Average** | **43** | **70** | **14,037** | |

**Notes:**

1 Wells shown on **Figure 5.17-8**.
2 Survey conducted October 2, 2007 to provide coordinates, ground surface elevation and top of casing. Survey conducted by WM Holdings Incorporated (William Meagher, Liscense 5948). Ground surface elevations for January 1980 provided by Switzer (2007). Elevations resurveyed October 2007.
3 Total depth of the well as provided by Switzer (2007). Well depth taken from Figure 4, "Fremont Valley Ranch - Groundwater Well Map". Figure provide by Switzer (2007) as part of the Phase I ESA.
4 Information provided by Switzer (2007) from a pumping test performed by Southern California Edison April 1980
5 January 1980, April 1980 and February 1981 estimated from ground surface elevation data. October 2007 elevations estimated from top of casing elevation that was resurveyed October 2, 2007.
6 Specific Capacity (Q/ds) estimated as the rate of water pumped divided by the drawdown (gpm/ft).
7 Transmissivity estimated after Driscoll (1986, pg. 1021). Q/ds = Transmissivity/1,500 (assuming an unconfined aquifer).
8 Top of screen confirmed by video logging performed during pumping test.
9 Well data not complete due to poor data quality in provided records.
10 Top and bottom of screen confirmed from the Table 2.2 and drillers logs provided in the EarthSat (1997) report.

**Definitions:**

bgs below ground surface
$ft^2$/day feet squared per day
gpm gallons per minute
gpm/ft gallons per minute per foot of drawdown
Hp horse power
msl mean sea level
-- unknown or information not provided

**Table DR-112W**
**Water Balance Comparison**
**Conceptual Site Model and Numerical Groundwater Model**
**Beacon Solar Energy Project**
**Kern County, California**

| | 1958 | | 1976 | | 2007 | |
|---|---|---|---|---|---|---|
| | Conceptual Model | Groundwater Model | Conceptual Model | Groundwater Model | Conceptual Model | Groundwater Model |
| **Water Balance Components** | acre-feet per year | | | | | |
| **Inflow** | | | | | | |
| Flow from California City | 1,000 | 997 | 1,000 | 997 | 1,000 | 997 |
| Flow across Muroc Fault | -- | 670 | -- | 670 | -- | 670 |
| Mountain-Front Recharge | 6,800-7,800 | 15,000 | 6,800-7,800 | 15,000 | 6,800-7,800 | 15,000 |
| Groundwater flow from Northeast | 3,000 | 3,450 | 3,000 | 3,450 | 1,000-3,000 | 3,450 |
| of Koehn Lake | | | | | | |
| **Outflow** | | | | | | |
| Evaporation from Koehn Lake | -- | 15,800 | -- | 0 | 2,800-3,000 | 0 |
| Water use by Honda Wells | none | 0 | 0 | 0 | 150 | included with ag pumping[3] |
| Domestic Water Use[1] | not considered | 0 | not considered | not considered | 50 | included with ag pumping[3] |
| Agricultural Water Use[2] | up to 18,000 | 846 | 60,000 | 60,000 | 843 | 846 |

**Notes**

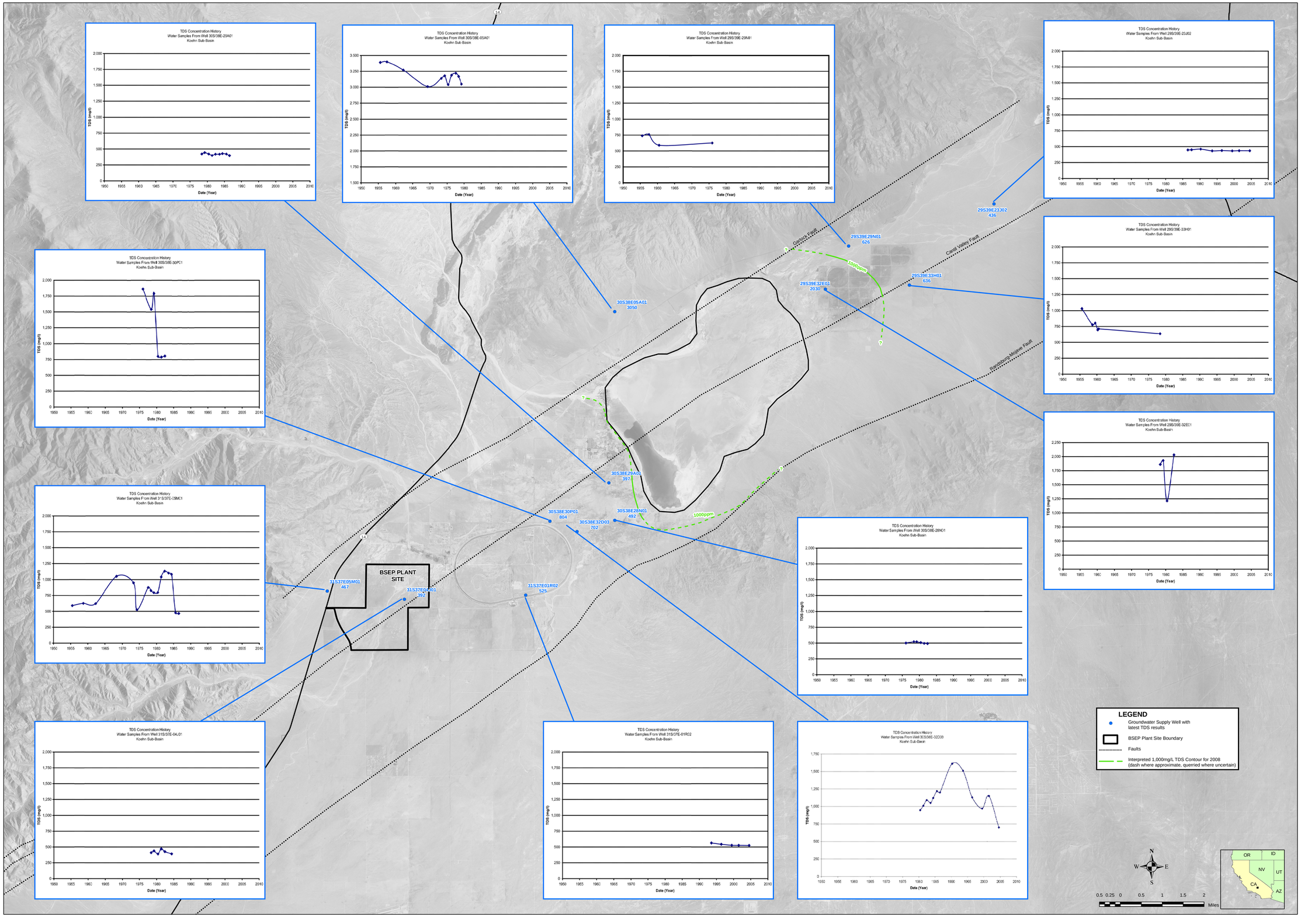
1 = "Domestic water" use was not considered in some cases since it was a fraction of the agricultural water use and there was no data from which to provide an annualized volume e
2 = "Agricultural use" is after Koehler, 1977 for 1958 and 1976. The value for 2007 is based on an estimate of acres under agricultural use from field surveys and photographic resea
3 = "Included with ag pumping" indicates that the model combined domestic and Honda water usage into the agricultural useage.
-- = Not known or available in literature for the Koehn Sub-basin.

**Table 115W**
**Summary of Sensitivity Analysis**
**Numerical Groundwater Model**
**Beacon Solar Energy Project**
**Kern County, California**

| ***Maximum Drawdowns for the Calibrated Model and Sensitivity Runs in the Three On-Site Aquifer Tests.*** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Simulation** | **Well 43 Test - Drawdown** | | | **Well 48 Test - Drawdown** | | | **Well 63 Test - Drawdown** | | |
| | **Well 46** | **Well 50** | **USGS Well** | **Well 41** | **Well 47** | **Well 49** | **Well 44** | **Well 45B** | **Well 49** |
| Measured | 1.05 | 0.85 | 12.37 | 1.93 | 2.75 | 0.41 | 7.26 | 0.92 | 6.17 |
| Calibrated | 1.08 | 0.05 | 11.66 | 1.95 | 1.88 | 1.34 | 6.21 | 1.09 | 6.49 |
| Kx times 2 | 1.19 | 0.05 | 9.22 | 2.34 | 2.10 | 1.80 | 4.78 | 1.06 | 5.84 |
| Kx times 0.5 | 1.12 | 0.06 | 14.60 | 1.94 | 2.47 | 1.41 | 9.88 | 1.44 | 9.21 |
| Ss times 2 | 0.40 | 0.01 | 8.18 | 1.12 | 1.29 | 0.76 | 5.53 | 0.52 | 6.08 |
| Ss times 0.5 | 1.13 | 0.05 | 12.19 | 2.22 | 2.31 | 1.68 | 6.89 | 1.16 | 7.37 |
| No Fault | 0.62 | 0.03 | 5.68 | 1.84 | 2.14 | 1.30 | 5.17 | 0.94 | 6.16 |
| No Zone 7 | 2.94 | 2.01 | 3.12 | 1.96 | 2.26 | 1.18 | 4.00 | 3.80 | 4.48 |
| Recharge Times 2 | 1.08 | 0.05 | 11.66 | 1.95 | 1.88 | 1.34 | 6.21 | 1.09 | 6.49 |
| Recharge Times 0.5 | 1.08 | 0.05 | 11.66 | 1.95 | 1.88 | 1.34 | 6.21 | 1.09 | 6.49 |

## Attachment A

J:\GIS\Projects\10056-Beacon\mxd\TDS-poster.mxd




Beacon Solar

ENSR | AECOM

**BSEP**

**TDS TREND DATA POST 1976**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

SCALE:

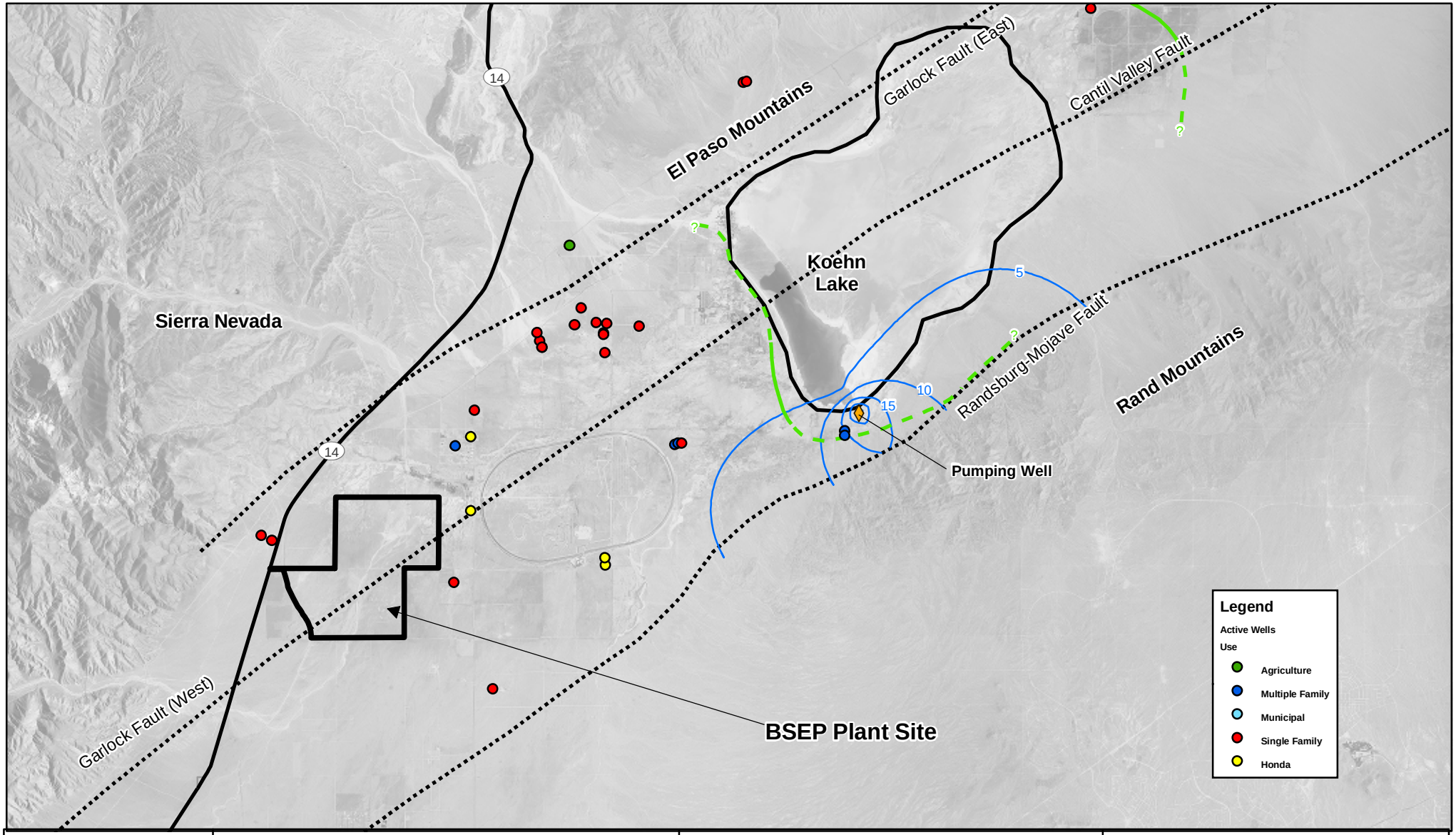
FIGURE NUMBER:

**96W1**

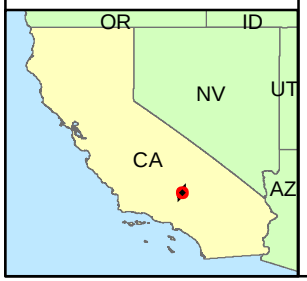
SHEET NUMBER:

X

J:\GIS\Projects\10056-Beacon\mxd\tds-jimr.mxd




Map Location




**Legend**

- Model Simulated Draw Down
- Fault
- BSEP Plant Site Boundary
- 1,000ppm TDS Contour Post-1976 (dash where approximate, quarried where uncertain)

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 Miles

1:126,720

**BSEP**

**Figure 96W2**
**Hypothetical "Poor Water Quality" Water Supply Well**

Beacon Solar

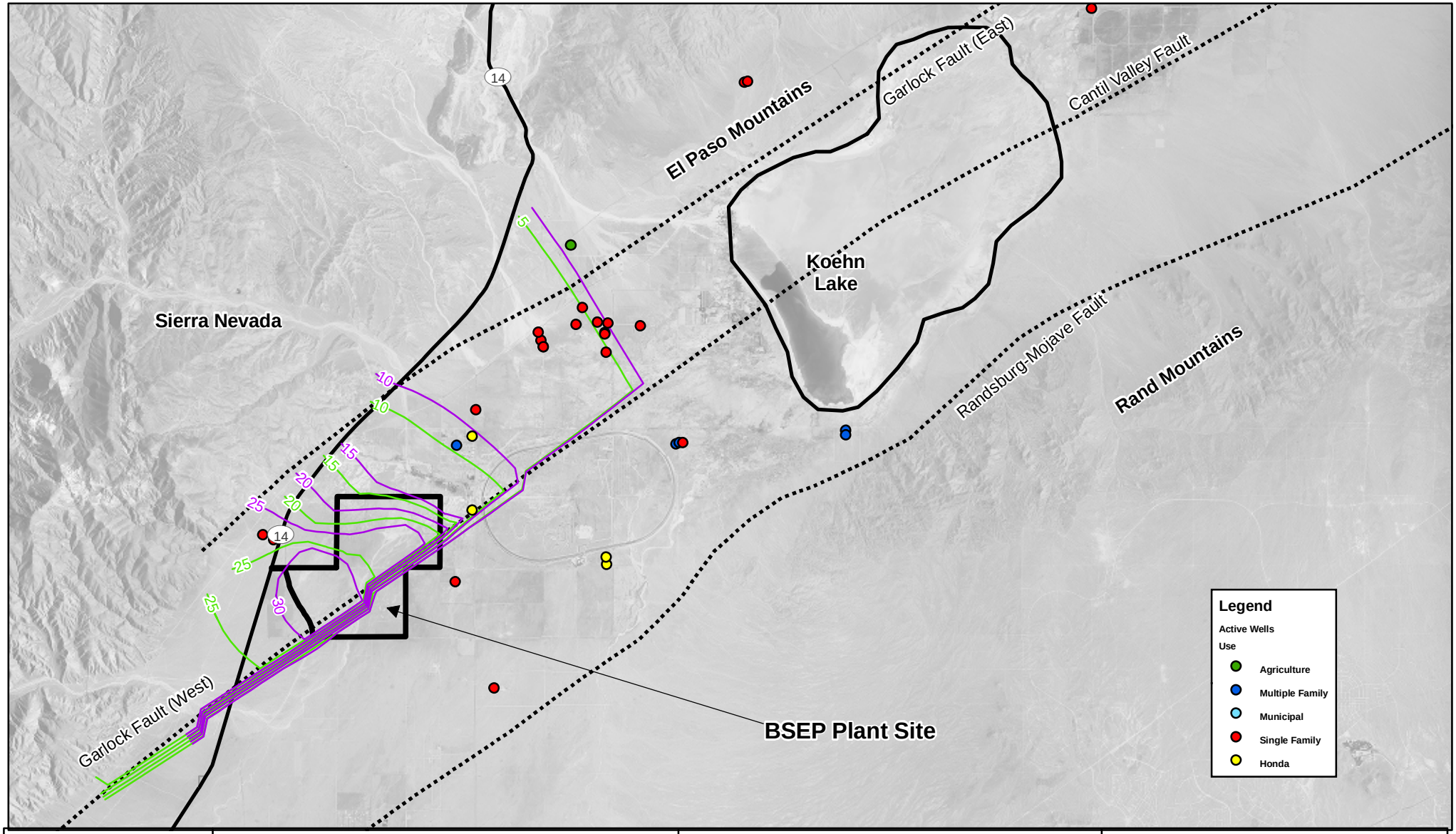
ENSR | AECOM

Project: 10056-014
Date: Dec. 2008

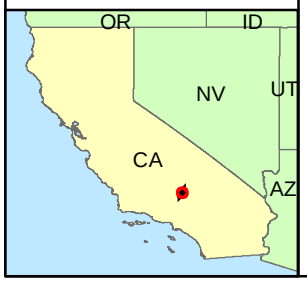
J:\GIS\Projects\10056-Beacon\mxd\tds-jimr.mxd

## Attachment B

J:\GIS\Projects\10056-Beacon\mxd\recharge_w63-jimr.mxd




Map Location




**Legend**

- Simulated Drawdown - Recharge 10,000 AFY
- Simulated Drawdown - Recharge 25,000 AFY
- Fault

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 Miles

1:126,720

**BSEP**

**Figure 114W1**
**Sensitivity Analysis**
**Recharge Well 63**

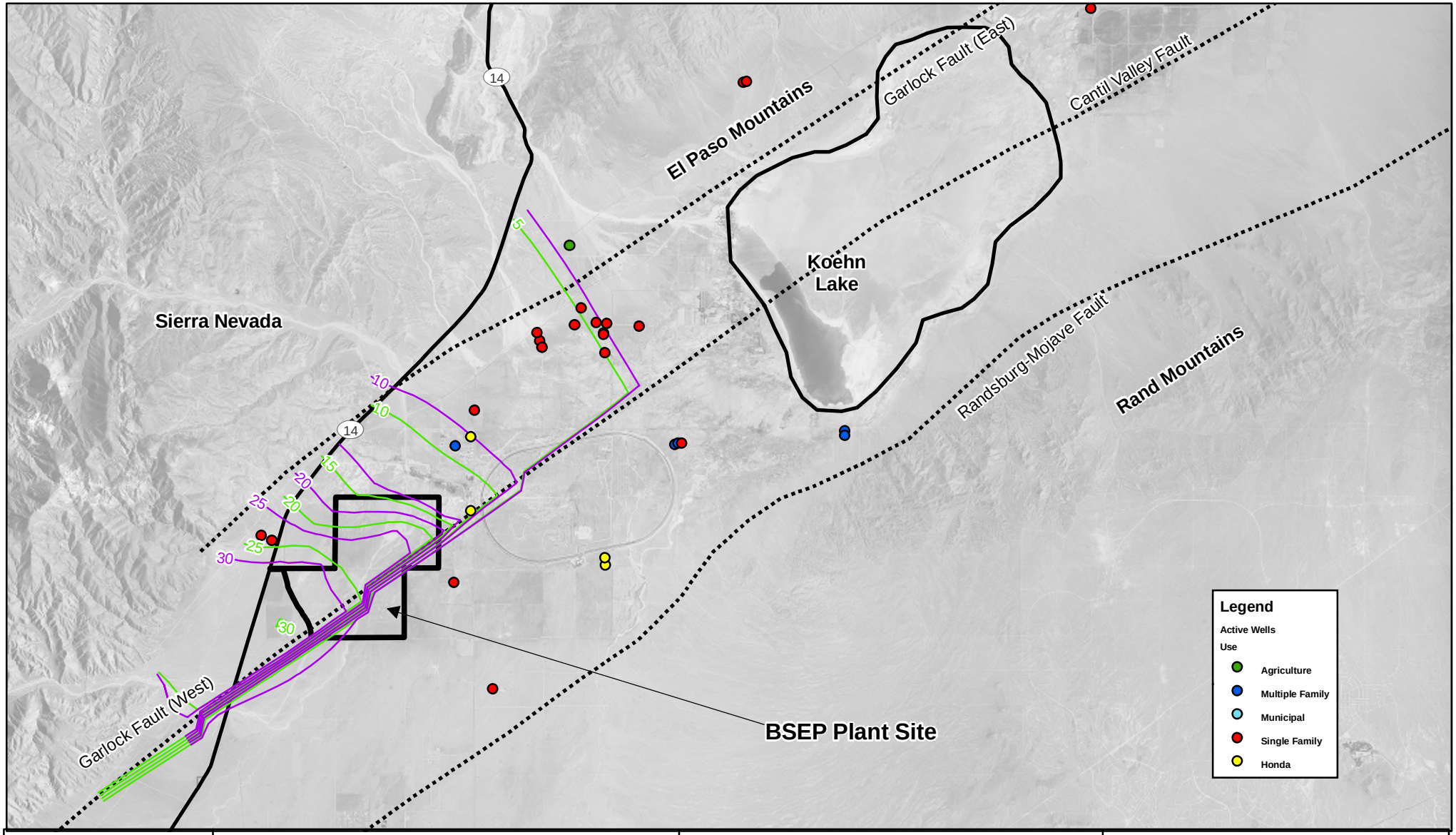
Beacon Solar

ENSR | AECOM

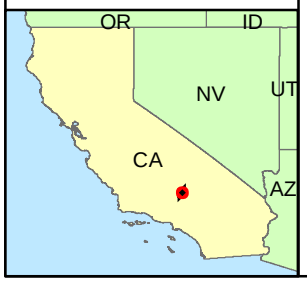
Project: 10056-014
Date: Dec.. 2008

J:\GIS\Projects\10056-Beacon\mxd\recharge_w63-jimr.mxd

J:\GIS\Projects\10056-Beacon\mxd\recharge_w48-jimr.mxd




Map Location




**Legend**

- Simulated Drawdown - Recharge 10,000 AFY
- Simulated Drawdown - Recharge 25,000 AFY
- Fault

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 Miles

1:126,720

N W E S

**BSEP**

**Figure 114W2**
**Sensitivity Analysis**
**Recharge Well 48**

Beacon Solar

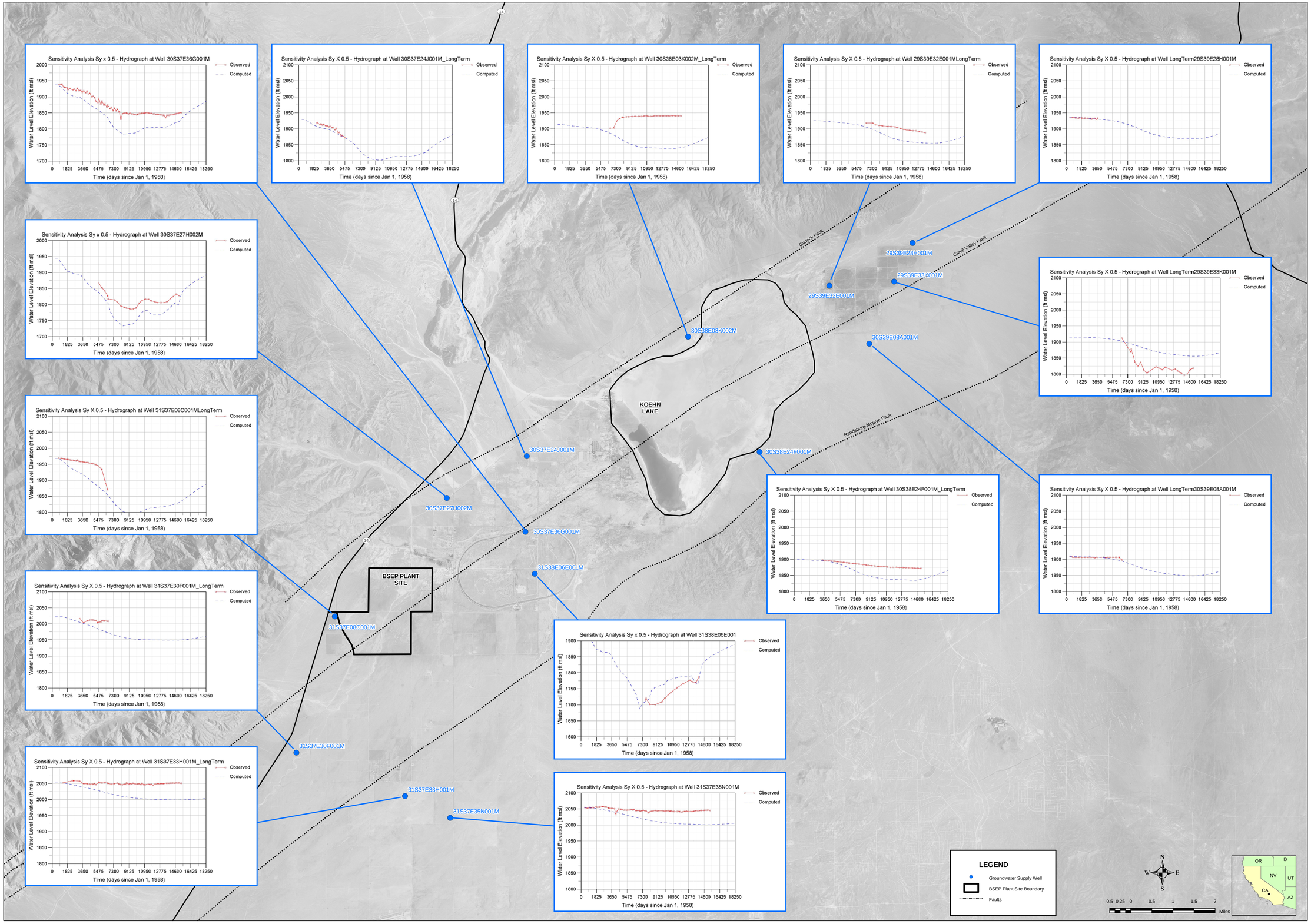
ENSR | AECOM

Project: 10056-014
Date: Dec. 2008

J:\GIS\Projects\10056-Beacon\mxd\recharge_w48-jimr.mxd

## Attachment C

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-specific_yield-half.mxd




Beacon Solar

ENSR | AECOM

**BSEP**

**Sensitivity Analysis Hydrographs**
**Specific Yield 1/2 Model Values**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

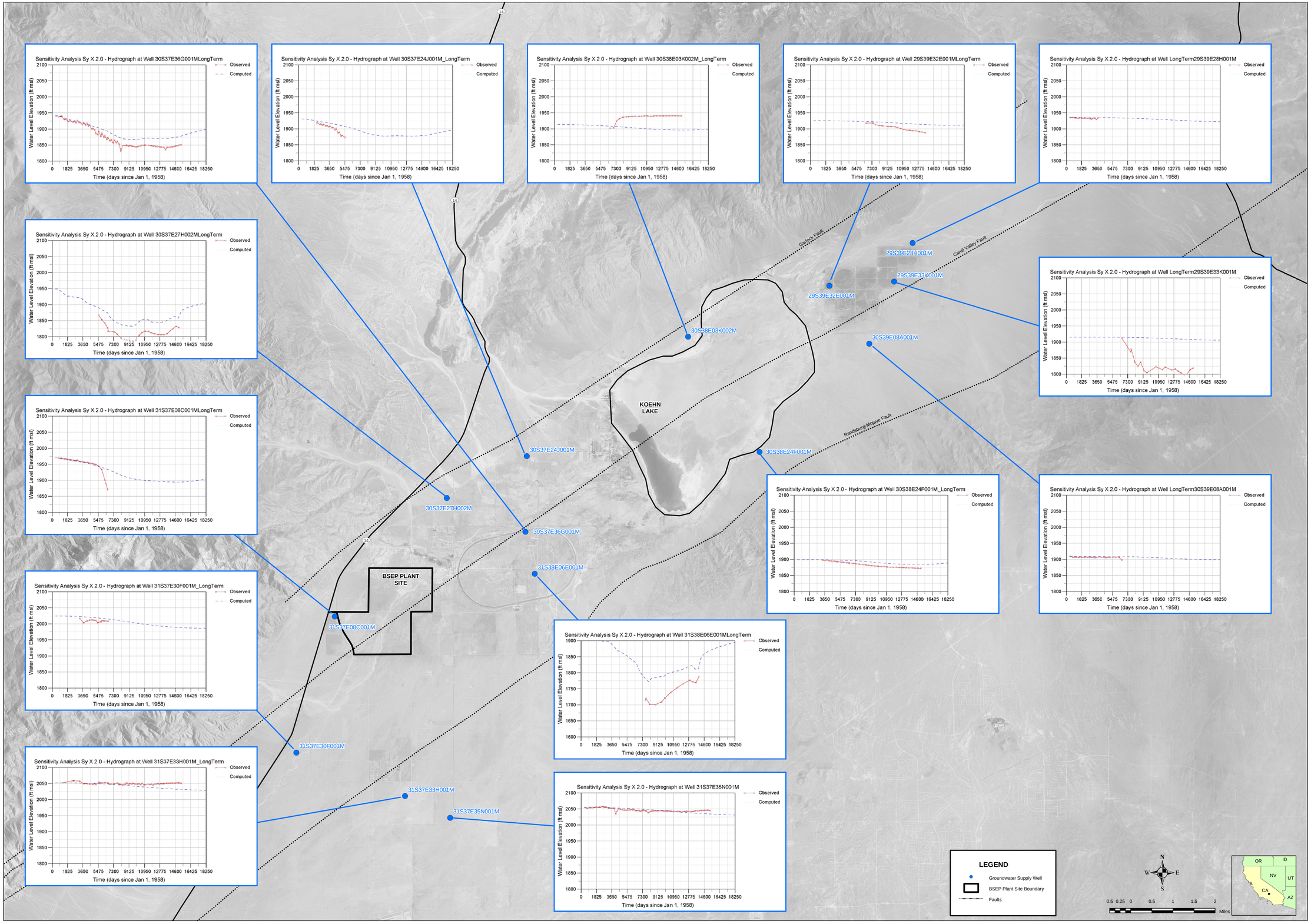
SCALE:

FIGURE NUMBER:

**115W(a)**

SHEET NUMBER:

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-specific_yield-2x.mxd




Beacon Solar

ENSR | AECOM

**BSEP**

**Sensitivity Analysis Hydrographs**
**Specific Yield 2x Modeled Values**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

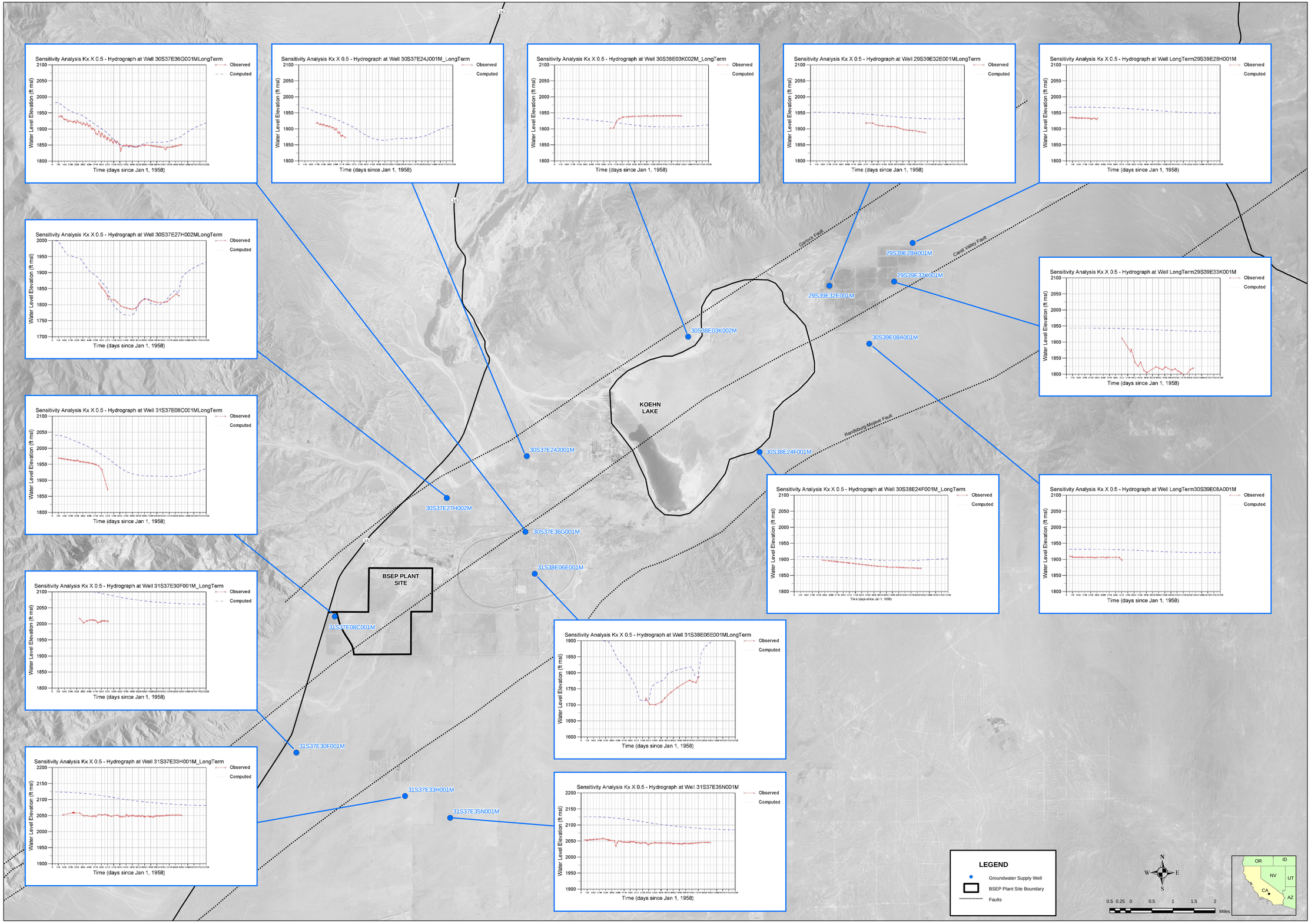
SCALE:

FIGURE NUMBER:

**115W(b)**

SHEET NUMBER:

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-hc_half.mxd




Beacon Solar

ENSR | AECOM

**BSEP**
**Sensitivity Analysis Hydrographs**
**Hydraulic Conductivity**
**1/2 Modeled Values**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

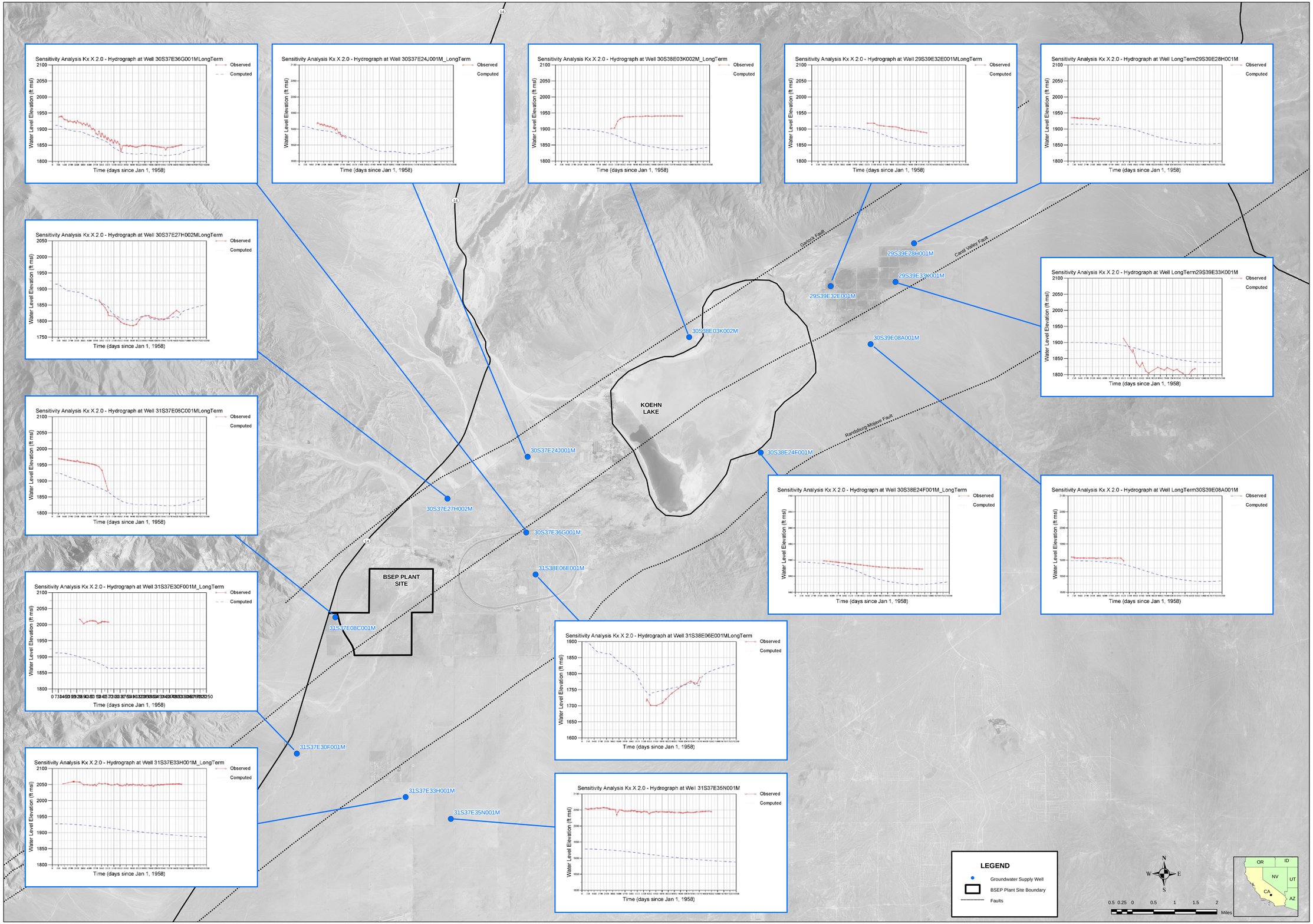
SCALE:

FIGURE NUMBER:

**115W(c)**

SHEET NUMBER:

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-hc_2x.mxd




Beacon Solar

ENSR | AECOM

**BSEP**
**Sensitivity Analysis Hydrographs**
**Hydraulic Conductivity**
**2x Modeled values**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

SCALE:

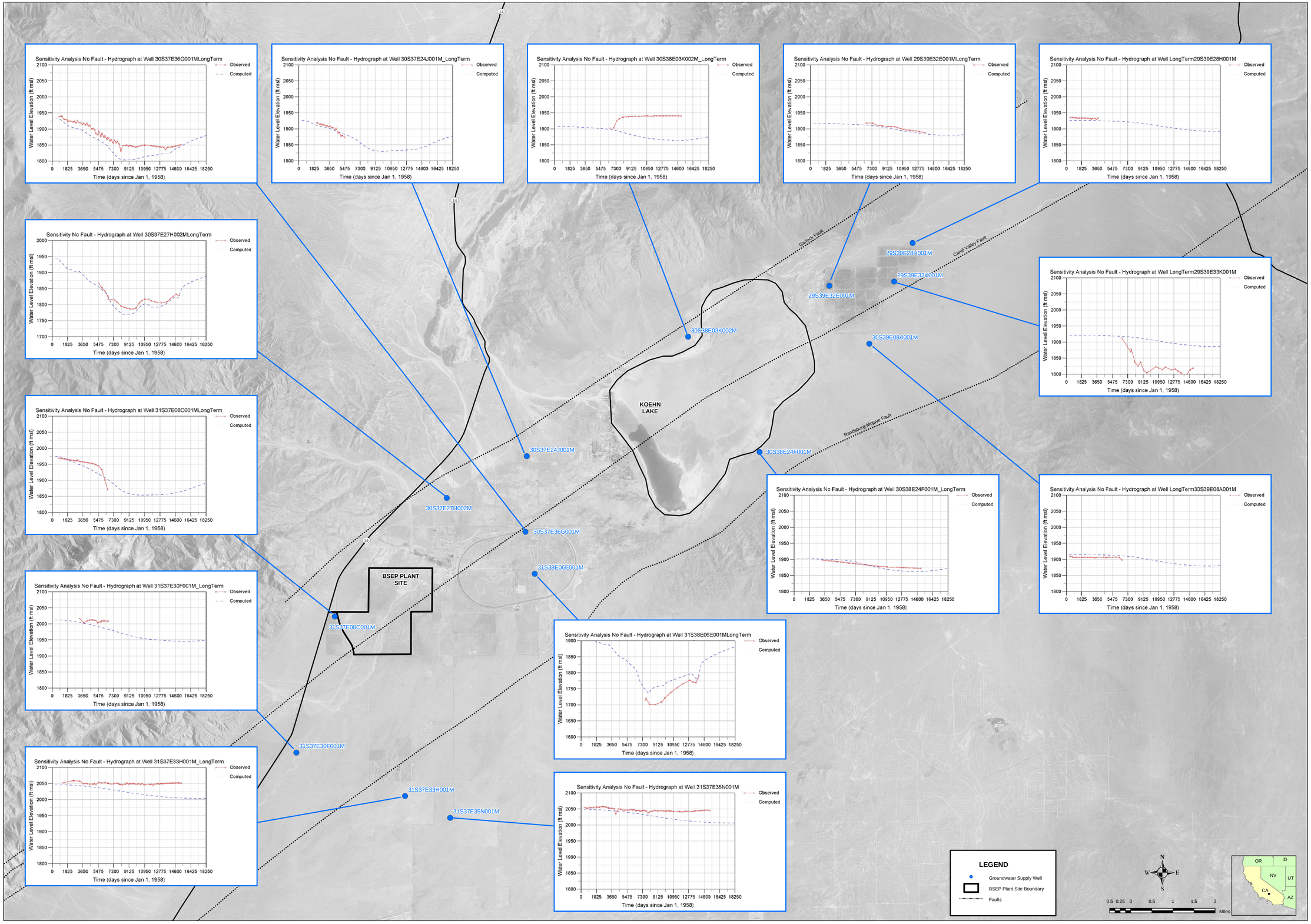
FIGURE NUMBER:

**115W(d)**

SHEET NUMBER:

X

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-nofault.mxd




Beacon Solar

ENSR | AECOM

**BSEP**

**Sensitivity Analysis Hydrographs No Fault**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

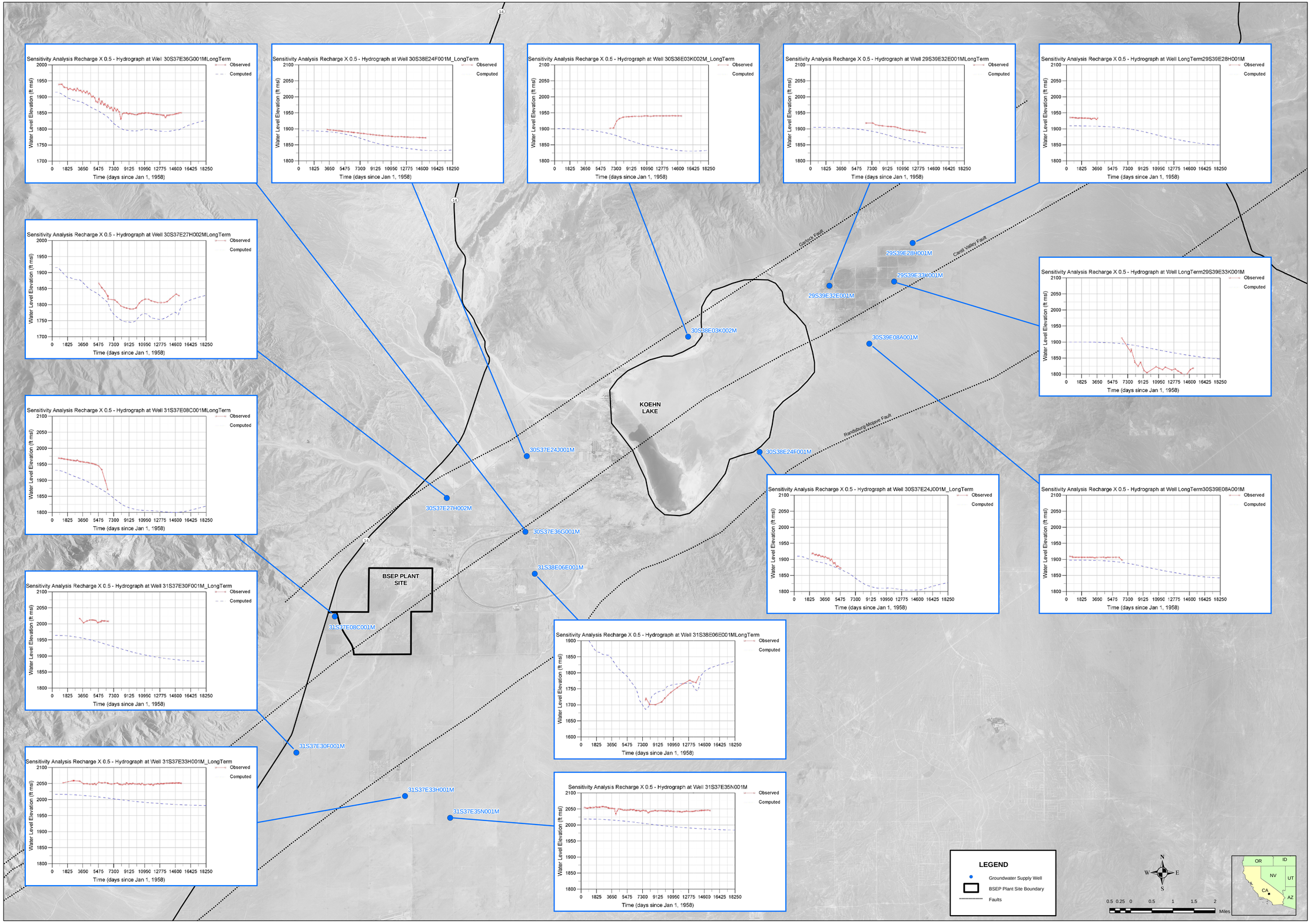
SCALE:

FIGURE NUMBER:

**115W(f)**

SHEET NUMBER:

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-recharge-half.mxd




Beacon Solar

ENSR | AECOM

**BSEP**

**Sensitivity Analysis Hydrographs Recharge 1/2 Model Value**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

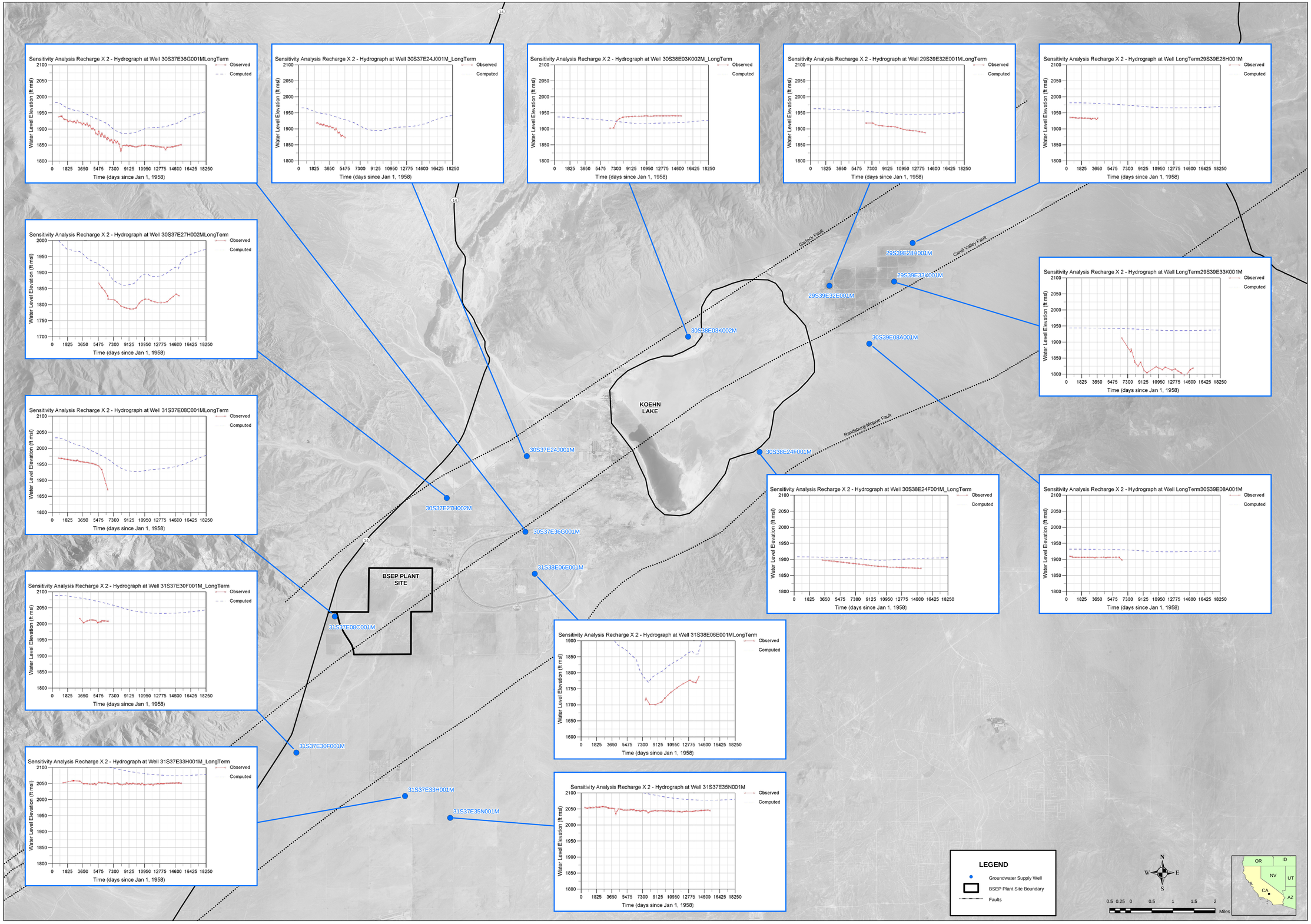
SCALE:

FIGURE NUMBER:

**115W(g)**

SHEET NUMBER:

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-recharge-2x.mxd




Beacon Solar

ENSR | AECOM

**BSEP**

**Sensitivity Analysis Hydrographs Recharge 2x Model Value**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

SCALE:

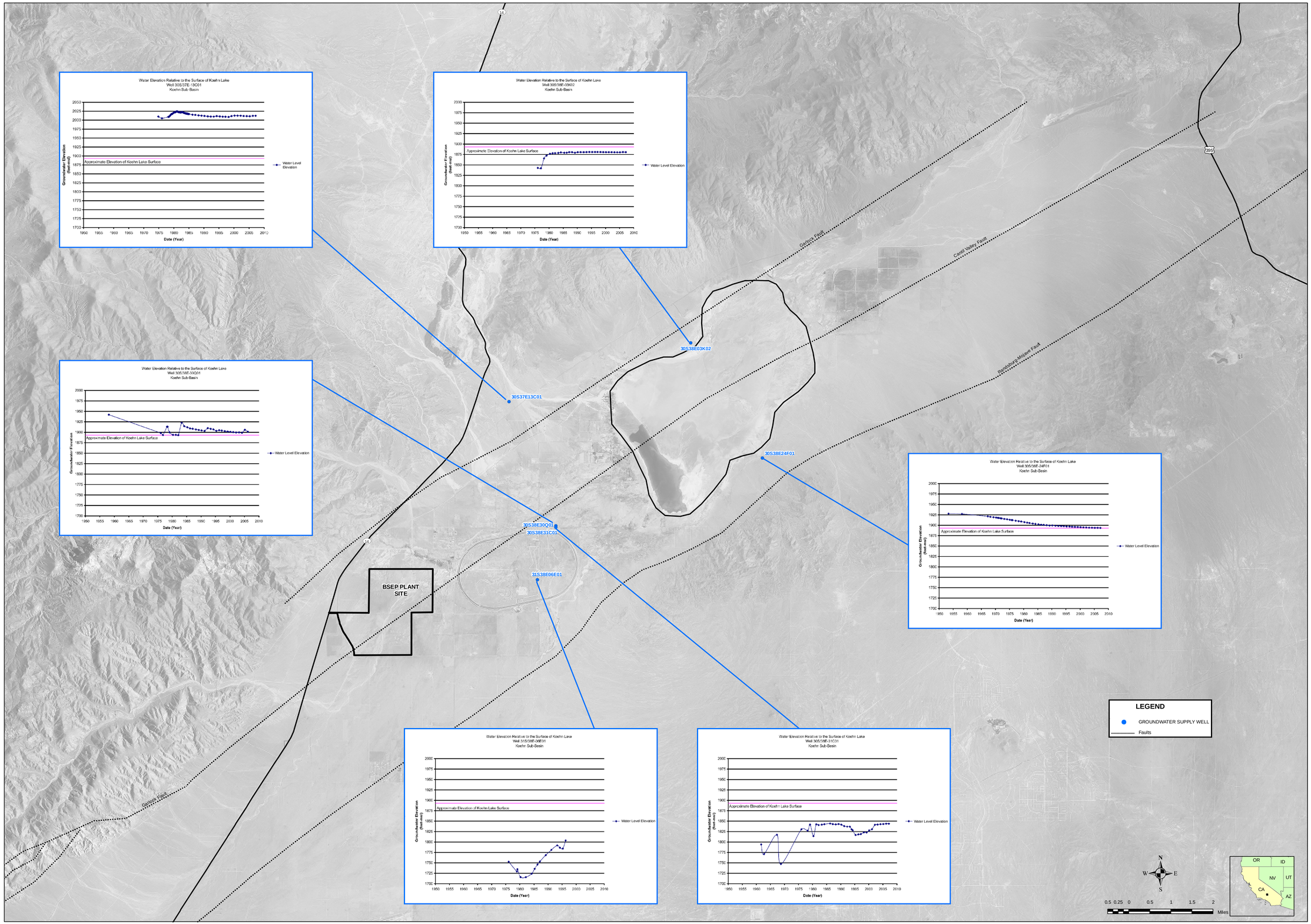
FIGURE NUMBER:

**115W(h)**

SHEET NUMBER:

## Attachment D

J:\GIS\Projects\10056-Beacon\mxd\GW Levels-poster.mxd




Beacon Solar

ENSR | AECOM

# BSEP

## SELECTED HYDROGRAPHS IN VICINITY OF KOEHN LAKE

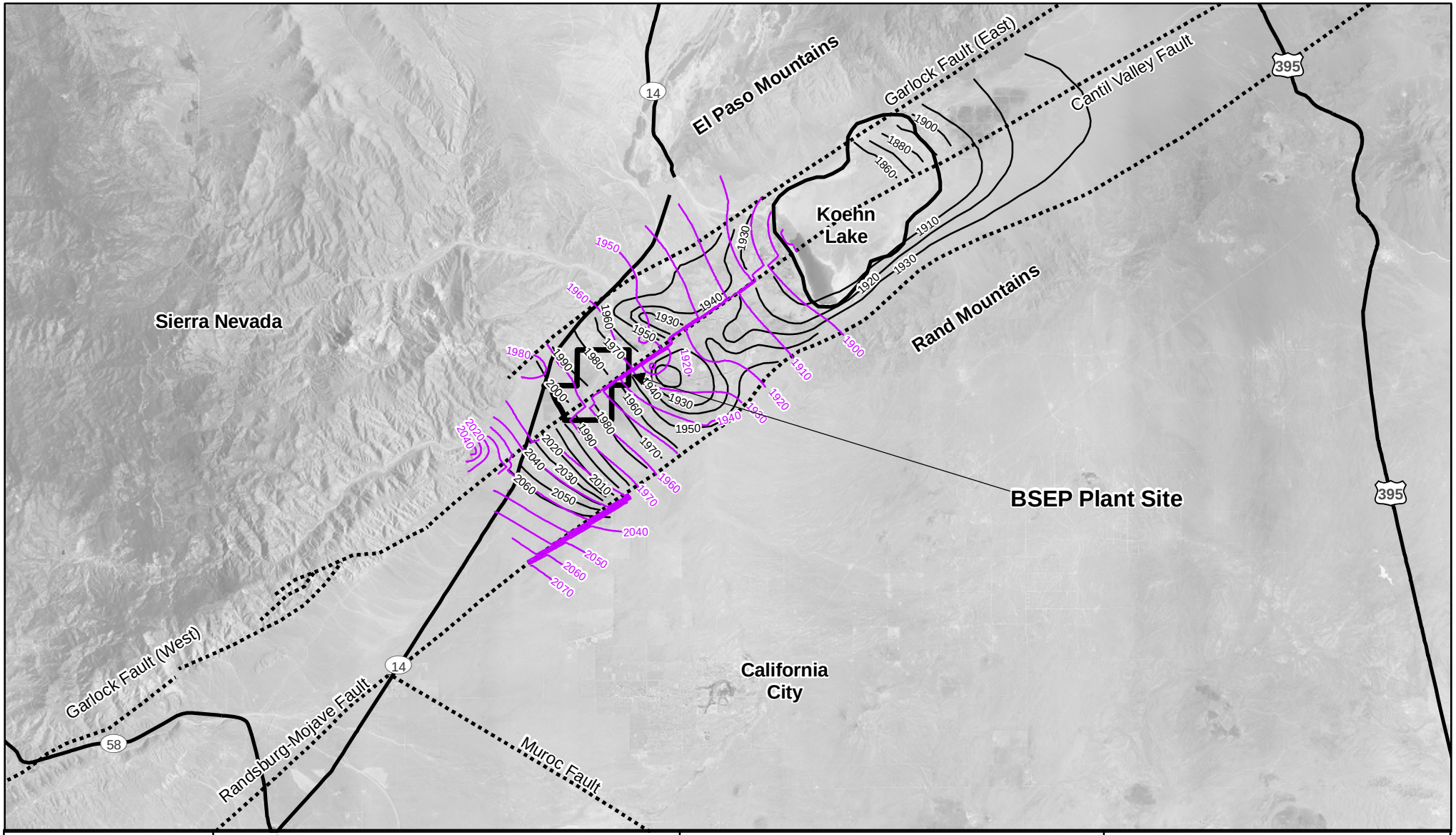
| SCALE: | DATE: | PROJECT NUMBER: |
|---|---|---|
| AS NOTED | Dec. 2008 | 10056-014-300 |

FIGURE NUMBER:

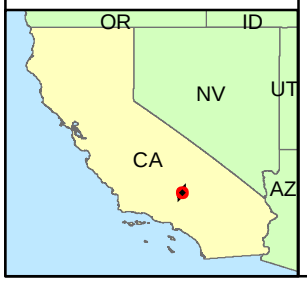
116W

SHEET NUMBER:

## Attachment E




Map Location




**Legend**

- Predicted WaterTable
- Groundwater Contour (feet amsl) (Koehler, 1977)
- Fault
- BSEP Plant Site Boundary

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 6 8 Miles

1:253,440

**BSEP**

**Figure 118W1**
**Steady - State Calibration**
**Predicted vs. 1958 Water Levels**
**after Koehler, 1977**

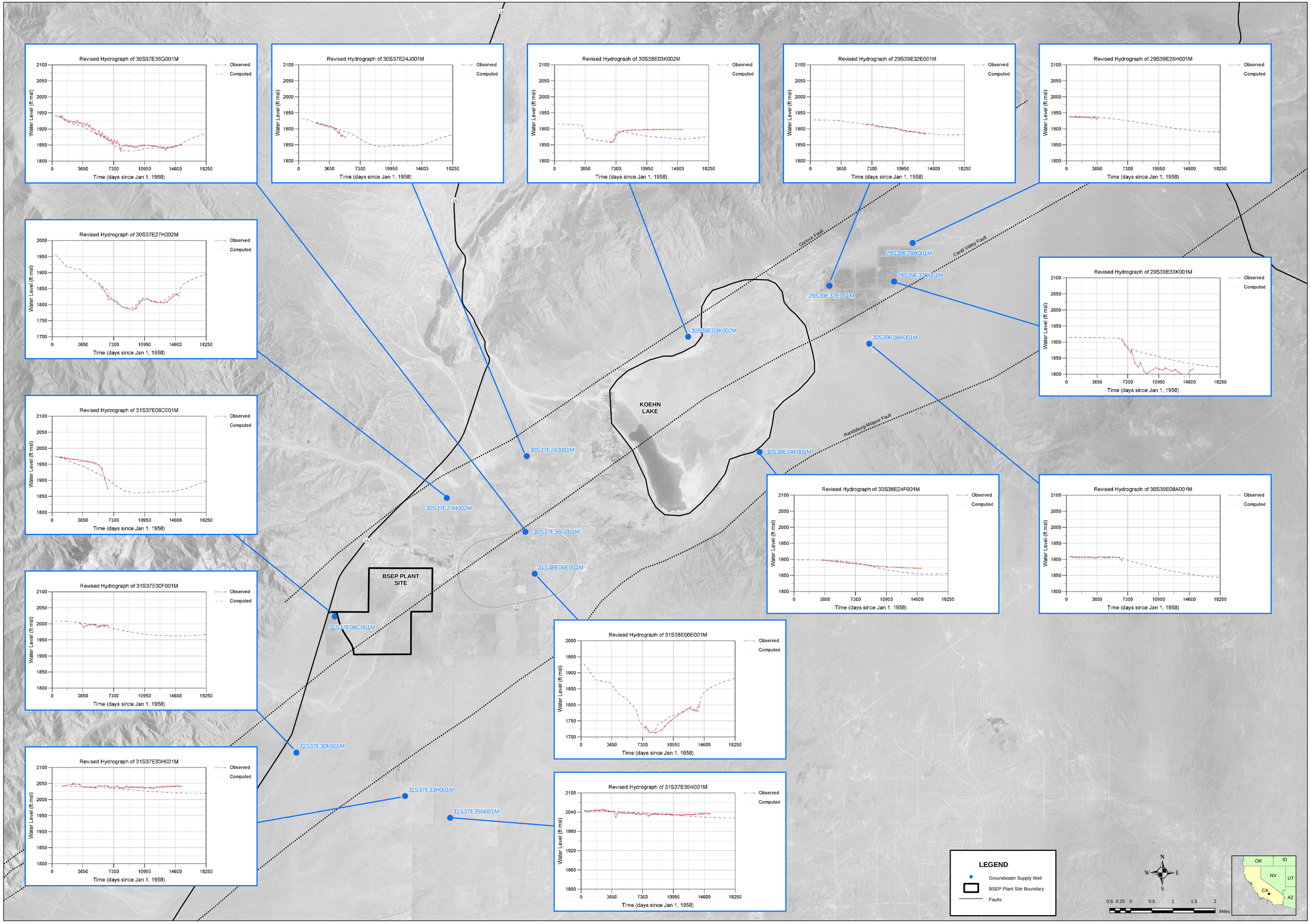
Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Dec. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure 118W1.mxd

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-revised.mxd




Beacon Solar

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**BSEP**
**Model Calibration**
**Selected Hydrographs**
**Simulated vs. Measured Water Levels**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

SCALE:

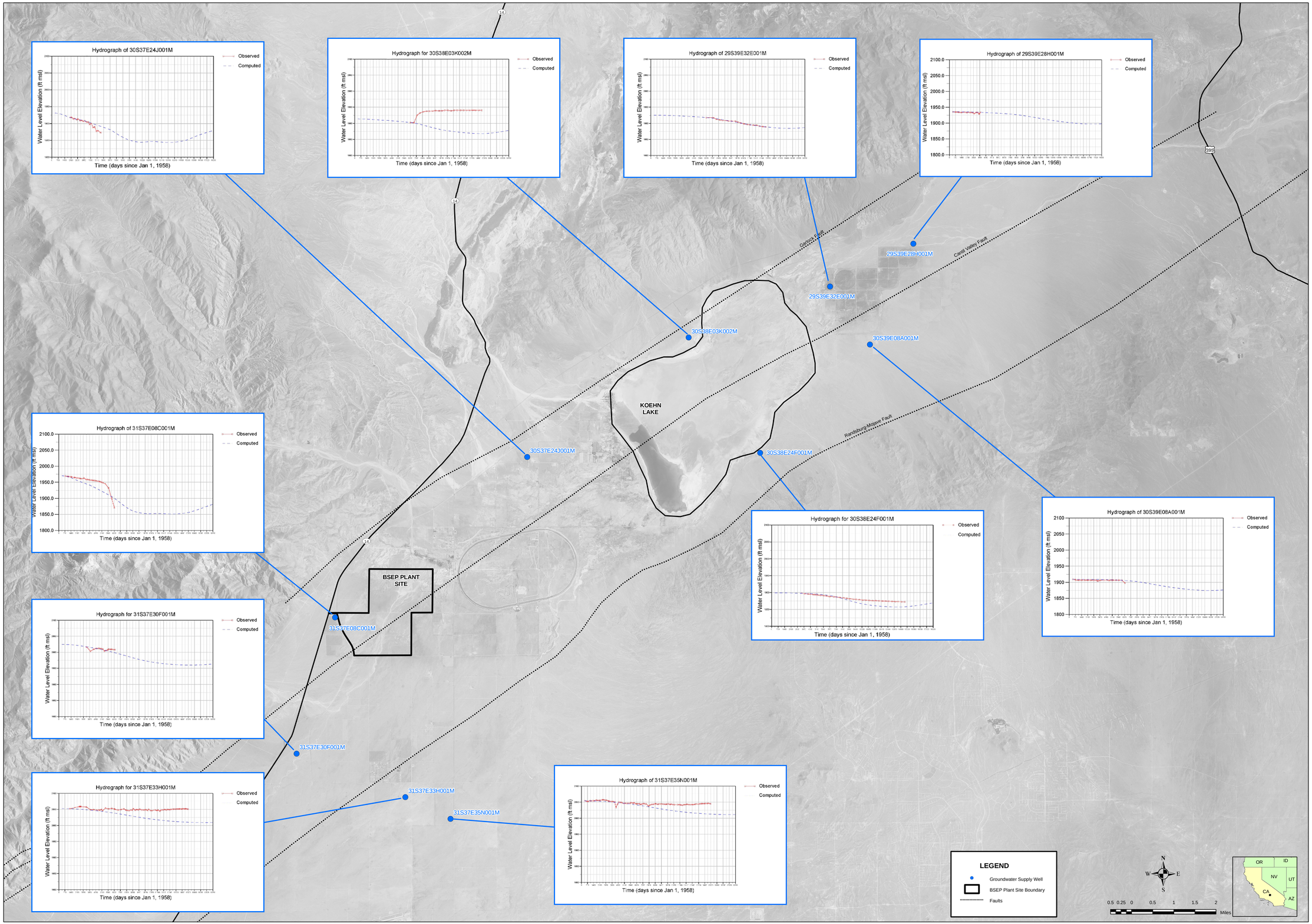
FIGURE NUMBER:

**118W2**

SHEET NUMBER:

# Attachment F

J:\GIS\Projects\10056-Beacon\mxd\hydrograph-121.mxd




Beacon Solar

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**BSEP**

**Model Verification**

PROJECT NUMBER: 10056-014-300

DATE: Dec. 2008

SCALE:

FIGURE NUMBER:

**121W**

SHEET NUMBER:

**BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA**

| | |
|---|---|
| **APPLICATION FOR CERTIFICATION FOR THE BEACON SOLAR ENERGY PROJECT** | DOCKET NO. 08-AFC-2<br><br>**PROOF OF SERVICE**<br>(Revised 11/10/08) |

INSTRUCTIONS: All parties shall either (1) send an original signed document plus 12 copies or (2) mail one original signed copy AND e-mail the document to the address for the docket as shown below, AND (3) all parties shall also send a printed or electronic copy of the document, which includes a proof of service declaration to each of the individuals on the proof of service list shown below:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-2
1516 Ninth Street, MS-14
Sacramento, CA 95814-5512
docket@energy.state.ca.us

| | |
|---|---|
| Mike Argentine<br>FPL Energy, LLC<br>1465 Oak Hill Way<br>Roseville, CA 95661<br>Michael.argentine@fpl.com | Kenneth Stein, J.D.<br>Duane McCloud<br>Bill Narvaez<br>Meg Russell<br>FPL Energy, LLC<br>700 Universe Blvd., MS JES/JB<br>Juno Beach, FL 33408<br>Kenneth.stein@fpl.com<br>Guillermo.narvaez@fpl.com<br>Duane.mccloud@fpl.com<br>Meg.russell@fpl.com |
| Jane Luckhardt, Esq.<br>Downey Brand, LLP<br>621 Capitol Mall, 18th Floor<br>Sacramento, CA 95814<br>jluckhardt@downeybrand.com | Sara Head, Vice President<br>ENSR Corporation<br>1220 Avenida Acaso<br>Camarillo, CA 93012<br>shead@ensr.aecom.com |
| Geoffrey R. Baxter, P.E. – Project Manager<br>Worley Parsons<br>2330 E. Bidwell Street, Suite 150<br>Folsom, CA 95630<br>Geoffrey.baxter@worleyparsons.com | CA Independent System Operator<br>P.O. Box 639014<br>Folsom, CA 95763-9014<br>e-recipient@caiso.com |

| | |
|---|---|
| Tanya A. Gulesserian<br>Marc D. Joseph<br>Adams, Broadwell, Joseph & Cardozo<br>601 Gateway Blvd., Suite 1000<br>So. San Francisco, CA 94080<br>tgulesserian@adamsbroadwell.com | |
| Karen Douglas<br>Commissioner & Presiding Member<br>kldougla@energy.state.ca.us | Jeffrey D. Byron, Associate Member<br>jbyron@energy.state.ca.us |
| Kenneth Celli, Hearing Officer<br>kcelli@energy.state.ca.us | Jared Babula, Staff Counsel<br>jbabula@energy.state.ca.us |
| Eric K. Solorio, Project Manager<br>esolorio@energy.state.ca.us | Public Adviser<br>pao@energy.state.ca.us |

**DECLARATION OF SERVICE**

I, Lois Navarrot, declare that on December 10, 2008, I deposited copies of the attached **Supplemental Water Resources Responses 96, 98, 101-103, 114-116, 118, 119, 121** in the United States mail at Sacramento, California with first-class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above.

**OR**

Transmission via electronic mail was consistent with the requirements of the California Code of Regulations, title 20, sections 1209, 1209.5 and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

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

Lois Navarrot

Lois Navarrot