BEACON SOLAR ENERGY PROJECT

Supplemental Responses to CEC Data Requests 16; 30 & 32; 101-103, 106-109, 112, 114-115, & 117-123 Docket No. 08-AFC-2

Submitted by:

Beacon Solar, LLC

Submitted to:

California Energy Commission

October 23, 2008

Prepared by:

ENSR | AECOM

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 **PROOF OF SERVICE** (Revised 8/18/08)

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:

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DECLARATION OF SERVICE

I, Lois Navarrot, declare that on October 23, 2008, I deposited copies of the attached **Supplemental Response to CEC Data Requests 16; 30 & 32, 101-103, 106-109, 112, 114-115, & 117-123** 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

BEACON SOLAR ENERGY PROJECT

Supplemental Responses to CEC Data Requests
16; 30 & 32; 101-103, 106-109, 112, 114-115, & 117-123
Docket No. 08-AFC-2

by:

Beacon Solar, LLC

Submitted to:
California Energy Commission

Prepared by:
ENSR

October 23, 2008

Data Request 16:

Please provide a detailed raven monitoring and control plan that includes at least the following elements:

a. a discussion of how the monitoring and control plan will be coordinated with CDFG and USFWS;
b. area to be covered by the plan;
c. use of perch-deterrent devices and locations of installation, and other pre-construction measures that might reduce raven presence and nesting activities;
d. a monitoring plan, including a discussion of survey methods and frequency, for establishing baseline data on pre-project raven numbers and activities and assessing post-project changes from this baseline
e. remedial actions that could be taken (e.g., nest removal) if ravens are preying on desert tortoise and other wildlife; and
f. triggers for those remedial actions.

Revised Response:

An initial Draft Raven Monitoring, Management and Control Plan for the Beacon Solar Energy Project was submitted on July 16, 2008. A revised plan is provided with this submittal as Attachment DR-16. This revised plan reflects discussions with the U.S. Fish and Wildlife Service (USFWS) on August 19, 2008 regarding the resource agency goals for raven management, and subsequent discussions with the USFWS, California Department of Fish and Game (CDFG), and the California Energy Commission (CEC) during the August 25, 2008 public workshop.

The plan also includes reference to the Memorandum of Agreement (MOA) discussed at the workshop and during subsequent conversations with the USFWS. This MOA is being prepared by the USFWS in collaboration with CDFG and Beacon Solar, LLC.

Attachment DR-16

Common Raven Monitoring, Management, and Control Plan

DRAFT
Common Raven Monitoring, Management, and Control Plan
Beacon Solar Energy Project

Prepared for:

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October 21, 2008

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1.0 Introduction

This section introduces the project background, purpose, objectives, and conditions of concern related to raven monitoring, management, and control in the vicinity of the proposed Beacon Solar Energy Project (BSEP, or Project).

1.1 Background

The proposed BSEP is located along State Route 14 (SR-14), approximately 10 miles north-northwest of California City, approximately 15 miles north of the town of Mojave, and approximately 24 miles northeast of the city of Tehachapi, in Kern County, California (Figure 1). Landmarks in the area include Red Rock Canyon State Park approximately 3.6 miles to the north, Koehn Dry Lake approximately 5.4 miles to the east-northeast, and the Desert Tortoise Natural Area approximately 3 miles to the east.

Beacon Solar, LLC (Beacon) proposes to develop a 250-megawatt solar energy facility on approximately 2,012 acres. The BSEP would use parabolic trough solar thermal technology to concentrate the sun's energy on a linear receiver located at the center point of each parabolic solar subarray. Energy collected in the array would be used to generate steam, driving a turbine that generates electricity. This solar array would be located east of the Southern Pacific Railroad tracks, which run parallel to and east of SR-14. Two options are under consideration for a short (less than 3.5 miles) transmission line, which would be constructed from the solar array across SR-14 to interconnect with the Los Angeles Department of Water and Power's (LADWP) existing transmission system west of the site. Three evaporation ponds (8.3 acres each), used to manage the cooling tower blowdown stream, are planned within a highly disturbed portion of the Project Area. A 17.6-mile, 8-inch natural gas line, which would connect an existing Southern California Gas pipeline in California City with the Project, would be constructed to provide fuel for startup and emergency operations.

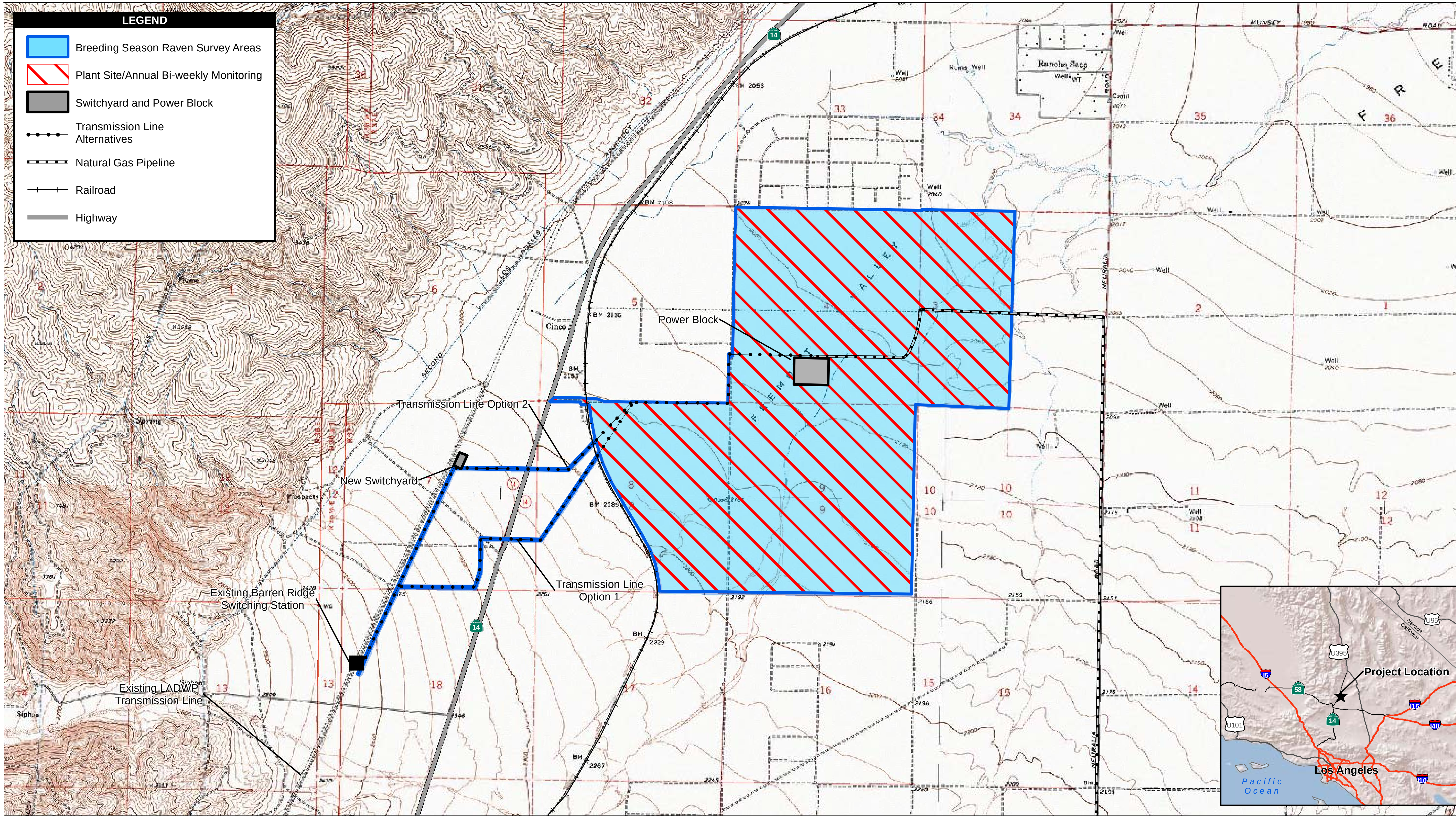
The proposed Project has the potential to indirectly impact populations of the desert tortoise, Mojave population (*Gopherus agassizii* [DT]), listed as threatened under the federal Endangered Species Act (ESA) and California ESA, by increasing the attraction of common ravens (*Corvus corax* [raven]) into the area and thereby increasing potential DT depredation by raven. While potential attractants are not within DT habitat, the movement of raven throughout the area and over potential DT habitat adjacent to and in the vicinity of the Project Area could increase the chances of a raven encountering and depredating a DT.

1.2 Purpose and Objectives

The purpose of this plan is to identify the conditions of concern specific to the BSEP that may attract ravens to the area and to define a monitoring, management, and control plan that will 1) monitor raven activity and 2) specify management and control measures that will avoid, minimize, or mitigate impacts. The monitoring effort is intended to provide qualitative data that can be interpreted by the Project Biologist to determine if Project design features (PDFs) are working or if additional management and control measures are needed to mitigate impacts to DTs.

Specific plan objectives include:

1. Clearly identify how the Project would utilize PDFs to manage the conditions of concern specific to the BSEP that may attract ravens to the area.



Source: TetraTech 2007; Kern County 2007; USGS 2007; WorleyParsons 2007

2,750 1,375 0 2,750 Feet

Scale: 1:33,000; 1 inch = 2,750 feet

Figure 1
Site Location and Raven Monitoring Areas

Path: P:\2008\08080001 FPLE Proj Beacon Solar\5GIS\MXD\Raven\Figure 1 Vicinity Map_MonitoringLocations.mxd, 10/07/08, janssenn

2. Document the effectiveness of PDFs in addition to raven management and control measures implemented at the BSEP.

3. Specify how and when mitigation measures would be selected and implemented if the monitoring suggests the need for additional controls.

4. Define triggers for modification of management and control measures using adaptive management principles.

1.3 Conditions of Concern

The conditions of concern are those Project features or activities that, when not properly managed, provide new subsidies that may result in changes in raven population or behavior that could potentially adversely affect the DT population in the Project Area. Four basic conditions of concern have been identified for the BSEP and have been considered in developing this Plan:

1. Water from evaporation ponds;

2. Potential creation of new perching/roosting/nesting sites;

3. Water ponding potential from dust suppression; and

4. Construction/operation waste management.

The study design for raven monitoring, as well as measures for raven management and control, are dependent upon the accuracy of defining these conditions. Each of these conditions of concern is defined in more detail below.

<u>Evaporation Ponds</u>

The proposed Project includes three evaporation ponds that will collect blowdown water from the cooling towers. The three evaporation ponds will have a nominal surface area of 8.3 acres each for a total of 25 acres. The addition of a new water source to an area where water sources are generally sparse may result in the attraction of raven to the BSEP. Ravens will travel up to 40.4 miles from their roosts for subsidies including water (Boarman, 2003). However, much shorter distances to point subsidies are more common and Kristan and Boarman (2003) observed that raven densities declined with increasing distance from point subsidies.

<u>Perching, Roosting, and Nesting Sites</u>

The majority of raven predation on DT is thought to take place during the spring, most likely by breeding birds that have been shown to spend most of their time foraging within 1,300 feet (ft) of their nests (Kristan and Boarman, 2003). Therefore, structures that facilitate nesting in areas ravens could not otherwise nest in may pose a danger to nearby DT populations. Project components, such as tower structures, transmission poles and lines, and support structures provide new elevated perching sites that have the potential to increase raven use of the Project Area.

<u>Ponding Water</u>

During construction, water will be applied to the graded areas, construction right-of-way, dirt roads, trenches, spoil piles, and other areas of ground disturbance to minimize dust emissions and topsoil erosion. Ponding water resulting from these dust suppression activities has the potential to attract ravens, thereby potentially resulting in increased DT predation by raven.

Waste Management

Ravens are considered scavengers that obtain a high percentage of their diet from human subsidies such as landfills, dumpsters behind restaurants and grocery stores, open garbage drums and plastic bags placed on the curb for garbage pickup, and roadkill. Both the construction and operation phases of the BSEP would result in increased waste generation in the Project Area, improper waste management could attract ravens.

2.0 Memorandum of Agreement and In-lieu Fee Program

A Memorandum of Agreement (MOA) was established on October X, 2008, between Beacon, California Department of Fish and Game (CDFG), and United States Fish and Wildlife Service (USFWS) (Appendix X). The MOA was created to provide the general framework for cooperation and participation among the signatories to implement this Common Raven Monitoring, Management, and Control Plan for the BSEP. Pursuant to the MOA, Beacon has agreed to pay in-lieu fees to USFWS in place of quantitative raven monitoring. These in-lieu fees will be directed toward a future quantitative regional monitoring program aimed at understanding the relationship between ongoing development in the desert region, raven population growth and expansion and raven impacts on DT populations.

3.0 Management Practices

This section specifies management practices or PDFs to be implemented by the Project to avoid new subsidies and thus minimize the potential for the Project to attract ravens. The four basic conditions of concern identified in Section 1.3 have been grouped into construction and/or postconstruction (operation) phase conditions, as appropriate for the Project. Construction phase conditions are considered temporary and are anticipated to be avoided or minimized mainly by the implementation of management measures as defined in Section 3.1 below. Postconstruction (operation) conditions will include management measures to minimize potential impacts and may require additional control measures based on the results of the monitoring program (Section 3.2).

3.1 Construction

Construction-phase impacts are considered more temporary in nature than postconstruction impacts and would therefore require temporary management practices to avoid or minimize the potential to attract ravens to the BSEP. Construction-phase conditions of concern for the BSEP include ponding water and waste management.

3.1.1 Ponding Water

To minimize the occurrence of ponding water, the application rates of water for dust suppression activities will be predetermined to minimize excessive application. The application rate should consider soil infiltration and evaporation rates. During the DT active season, the Environmental Compliance Monitor (ECM) will patrol areas to ensure water does not puddle for long periods and make recommendations for reduced water application rates where necessary.

3.1.2 Waste Management

A trash abatement program will be established during the construction phase of the BSEP. Trash and food items will be contained in closed, secured containers on the Plant Site and removed daily to reduce the attractiveness to opportunistic predators such as ravens. In addition, the Worker Environmental Awareness Program will assist in ensuring that no trash is available that might attract DT predators.

3.2 Operation

Operation-phase impacts are considered ongoing impacts and would therefore require PDFs and ongoing management practices to avoid or minimize the potential to attract ravens to the BSEP. Operation-phase conditions of concern for the BSEP include evaporation ponds, perching sites, and waste management.

3.2.1 Evaporation Ponds

PDFs to deter use of the ponds by ravens include pond design features that will make the pond water less available to ravens (e.g., steep pond sides, at least 2 feet of freeboard, and perimeter protection). In addition, reducing other potential site attractants (see below) will assist in reducing the overall attractiveness of the Plant Site to ravens.

The evaporation ponds would be located approximately 0.25 mile inside of the perimeter fence, thus minimizing any visual cues to terrestrial wildlife species that a source of water is present within the Plant Site. Because the ponds need to remain uncovered to maximize evaporation rates, a series of avian deterrence measures are being incorporated into the design and operation of the evaporation ponds that would minimize access to the ponds by birds. The operational design of the ponds includes a minimum depth of 1 foot and a minimum freeboard of 2 feet so ravens cannot reach the water from the perimeter. In addition, the interior sides of the ponds would be at a 33 percent slope (3:1, horizontal:vertical), which is considered too steep for birds to walk down. Other options include the use of antiperching devices, such as “Bird-B-Gone” and “WhirlyBird,” placed strategically along the perimeter of the ponds to exclude ravens and other birds from accessing the edge of the ponds to drink water. These design features would make it difficult for perching birds (e.g., ravens) and/or shorebirds to access the water.

With three evaporation ponds available, each pond can be prepared with a different configuration of deterrents to determine the most effective combination (i.e., the first pond with only Bird-B-Gone, the second pond with only WhirlyBird, and the third pond with a combination of the two deterrents). The Project’s ECM would be responsible for making qualitative observations on the relative success of the deterrent(s) at each pond and providing recommendations for future improvements in monthly reports. The Project Biologist will review these reports and make recommendations regarding adapting the current configuration of the antiperching devices to maximize deterrence.

3.2.2 Perching, Roosting, and Nesting Sites

PDFs would be implemented to avoid introducing new subsidies by minimizing the attractiveness of Project components. Potential PDFs that would be considered to reduce impacts from these Project components primarily include the use of physical bird deterrents such as bird spikes, Bird-B-Gones, and WhirlyBirds. In addition, nest removal would occur in conjunction with monitoring, as discussed below in Section 4.3.

3.2.3 Waste Management

The trash abatement program developed for the construction phase will also include operation-phase measures to be implemented for the life of the Project. Trash and food items will be contained in closed, secured containers and removed daily to reduce the attractiveness to opportunistic predators such as ravens. The ECM will continue to ensure that these practices are enforced and make recommendations for improvements where applicable.

4.0 Monitoring Practices

Although Project-specific quantitative monitoring has been replaced by payment of an in-lieu fee to USFWS to support a regional monitoring plan, qualitative monitoring will be implemented to assess the efficacy of PDFs and management measures and to determine the need for implementing additional control measures. These qualitative monitoring practices are intended to evaluate the potential impacts that construction and operation may have on raven activity and populations, which could result in potential impacts to DT. Raven monitoring will be implemented in the construction and postconstruction (operations) phases of the BSEP. The monitoring program is designed as an observational reconnaissance level study aimed at monitoring the effectiveness of the PDFs and management measures implemented with the goal of avoiding new subsidies for ravens in the Project Area and evaluating the overall effects of the Project and specific project components (i.e., evaporation ponds) on the raven population (e.g., activity or presence).

4.1 Construction Phase

To identify potential increases in raven activity, the ECM will conduct weekly reconnaissance level surveys in the Project Area. Surveys will focus on all potential subsidies including waste disposal areas, erected structures, staging areas where large equipment or material may be stored, and any area where water is applied to control dust and erosion. Data will be recorded for each raven observed, including activity, categorized as flying, perched, or on the ground (likely scavenging); type of perch (if applicable); and the general location of the bird within the Project Area. In addition, any new nesting locations will be recorded and unoccupied nests will be removed (see Section 4.3 for a discussion on nest removal).

4.2 Operation Phase

To identify potential increases in raven activity during the operations phase of the BSEP, the ECM will conduct biweekly (i.e., every other week) reconnaissance level monitoring at the Plant Site for the life of the project in addition to annual breeding season raven monitoring at the Plant Site and all associated aboveground linear components (Figure 1).

4.2.1 Ongoing Biweekly Raven Monitoring (life of project)

The ECM will conduct biweekly surveys for raven activity at predesignated locations throughout the Plant Site. Surveys will begin when the plant is operational and continue every 2 weeks (biweekly) for the life of the Project (30 years). Survey locations will focus on Project components that may influence raven abundance, activity, and behavior by potentially allowing perching, roosting, and nesting opportunities or by providing supplemental resources such as food and water. These Project components include tower structures, transmission poles and lines, support structures, as well as evaporation ponds and waste disposal facilities.

Sampling will occur every other week. Up to five permanent sampling locations will be identified by the Project Biologist throughout the Plant Site based on areas that have the greatest likelihood of attracting ravens (e.g., tower structures, transmission poles and lines, evaporation ponds, and waste facilities).

A 5-minute sampling session will be spent at each sampling location observing and listening for ravens. The surveyor will record raven detections and will document the behavior of the raven (e.g., perched, flying, on the ground, nesting), perch type (if applicable), and distance and direction from the sampling location. Additional data collected will include the survey start/stop time, and weather (including temperature, average wind speed, and percent cloud cover). In addition, the location of any nests detected during a survey will be noted and Universal

Transverse Mercator (UTM) coordinates recorded immediately following the conclusion of the sampling session. To aid the ECM and ensure consistency throughout the duration of the Project's life, a data sheet will be prepared in advance outlining the required data to be collected. Surveys should not be conducted when wind or rain interferes with audible detection or rain interferes with visual detection, or when unusual weather events may affect raven behavior.

In addition to raven monitoring, the ECM will document the occurrence of roadkill within the Plant Site including the surrounding paved and dirt access roads, the staging area, and any other Project facilities that may support vehicular traffic, including construction equipment. If roadkill is observed, special attention should be given to the presence and behavior of raven in the immediate vicinity.

4.2.2 Breeding Season Raven Surveys

Annual breeding season raven surveys will follow a modified form of raptor nest search protocol (CEC, 2007). Breeding season surveys will occur biweekly (two week intervals) starting at the beginning of the typical breeding season (mid-February) and continue to the end of June to identify nests and evidence of predation at nests (Boarman, 2002, 2003). These surveys will be conducted during the first 5 years of BSEP operation. Each survey will consist of systematically searching the Survey Area, which includes the Plant Site and the aboveground linear features associated with the Project (Figure 1). Because the 17.6-mile natural gas pipeline is an underground linear component of the BSEP that will not act as a potential raven attractant, it will not be surveyed. Figure 1 currently depicts two transmission line alternatives; only the final selected option will be included in the breeding season surveys.

Surveys will be conducted by vehicle when possible and on foot when necessary. All Joshua trees, landscape trees, utility poles, transmission towers, and other structures within the Survey Area will be searched for nests. A UTM coordinate, as well as nesting substrate and current breeding status (if detectable), will be recorded for each nest located. Once data have been collected, the ECM will determine if the nest is unoccupied (i.e., no eggs in the nest or nestlings have fledged), in which case, pursuant to the MOA, the nest will be removed by the ECM (see description of nest removal below). The ECM will search a 30-meter radius surrounding each nest for evidence of DT predation. All DTs depredated will be photographed, a UTM coordinate collected, and the length measured (or estimated). In addition, each DT will be marked to avoid duplication of data recording on subsequent surveys.

Although descriptions of nesting behavior and DT predation will be qualitative, the data will be valuable for assessing raven behavior and documenting potential problem individuals for management actions. In addition, an increase in the number of raven nests in the Project vicinity with or without signs of DT predation will suggest the potential need for revisions to PDFs or additional control measures (as described in Section 6).

4.3 Nest Removal

The majority of raven predation on DT most likely occurs in the spring, from April to May, when DT are most active and ravens are feeding young (Boarman and Heinrich, 1999). As such, the removal of unoccupied raven nests may be utilized to control DT predation. Pursuant to the MOA, both the CDFG and USFWS have approved the removal of unoccupied nests within the Plant Site and associated aboveground linear components. Nests will be removed only from within Beacon controlled lands. If nest are observed on adjacent lands, the resource agencies will be notified. The removal of unoccupied nests will occur simultaneously with the breeding season raven surveys that will take place from mid-February to the end of June. Removing raven nests outside of the breeding season may have a smaller effect on the raven population since they may readily rebuild the following season. However, evidence suggests that birds with no nest in their territory at the beginning of the breeding season were less likely to commence nesting than those who already had an intact nest (Kristan and Boarman, 2003). As such, if an unoccupied raven nest is detected outside of the breeding window, it will also be removed by the ECM.

5.0 Adaptive Management

This section defines how adaptive management principles will be applied to the Common Raven Monitoring, Management, and Control Plan, specifically in reference to PDF and control/mitigation measure implementation. This section defines potential changes to the mitigation and conditions that may trigger them. Key examples would be 1) eliminating or refining a PDF or management measure if it is not working, or 2) incorporating a defined control measure, if impacts are observed, that would not otherwise be implemented (triggered). Other adaptive management techniques may also be identified in this section.

5.1 Definition

Adaptive management is typically used in environmental management efforts to facilitate more effective management of resources to achieve desired objectives. Adaptive management can be defined as an iterative and structured optimal decision-making process intended to reduce uncertainty through system monitoring. The decision-making process simultaneously maximizes one or more resource objectives and accrues information needed to improve future management, either actively or passively. Using current knowledge, passive adaptive management involves the use of conceptual modeling to guide management actions. The model is adjusted as new knowledge is obtained and management decisions are subsequently modified. Active adaptive management involves testing alternative hypotheses through system manipulation employing management strategies. Thus, passive adaptive management is based on information gained from observational studies whereas active adaptive management is based on information gained from experimental manipulation (Holling, 1978). This plan will focus on passive adaptive management but may ultimately apply both passive and active adaptive management.

5.2 Adaptive Management Conditions

In an effort to facilitate meeting plan objectives, it may be necessary to make changes to the PDFs or initiate the implementation of additional control measures. Foreseeable areas where changes may occur include the following:

1. Adjustments to the PDFs could occur for the following conditions of concern:

    a. Ponding water (construction phase)

    b. Evaporation ponds (operations phase)

    c. Roosting, nesting, and perching structures (operations phase)

    d. Waste management (construction and operations phases)

2. Implementation of additional control measures (described below in Section 6) could occur under the following set of conditions:

    a. The results of the biweekly and annual breeding season raven monitoring events suggest that current PDFs are ineffective at controlling raven occurrences in the Plant Site, thereby increasing the potential for DT mortality.

b. The Project proponent makes every attempt to adjust PDFs to resolve the raven issue and avoid the need for additional control measures; however, increased raven occurrences continue.

c. After reviewing the raven monitoring reports, the Project Biologist determines that any additional changes to PDFs will be ineffective at reducing the occurrence of ravens on site.

d. The Project Biologist makes recommendations regarding the appropriate control measure(s) to address an identified and uncontrolled raven issue.

e. The conditions prompting the need for additional control measures and the recommended control measures are discussed with Beacon and the resource agencies before any decisions are made.

f. The control measures proposed to be implemented are agreed to by the appropriate Project resource agency representatives.

3. Other adaptive management techniques may also be identified during implementation of the monitoring program but would be discussed with the Project proponent and the appropriate resource agencies before any decisions are made. These may include modifications to the monitoring program survey frequency.

6.0 Control Practices

If the results of the monitoring efforts suggest that there is a substantial and sustained (e.g., consecutive years) increase in raven activity that may result in DT predation, even with the implementation of PDFs as defined in Section 3.0, then Beacon may need to implement additional mitigation measures to further control ravens at the Project site. This section defines the types of control practices that may be implemented if additional mitigation is determined to be necessary based on the adaptive management conditions described above. As stated above, prior to the implementation of any control measure, the Project Biologist and Beacon would coordinate the discussion and approval of control measures with the appropriate resource agency representatives.

6.1 Roadkill Removal

Ravens are well known for eating animals that have been killed along roads and highways, which are often abundant in the desert region (Boarman and Heinrich, 1999). Although this food source is not considered great enough to dramatically increase raven populations in the desert region, it is considered a potential facilitator to increased raven nesting near roads and highways which may otherwise offer little food. Roadkill can comprise a large proportion of the diet for ravens nesting close to highways when other subsidies are located far away (Kristan et al., 2004). As described in Section 4.2.1, the ECM will document the occurrence of roadkill during the biweekly raven monitoring events. Monitoring of roadkill will focus on the Project Area, in particular the Plant Site, and surrounding paved and dirt roads, the staging area, and any other Project facilities that may support vehicular traffic, including construction equipment. If roadkill occurs frequently in the Project Area and if ravens are commonly noted feeding on that roadkill, it may be appropriate for Beacon to implement a roadkill removal program. Details of a roadkill removal program would be designed by the ECM in coordination with the Project Biologist and the appropriate resource agencies.

6.2 Hazing

Hazing can include any number of devices designed to scare birds; hazing can include either visual and auditory devices, or combinations of the two. Hazing was commonly used by farmers to dissuade birds from eating recently planted crops on airfields to prevent birds from accumulating near runways.

The most appropriate form of hazing technique for the BSEP would be an air cannon that would frighten birds away from the evaporation ponds. Gas cannons are mechanical devices that produce loud banging noises (similar to the noise of a shotgun) by igniting either acetylene or propane gas. Gas cannons may be used to scare birds out of large areas like agriculture fields, golf courses, and airports. However, their effectiveness is variable and is dependent upon the chosen method, the bird species involved, and the availability of alternative feeding/nesting/perching areas close by (Bishop et al., 2003). Many birds will become accustomed to this technique quickly if it is not reinforced with other techniques. Cannons are most effective when they are moved around to different parts of the impact area every few days. The air cannon would be stored onsite, but only used under specific circumstances, since birds may habituate to the disturbance caused by air cannon hazing, if used on a regular basis. If deemed appropriate, a hazing program would be designed by the ECM in coordination with the Project Biologist and the appropriate resource agencies. Permission may also be required from the local police or municipality, as there may be local ordinances that prohibit the creation of loud noises.

6.3 Methyl Anthranilate

Methyl anthranilate (MA) is a naturally occurring GRAS (generally recognized as safe) listed compound used as a food flavoring and fragrance additive. Chemical formulations containing MA have been found to be effective bird aversion agents as MA acts as chemosensory repellent, irritating pain receptors associated with taste and smell (Umeda and Sullivan, 2001). When applied as a formulated spray, MA has been found to be effective in repelling birds from feeding on crops such as cherries, blueberries, and table grapes. In addition, MA is used as a repellent for Canadian geese on lawns and in small pools of water. To date MA is thought to have limitations for topical application as it is considered highly volatile and breaks down readily under exposure to ultraviolet light. The most appropriate application of MA on the BSEP would be to small areas of ponding water or perhaps where known nesting has previously occurred. Repeat topical application would be necessary due to the breakdown of the chemical with exposure but may still prove useful as a short-term deterrent. After removing a current season unoccupied nest, the ECM could apply MA to deter nest rebuilding in that location. Prior to the use of MA at the BSEP, research into the most current application of MA to deter raven activity should be conducted by the Project Biologist and then methods could be designed in coordination with the ECM and the appropriate resource agencies.

6.4 Lethal Removal (Depradation)

If ravens are still attracted to the BSEP even after the implementation of PDFs, modification to PDFs, and implementation of control measures, it may be necessary to consider lethal removal. There is no evidence that lethal removal will have a long-lasting effect on raven population levels, raven foraging behavior, or survival of juvenile DT. In addition, identifying, targeting, and successfully removing individuals is also considered time consuming. However, this method is often used in management plans when specific raven pairs are determined to be responsible for taking relatively large numbers of DT (Boarman, 2002). These individuals can often be identified by the presence of juvenile DT shells beneath their nests, which are often used for consecutive years by the same pair of breeding ravens (Boarman and Heinrich, 1999). By removing those birds known to prey on DT, survival of juvenile DT in that vicinity may increase. However, it is very difficult to identify the target bird(s) with absolute certainty, much less locate and shoot both members of a pair.

Under this control method, targeted ravens would be shot by rifle or shotgun. If shooting is not possible (e.g., on power lines) or has been unsuccessful, ravens could be trapped and humanely euthanized. Young ravens found in nests of removed adults need to be euthanized humanely if they can be captured safely.

7.0 Reporting

The ECM will prepare monthly monitoring reports summarizing the results of the biweekly monitoring events and describing any noted raven activity in the Project Area. These reports should include a discussion on raven observations in relation to PDFs and their efficacy or lack thereof. These monthly monitoring reports will be submitted to Beacon and the Project Biologist for review.

Following the completion of breeding season raven monitoring events, the ECM will submit a report summarizing the results to Beacon and the Project Biologist. The Project Biologist will compile both the monthly reports and the breeding season report into an annual report that will be submitted to the Project resource agency representatives for review. The annual report will summarize the survey results, interpret raven trends within the Plant Site, discuss the success or failure of PDFs, and make recommendations for modification of PDFs or implementation of control measures as necessary.

8.0 References

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U.S. Fish and Wildlife Service (USFWS), 2008. Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise. March.

Data Request 30:

> To enable staff to complete its review of the project's potential to affect California Register-eligible prehistoric site components, please provide the results of the excavation program agreed to on February 28, 2008 (February 28, 2008 Report of Conversation, TN 46670).

Response:

An extension was requested for the preparation and submittal of the report containing the results of the excavation program. The completed Cultural Resources Evaluation Report containing these results is provided as Attachment DR-32. Note, the confidential appendices to this report have been provided under separate cover.

Two potentially eligible prehistoric sites (Site 6 and Site 54) that could be affected by the project will be avoided. Ten other potentially eligible prehistoric sites were assessed for significance. Five of these sites, Site 8, Site 9, Site 11, Site 12, and Site 13, are recommended eligible for the California Register of Historical Resources under Criterion 4. The remaining five sites, Site 10, Site 17, Site 18, Site 19, and Site 59, are recommended not eligible.

Data Request 32:

> To enable staff to complete its review of the project's potential to affect California Register-eligible historic site components, please provide the results of the excavation program agreed upon on February 28, 2008.

Response:

As noted above, an extension was requested for the preparation and submittal of this report. The completed Cultural Resources Evaluation Report is provided as Attachment DR-32. Note, the confidential appendices to this report have been provided under separate cover.

Two potentially eligible historic sites (CA-KER-3366H and Site BSPL-H-2) that could be affected by the project will be avoided. Four other potentially eligible historic sites were assessed for significance. None of the four sites, CA-KER-5264H, Site 3, Site 16, and Site BSPL-H-1, are recommended eligible for the California Register of Historical Resources.

Data Request 34:

Please provide a discussion of the historical geomorphology of the project site to better evidence a consideration of the potential there for buried archaeological deposits. The discussion should describe the development of the alluvial landforms and the lake bed deposits on which the project area is proposed with a focus on the character of local depositional regimes since the Late Pleistocene era. The basis for the discussion should be data on the geomorphology, sedimentology, pedology, and stratigraphy of the project area or the near vicinity. The source of these data may be a combination, as necessary, of extant literature or primary field research.

Response:

The geomorphology study was previously provided in the supplemental responses submitted on August 18, 2008 (Attachment DR-34).

Attachment DR-34

Evaluation of Cultural Resources

EVALUATION OF CULTURAL RESOURCES FOR BEACON SOLAR ENERGY PROJECT KERN COUNTY, CALIFORNIA

Beacon Solar Energy Project Docket #08-AFC-02

Prepared for:

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With contributions by:

Collin Tuthill, B.A.
and
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U.S.G.S. Quadrangles: Cantil, Cinco, Mojave NE

October 2008

Key Words: Kern County, Hearths, Trail, Lithic Scatter, Historic Debris, Scatter

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EXECUTIVE SUMMARY

Beacon Solar, LLC (Beacon) is proposing to construct a solar electric generating facility in the Fremont Valley, Kern County, California. In addition to the plant, linear facilities include a transmission line and a natural gas pipeline.

In accordance with California Energy Commission (CEC) guidelines an archaeological resources study was conducted for the project area and buffer areas. The field survey identified 59 sites, 18 of which are in areas that may be subject to ground disturbance associated with the Beacon Solar Energy Project (BSEP). This report addresses evaluation of the sites that could potentially be affected by BSEP and is intended to supplement the Archaeological Resources Report (Apple and Glenny 2008) that was provided in the Application for Certification.

Of the 18 sites potentially affected by BSEP, based on surface observations and documentation, six sites (CA-KER-5264H, Site 16, Site 17, Site 18, Site 19, and Site BSPL-H-1) are recommended not eligible for the California Register of Historical Resources (CRHR) and do not meet California Environmental Quality Act (CEQA) criteria for uniqueness. All of the sites are small archaeological resources that do not have significant associations and lack significant data potential.

The remaining 12 potentially eligible sites that could be affected by BSEP are CA-KER-3366H, Site 3, Site 6, Site 8, Site 9, Site 10, Site 11, Site 12, Site 13, Site 54, Site 59, and Site BSPL-H-2. Beacon has committed to avoiding CA-KER-3366H, Site 6, Site 54, and Site BSPL-H-2. The remaining eight sites were evaluated and results of the evaluation are documented in this report.

Based on discussions with CEC cultural resource staff, a testing program incorporating additional documentation, hand excavation, and mechanical trenching was carried out. Field work identified subsurface hearth features dating between 190 ± 40 before present (B.P.) and 880 ± 40 B.P. in conventional radiocarbon years. Based on these investigations Site 8, Site 9, Site 11, Site 12, and Site 13 are recommended eligible for the CRHR under Criterion 4 (Table ES-1). Subsequent to the evaluation program, Beacon has determined that Site 8 will be avoided. Site 3, Site 10, and Site 59 do not meet the criteria for the CRHR or CEQA criteria for uniqueness and are recommended not eligible.

Table ES-1
Site Summary

Site Designation	Site Type	Eligibility Recommendation
15-003366/CA-KER-3366H	Southern Pacific Railroad	Potentially eligible*
15-006415/CA-KER-5264H	Debris scatter	Not eligible
Site 3	Historic debris and lithic scatter	Not eligible
Site 6	Lithic scatter and historic debris	Potentially eligible*
Site 8	Fire-affected rock and lithic	Eligible*
Site 9	Fire-affected rock	Eligible
Site 10	Camp	Not eligible
Site 11	Fire-affected rock	Eligible
Site 12	Fire-affected rock	Eligible
Site 13	Fire-affected rock, groundstone, biface	Eligible
Site 16	Refuse scatter	Not eligible
Site 17	Lithic scatter	Not eligible
Site 18	Lithic scatter	Not eligible
Site 19	Lithic scatter	Not eligible
Site 54	Lithic scatter	Potentially eligible*
Site 59	Trail	Not eligible
Site BSPL-H-1	Debris scatter	Not eligible
Site BSPL-H-2	Foundation and refuse	Potentially eligible*

* BSEP will avoid

CHAPTER 1
INTRODUCTION

Beacon Solar, LLC, a Delaware limited liability company (herein "Beacon Solar" or "Applicant"), is proposing to construct, own and operate the Beacon Solar Energy Project (herein "BSEP" or "Project"). ENSR prepared an Application for Certification (AFC) for the California Energy Commission (CEC) for the Project. ENSR retained EDAW, Inc. (EDAW) to conduct cultural resources studies, including an archaeological survey in support of the AFC (Apple and Glenny, 2008). The evaluation program documented in this report was prepared in further support of the AFC.

PROJECT DESCRIPTION

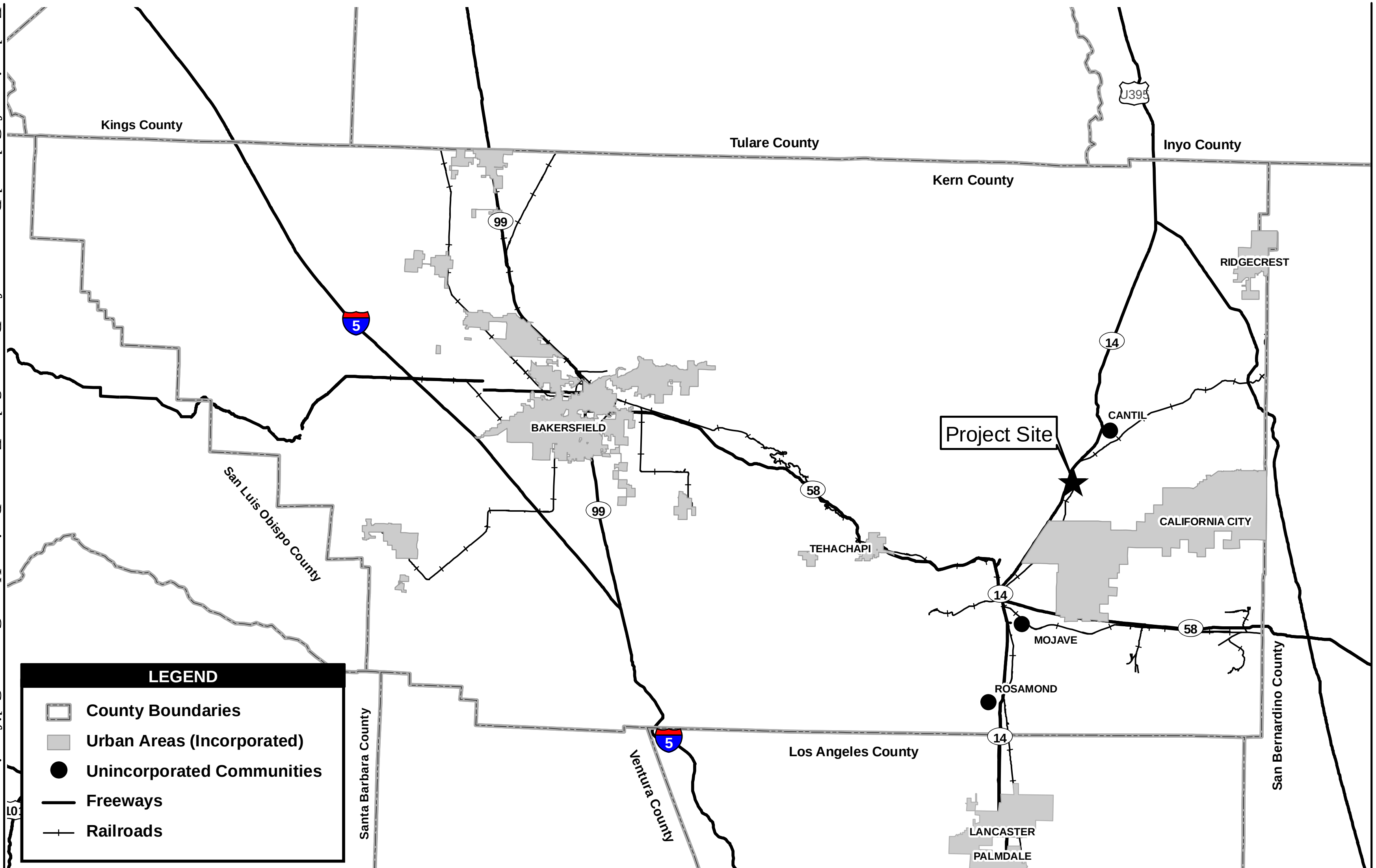
The Project is a concentrated solar electric generating facility proposed on approximately 2,012 acres in Fremont Valley, Kern County, California (Figure 1 and Figure 2). Koehn Lake is located approximately 5 miles to the east-northeast and Red Rock Canyon State Park is located approximately 4 miles to the north. The BSEP plant site and its general environs are essentially undeveloped and have been significantly disturbed from past agricultural activities that occurred up to the early 1980s. There are several abandoned structures in a small developed area west of the plant site boundary and east of State Route 14 (SR 14) near the site access point from the highway. The site is relatively flat, with elevations ranging from approximately 2,220 feet above mean sea level (amsl) in the southwest to 2,025 feet amsl in the northeast. Pine Tree Creek, a dry desert wash, trends north-northeast to south-southwest through the center of the site. There is also a fault zone crossing the site from southwest to northwest resulting in up to a 10-foot step change in elevation across the fault zone.

The BSEP will use parabolic trough solar thermal technology to concentrate the sun's energy on a linear receiver located at the center point of each parabolic solar subarray. Energy collected in the array is used to generate steam, driving a turbine which generates electricity. This solar array would be located east of the railroad tracks, which run parallel to and east of SR 14. The Project's electrical generation facilities (i.e., solar array and power block) would be located on approximately 2,012 acres of private land.

Two options are under consideration for a short transmission line which will be constructed from the solar array across SR 14 to interconnect with the Los Angeles Department of Water and Power's (LADWP) existing transmission system west of the site. Three evaporation ponds, used

Evaluation of Cultural Resources for Beacon Solar Energy Project Kern County, California

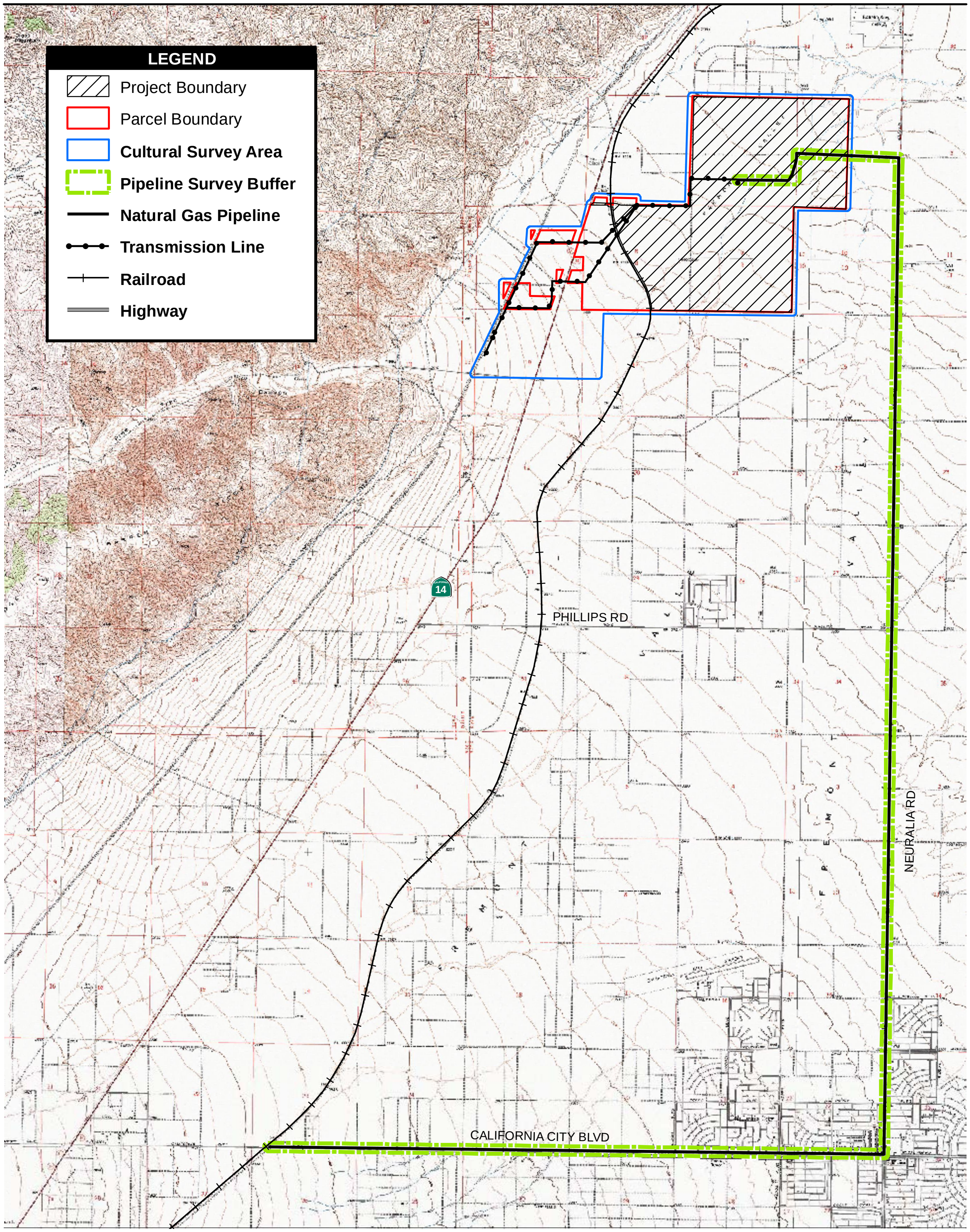
Path: P:\2008\08080001 FPLE Proj Beacon Solar\5GIS\MXD\Cultural\Figures\Archaeological Resources\Figure 1 Regional Setting.mxd, 09/25/08, SorensenJ



Source: ESRI 2007; Kern County 2007

10 0 10 Miles

Figure 1
Regional Setting



Source: California City North (1973), California City South (1973); Cantil (1973), Cinco (1994), and Mojave NE (1994), Sanborn (1973) Calif., USGS 7.5' Series Quadrangles

7,500 3,750 0 7,500 Feet

Scale: 1:90,000; 1 inch = 7,500 feet

Figure 2
Project Area

Path: P:\2008\08080001 FPLE Proj Beacon Solar\5GIS\MXD\Cultural\Figures\Archaeological Resources\Figure 2 Survey Area.mxd, 10/21/08, SorensenJ to manage the cooling tower blowdown stream, are planned within a highly disturbed portion of the survey area. A 17.6-mile, eight-inch natural gas line will be constructed, connecting an existing Southern California Gas pipeline west of California City with the Project, to provide fuel for startup and to provide freeze protection for the solar heat transfer fluid.

No other linear facilities are currently proposed for the Project. The Project intends to use ground water as its cooling water supply source and septic tanks for sanitary waste water disposal, which would eliminate the need for the installation of off-site water supply and sewer pipelines to the site.

REGULATORY SETTING

Numerous laws, ordinances, regulations, and standards (LORS), on Federal, State and local levels, seek to protect and target the management of cultural resources. The BSEP will comply with applicable LORS throughout construction and operation. CEC Siting Regulations provide direction for project environmental compliance and projects licensed by the CEC are reviewed for compliance with applicable laws. For this project, where there is no federal involvement, the applicable LORS are State and local. Applicable LORS are summarized in the survey report provided as Appendix G in the AFC (Apple and Glenny 2008).

All resources nominated for listing must have integrity, which is the authenticity of a historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance. Resources, therefore, must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling and association. It must also be judged with reference to the particular criteria under which a resource is proposed for nomination.

PERSONNEL

Rebecca Apple MA, RPA served as Co-Principal Investigator with James H. Cleland, PhD, RPA. Wayne Glenny, MS directed the field work. Tiffany Contreras, Clare Fritz, and Collin Tuthill participated in the field work. Andrew York, MA, RPA provided senior review. Resumes of key personnel are provided in Attachment 1.

During Native American consultation for the project, tribal representatives expressed interest in monitoring the excavation activities. Jovan Mia of Seven Feathers monitored all ground disturbing activities associated with the archaeological investigations.

NATIVE AMERICAN PARTICIPATION

Consultation with local Native American groups and interested parties has been initiated. A letter was sent to the Native American Heritage Commission (NAHC) in October 2007, requesting information on sacred lands, traditional cultural properties and a list of Native American individuals and organizations that might have knowledge or concerns with cultural resources within the project area. At that time the NAHC files did not reveal any specific site information. Seven Native American representatives were identified by the NAHC. Letters were sent to these individuals, along with a project map, response form, and return envelope. The letter asked for their input and concerns. Copies of the correspondence are provided as Appendix G of the AFC (Apple and Glenny 2008:G.1,Attachment 3).

Follow up telephone calls were made to Native American representatives and are provided in Attachment 2 of this report. Based on discussions with John Valenzuela, Chairman of the San Fernando Band of Mission Indians, a monitor was identified. As discussed above, Jovan Mia of Seven Feathers monitored all ground disturbing activities related to the cultural resources investigations.

REPORT ORGANIZATION

Chapter 1 of this report provides a description of the proposed Project. Chapter 2 is a discussion of the physical and cultural setting. Next, a research design is provided in Chapter 3. Field and analytical methods and the results of fieldwork are summarized in Chapter 4. Chapter 5 includes site descriptions and evaluation results. Chapter 6 is a discussion of the results. Chapter 7 provides management recommendations. A copy of the report is also being sent to the Southern San Joaquin Valley Archaeological Information Center at California State University, Bakersfield as a permanent record.

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CHAPTER 2
ENVIRONMENTAL AND CULTURAL SETTING

An Environmental and Cultural Setting for BSEP was provided in the Archaeological Resources Report (Apple and Glenny 2008) submitted with the AFC. The following briefly summarizes key points. For more complete documentation readers are directed to the survey report (Apple and Glenny 2008).

ENVIRONMENTAL SETTING

The BSEP is located in the Fremont Valley of Kern County in the western portion of the Mojave Desert, California. The Mojave is situated between two major fault lines- the Garlock Fault to the north and the San Andreas Fault to the west. Mountain ranges are visible throughout the Mojave Desert and the floor is primarily alluvial fill eroded from the surrounding mountains (Schoenherr, 1992).

Physiology

Fremont Valley is bounded by the Rosamond Hills and Antelope Valley to the south, the southern Sierra Nevada and Tehachapi Mountains to the west, the El Paso Mountains to the north and the Rand Mountains to the east (Sutton, 1991). Fremont Valley itself is deeply-filled with alluvium that originates in the El Paso and Rand mountains (Sutton, 1991). Cajon loamy sand and Rosamond clay are the most widespread soils in the valley. These soil types are most prevalent in areas that have been impacted upon by agriculture (Sutton, 1991).

Hydrology

Fremont Valley is a closed basin that contains one playa, Koehn Lake (Sutton, 1991). Three major drainages flow into the lake; from the west, Cottonwood and Cache creeks, and a wash enters the lake from the east, draining the eastern Rand and El Paso mountains (Sutton, 1991). Although the importance of these drainages to prehistoric population groups is uncertain, known prehistoric habitation sites in the area are located near fairly large drainages, or next to the shoreline of Koehn Lake (Sutton, 1991). This seems to indicate that water availability would have had a significant influence in determining the location of prehistoric habitation sites.

Climate

Knowledge of the paleoenvironment is essential in understanding prehistoric human occupation patterns on the landscape. Climatic changes through time, influenced by temperature and moisture variations, would have determined the distribution and subsistence practices of these human populations. Evidence of paleoenvironmental change for the Great Basin, Mojave Desert and Sierra Nevada region has been well documented (Anderson, 1990; Anderson et al., 1985; Mehringer, 1986). Through these studies a general picture of environmental change has emerged for the last 10,000 years. Little evidence of human activity from the earlier time periods was encountered during the BSEP investigations, therefore the focus here is on more recent conditions.

The Late Holocene (ca. 3,000 B.P. to present), is characterized by moderately cooler and wetter conditions with punctuated periods of drought (Sutton et al., 2007). Evidence from the Great Basin suggests that there was much environmental variability; including periods of rapid and severe climatic change during the past 3,000 years (Grayson, 1993).

Today the Mojave is a warm temperature desert situated between the subtropical Sonoran Desert to the south and the cold temperature Great Basin to the north. The Mojave Desert is characterized by extreme variations in daily temperatures and more arid conditions than other American desert regions. Freezing temperatures occur during the winter, particularly in higher elevation regions. Summers tend to be hot, dry, and windy. Precipitation in the region is highly variable from one year to the next (ranging from 3 to 5 inches per year). Almost all precipitation arrives in the winter, but the region also experiences rare, intense summer thunderstorms. It is during these rare flood events that some of the most dramatic changes take place on the desert landscape.

Fremont Valley is within the rain shadow of the Sierra Nevada Mountains. The climate is semi-arid with low humidity. Temperatures have an extremely wide range with diurnal summer time temperatures from 120˚F to diurnal winter temperatures of 0˚F (Sutton, 1991). Rainfall is similar to that of Antelope Valley averaging about three inches per year on the valley floor (Stones, 1964).

Flora and Fauna

The Mojave has a typical mountain-and-basin topography with sparse vegetation. Although a large portion of the Project area is marked by creosote bush (*Larrea tridentate)* which is the dominant plant species of the Mojave Desert (Warren, 1984), extant vegetative resources are characterized by moderate species diversity. Lower elevations are dominated by creosote bush, while higher elevations contain yuccas and agaves and then pinion-juniper habitats (Warren, 1984). Plant communities within proximity of springs, marshes and streambeds produce tules, cattail and various grass species (Warren, 1984).

Large fauna species are rare in the Mojave Desert. Rodents, reptiles and birds are more common and are found along the desert floor. Rodent species include various pocket mice (*Perognathus spp.*), whitetail antelope squirrel (*Ammospermophilus leucurus*), and kangaroo rats (*Dipodomys* spp.). Reptile species present include the desert tortoise (*Xerobates agassizii*), desert iguana (*Dipsosaurus dorsalis*), common king snake (*Lampropeltis getulus*) and the Mojave rattlesnake (*Crotalus scutulatus*). Other species found in the Mojave include the blacktail jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*) and the coyote (*Canis latrans*).

CULTURAL SETTING

Prehistory

Prehistoric human settlement patterns in the Mojave Desert have been influenced by environmental change. Major climatic periods influenced prehistoric spatial settlement patterns and resource exploitation. Archaeological investigations have indicated that although the area had limited prehistoric resources and surface water, the region supported a long and occasionally dense human population (Moseley and Smith, 1962). Archaeological remains tend to be widely scattered and sparse and are usually located along the margins of pluvial lakes (Warren, 1990; Willig, 1988). Although research in the Mojave has produced a wide array of cultural sequences, for the purpose of this report, a broad terminology is used to provide temporal context to the region. The sequence consists of the Paleoindian period, Pinto period, Gypsum period, and the Protohistoric period.

Paleoindian Period (12,000 to 7000 years B.P). This period is the earliest documented evidence of human occupation in the Mojave Desert and has been referred to as the Western Pluvial Lakes Tradition (WPLT) (Sutton, 1991). The WPLT encompasses a broad geographic region from the western Great Basin to southern California and north to Oregon. Evidence suggests that Paleoindian period population groups were highly mobile, with settlement patterns that reflect a dependency upon lacustrine resources (Sutton 1991; Sutton et al., 2007; Warren, 1990).

Pinto Period (7000 to 4000 B.P.). A period of dramatic environmental change has been posited for the Pinto period. The environment changed from pluvial to arid conditions, rivers and lakes dried up and animal and plant life changed. This period is seen by Warren (1984) as marking the beginnings of cultural adaptations to the desert. Desert humans either adapted to this change or relocated to areas with more favorable environmental conditions. This depopulation of the area seems evident in the small size of Pinto period sites, which are often limited to surface deposits. These ephemeral sites suggest temporary or seasonal occupations by small groups of people (Moratto, 1984), focusing on a forager like strategy (Sutton et al., 2007).

Gypsum Period (4000 to 1500B.P). The Gypsum period is marked by an increase in the number of archaeological components, and increased diversity in assemblage and site setting (York, 1995). Occupations in the Antelope Valley during this period are indicative of large permanent or seasonally occupied villages, with smaller seasonally based special purpose sites including rock rings, lithic scatters and milling stations (Sutton, 1980; Warren, 1986). The appearance of large village and special purpose sites in the Antelope Valley has been attributed by Warren (1986) to refined hunting methods and seed processing technologies that raised the regional carrying capacity and facilitated population growth.

Rose Spring Period (ca. 1500 to 1000 B.P.). Archaeological evidence for the Rose Spring period indicates a major population increase, changes in artifact assemblages, and well developed middens (Sutton, 1988). The introduction of small projectile points into assemblages in the Mojave Desert and the Great Basin, appear to mark the introduction of the bow and arrow and the decline of the atlatl and spear weaponry.

Protohistoric Period (1000 B.P to the time of European contact). There is an increase in the ethnic and linguistic complexity within the Mojave Desert during this period. Desert Side-notched points and Brownware ceramics become more widely distributed throughout the Mojave Desert and the Great Basin. This development, combined with linguistic, evidence is associated with the Numic-speaking Paiute and Shoshone expansion throughout most of the area (Bettinger and Baumhoff, 1982).

Ethnohistory

The Kawaiisu occupied the southern Sierra Nevada south of the Kern River and into the northern Tehachapi Mountains. They also claimed a major portion of the western Mojave Desert, including the Fremont Valley during the ethnographic period (Sutton, 1991). Neighboring groups included the Tubatalubal to the north, the Southern Yokuts to the west and the Kitanemuk and Serrano groups to the south. The notion of distinct cultural boundaries was foreign to the Kawaiisu, and the overlapping of groups was customary (Zigmond, 1986). Interaction and intertribal relations were peaceful and cooperative, with combined annual hunting expeditions for game drives being commonplace (Voegelin, 1938).

Historical Background

European and American exploration into the Fremont Valley began in the late 18th century. Later exploration into the valley included visits by John C. Fremont (Fremont, 1845).

European and American exploration into eastern California established trails and wagon roads utilized throughout the 19th century. Early trails were used in conjunction with mining, early commerce, and railroad development. Portions of the Owens River Road run through the Fremont Valley. The road was established as a result of intense prospecting taking place in the eastern California. Two stops along the Owens River Road are located in the Fremont Valley. The first is at Nadeau Springs, west of the town of Mojave. This was originally a wagon stop along the road between Los Angeles and the mines located at Inyo. Later the Southern Pacific Railroad established a stop north of Mojave called Nadeau station (Warren and Roske, 1981).

Mining had a significant influence on the development of the valley. The discovery of gold in California, including the mountains surrounding Fremont Valley, resulted in a large influx of Euroamericans into the region (Sutton, 1991). Early mining exploited borax and later efforts focused on potash (Wynn, 1963). Major mining districts were established in both the Rand and El Paso mountains (see Hall and Barker, 1975). The development of mining districts in the mountains surrounding the Mojave Desert contributed to the development of towns as stops along the roads running from the mining districts back to southern California. For instance, the 20-Mule Team Borax Road was one such road that crossed the valley (Wynn, 1963).

The next major development in the Fremont Valley is associated with the construction of the Southern Pacific Railroad. The construction of a rail line through the valley proved to be a boon for development. Construction of rail lines often corresponds to previously established trails and wagon roads. The town of Mojave was founded in 1876 and is directly connected to the construction of the railroad (Wynn, 1963).

Farming and agricultural demands as well as the demands for water in the city of Los Angeles necessitated the construction of an aqueduct. The Owens River was identified as the best source for Los Angeles' increasing water needs and construction was begun on the First Los Angeles Aqueduct in 1908 (Bevill et al., 2003). Construction took five years and thousands of workers of various backgrounds. Construction was completed in 1913, when water was delivered to Los Angeles by a gravity flow aqueduct (LADWP, 1996). The completion of the aqueduct stands as one of the major contributing factors to the expansion of the city of Los Angeles in the early 20th century. Expansions of the First Los Angeles Aqueduct began in 1940 and extended the system 105 miles north to Mono Basin, culminating in the Second Los Angeles Aqueduct in 1970.

CHAPTER 3
RESEARCH DESIGN

To apply the CRHR criteria to archaeological sites, the sites' cultural and historical associations must be determined to the extent possible, and the potential importance of the information contained in the sites must be evaluated. This chapter presents a Research Design for making these determinations, laying out current regional research issues and specific research questions that will be addressed in the evaluation program.

RESEARCH ISSUES – PREHISTORIC/NATIVE AMERICAN SITES

Chronology

The ability to place a prehistoric site within a temporal framework is often of critical importance in assessing significance. Establishing the date a site was occupied is necessary in describing the site's cultural context and in assessing its research potential.

Within the BSEP survey area, the following data sets may be relevant to establishing temporal affiliation:

- Presence of organic materials suitable for radiocarbon dating – Radiocarbon dating remains the most reliable chronometric tool available for the BSEP region. Presence of suitable organic material substantially increases a site's research value.
- Presence of stratified deposits – Stratified cultural deposits, which are quite useful in developing regional chronological sequences, are relatively rare in the region. Many habitation sites are found on relatively stable surfaces, resulting in a lack of clear stratigraphic separation between occupation periods.
- Presence of prehistoric ceramics – Prehistoric brown ware ceramics have been found within the Fremont Valley (Lyneis, 1991). However, they are relatively rare have additional studies are necessary to better assess their cultural affiliation.
- Presence of typable projectile points and other formal tools – Despite challenges to the basic assumptions of projectile point seriation in the Great Basin (Flenniken and Wilke, 1989), cross-dating of point types through associated radiocarbon dates and, in the western Great Basin, directly through obsidian hydration dating, continues to support the temporal utility of point types (Bettinger et al., 1991). However, several types, including

some Pinto/Gatecliff and Elko series points, appear to vary in their temporal placement across the broad expanse of the Great Basin (see Beck, 1994). Notwithstanding this problem, the point sequence used by Warren and Crabtree (1986) remains generally valid for the Mojave Desert.

- Presence of obsidian suitable for hydration dating – The Project area is relatively close to the Coso obsidian source, and it is expected that flaked tools and debitage from this source could be recovered. This source of volcanic glass has been intensively studied for hydration dating purposes (Basgall, 1990; Cleland, 2006; Gilreath and Hildebrandt, 1997; Rogers, 2006). Despite numerous problems, hydration analysis of Coso obsidian has been generally successful producing results accurate enough for chronological ordering (seriation) and placement of assemblages within a reliable range of dates.

Research Questions

For the BSEP evaluation effort the following research questions can be asked at each site:

1. What is the best available information relevant to the temporal placement of each site?
2. Is there evidence that the site is single component? If not, can the components be segregated (vertically and/or horizontally) for analytical purposes?
3. Is there evidence relevant to the length of occupation of each component?

Site Structure

Assessing the horizontal and vertical organization of cultural materials at a site is necessary in determining whether there are multiple periods of occupation at the site or distinct activity loci. Proper understanding of site structure requires the consideration of the geomorphic context of the sites, especially with regard to the processes affecting deposition and erosion. The prehistoric sites tested in the BSEP area lie on the surface of a dry lake bed near Koehn Lake playa, which was a small pluvial lake in the latest Pleistocene, ca 12,000 BP (Grayson, 1993; Kleinfelder, 2008), fed by run-off from the Tehachapi and El Paso mountains. The lake had dried by 8700 B.P. (Kleinfelder, 2008) and probably earlier to due its small size (see Grayson, 1993), but continued to hold intermittent water in response to precipitation cycles through the historic period. Down-warping along the Garlock fault creates a generally accretionary depositional environment (Kleinfelder, 2008). This process of basin in-filling, however, could be counter-balanced to some degree by aeolian erosion of the finer sediments such as those on the lake-bed itself. An additional consideration for the lake-bed is that 20th century agricultural practices, including plowing, have resulted in the disturbance of the upmost sediments an estimated depth of 50 cm or so.

Horizontal Structure

Where distinct occupations or activities can be isolated, the informational value of associated materials is enhanced. For example, discrete artifact accumulations may reflect multiple temporal occupations or synchronic organization of space within a short-term habitation site. Similarly, discrete flaking stations may be more useful in analyzing lithic reduction than generalized lithic scatters. In the BSEP case, horizontal structure may persist even through repeated modern period plowing, or plowing may be so severe as to smear the cultural deposit to the point where horizontal patterning is no longer useful.

Subsurface Materials

Depending upon the depth of the deposit, surface materials may not adequately expose the full informational potential of the site. Sites with a distinctive subsurface deposit are likely to contain useful information in addressing a variety of regional research questions. Moreover, the presence of substantial numbers of subsurface artifacts may be indicative of the presence of buried features that can only be detected with more intensive subsurface methods (Ahlstrom, 2006; Schroedl, 2006). The BSEP evaluation program will include both manual excavation and controlled mechanical excavation to search for and investigate subsurface cultural deposits.

Research Questions

The following research questions will be addressed during the BSEP evaluation:

1. Are cultural materials in their primary context or substantially redeposited?
2. Are there distinct artifact concentrations indicative of distinct loci of human activity?
3. Is there evidence for constructed features?
4. Is there evidence of a subsurface component, and if so, what depositional mechanism may account for it?
5. Are there buried features such as fire-pits or cache pits that retain integrity after plowing?

Subsistence, Settlement, and Mobility

This research theme addresses the role the BSEP area served in prehistoric subsistence activities, recognizing that site locations, artifact assemblages, and associated ecofactual evidence reflect in part the ways that prehistoric societies organized their subsistence activities.

Land Use at the Desert/Mountain Interface

The archaeological evidence suggests that by late Gypsum period times the western Mojave Desert was utilized by groups whose core territory also included the major mountain ranges to the west – the Transverse ranges and the southern Sierra Nevada (Sutton et al., 2007). The BSEP area lies very close to the foot of the Tehachapi Mountains, near the mouth of Pine Tree Canyon, a prominent canyon which yields access to the mountains. As such the project area could be relatively easily exploited from logistical base camps located within the canyon or nearby foothills. Resource gathering and processing sites would be expected under that type of scenario. Alternatively, residentially more mobile groups may have established temporary residences within the project area. Distinguishing among these site types is difficult, but assemblage richness and composition, site structure, and floral and faunal remains are important data sets to consider.

The BSEP sites' open location on the valley floor and the presence of fragmentary groundstone and scatters of fire-affected rock are suggestive that subsistence activities may have focused on the procurement and processing of floral resources. Residues in hearth features could provide important information on specifically targeted resources. Additionally, Sutton and colleagues (2007) have drawn attention to climatic variability as important in understanding changing land-use in the western Mojave. Paleoenvironmental proxies suggest that latest period of prehistory (ca. 800 to 200 BP) was particularly prone to decadal to century-long variability in precipitation with two particularly significant drought cycles occurring during the Medieval Climatic Anomaly (Jones, et al. 1999; Stine, 1994). It can be expected that the BSEP sites might show increased utilization during relatively mesic environmental conditions and reduced use during more arid periods.

Other Factors Affecting Site Distributions

Most settlement pattern studies in the Mojave Desert start with the premise that prehistoric site distributions primarily reflect the organization of subsistence activities. However, in marginal environments it is important as well to consider nonsubsistence activities (Cleland, 2004). For example, the BSEP area may have been located along a travel corridor connecting the Tehachapi Mountains with the desert to the east. Additionally, it is noteworthy that a rock art complex is found in nearby Jawbone Canyon, suggesting the possibility that ceremonial activities could contribute to the distribution of sites in the Project area.

Research Questions

The following research questions relevant to this research theme will be addressed during the BSEP evaluation:

1. What subsistence related activities, if any, are represented at each site?
2. Are there nonportable artifacts or features present?
3. Is there evidence of domestic habitation debris indicative of residential use? If so, is there any evidence present relevant to the length of stay or seasonality?
4. Is there any evidence of caching in the sites tested?
5. To what degree can the archaeological remains in the BSEP survey area aid in the classification of regional settlement and mobility systems with respect to mobility type, frequency, and range?
6. Does the frequency or intensity of occupation of the BSEP sites correlate with reconstructed patterns of paleoenvironmental change?
7. Is there evidence to suggest that the site is primarily related to nonsubsistence functions?

Lithic Technology and Utilization

Flaked and groundstone tools and waste products are relatively rare on the surface of the sites within the BSEP survey area. However, agricultural disturbance may obscure more robust assemblages, and even simple assemblages can be useful in reconstructing resource procurement and mobility strategies.

Flaked Stone Technology

The ways that hunter-gatherers chose to organize the procurement, manufacture, and discard of flaked stone tools varies in relationship to several factors, including the relative availability and quality of toolstone within their territorial range, intended tool functions, the frequency and nature of residential moves, organization of work groups, and division of labor (e.g., Bamforth, 1990; Beck et al., 2002; Eerkens et al., 2007; Kelly, 1988). Hence, the recording of lithic technology can be useful in addressing more general questions regarding territoriality, mobility, settlement patterns, and down-the-line exchange. For example, highly mobile peoples may "gear up" when they encounter knappable toolstone (Kelly and Todd, 1988). In doing so they discard curated tools, often from distant sources. Changes in toolstone procurement behavior may be reflective of intensified subsistence procurement within more restricted territories and/or changes in the scheduling and directionality of seasonal subsistence-related residential mobility. Since the location of the BSEP sites was not likely a source of usable toolstones, any flaked or groundstone material would have to have been brought to the site and would thus be useful in reconstructing mobility and resource procurement strategies.

Desert pavements in the western Mojave often contain sources of knappable toolstones, including cryptocrystalline silicates (e.g., chert and chalcedony) and basalt. California City, near the BSEP area is known as a source of such lithic materials. Also as mentioned above, the Coso obsidian source is within a possible range of direct procurement, or may have been relatively obtainable through exchange networks. Excavations near the BSEP area yielded relatively high frequencies of chalcedony, rhyolite, and obsidian (Sutton, 1991).

Groundstone Technology

Because of high transport costs, groundstone tools are often cached or left in situ in places to which mobile groups intend to return. As such these tool types may be good indications of a location of relatively frequent and/or long-term use. Also, because of transport costs, toolstones from distant sources are particularly noteworthy in terms of the implications for regional mobility and exchange relationships.

Research Questions

The following research questions relevant to this research theme will be addressed during the BSEP evaluation program:

1. What types of raw materials were utilized in the production of flaked and groundstone tools?
2. Can the sources of these materials be identified?
3. Is the use and/or production of bifaces present? If so, what production stages are present?
4. Are expedient core/flake technologies present? If so, what stages of production are present?

5. Is there evidence on-site for procurement of locally available toolstone?
6. What can be inferred about prehistoric settlement and mobility patterns from the toolstone assemblages?

Cultural Affiliation and Linguistic Prehistory

For at least 50 years archaeologists, linguists, and Native American groups have debated whether the Numic branch of the Uto-Aztecan language family originated in the southwestern Great Basin and adjacent mountain ranges and spread northward and eastward until most of the region during the past 1,000 years (Lamb, 1958; Rhode and Madsen, 1994). The BSEP area is within the area generally considered to be the possible homeland of the southern Numic languages, and archaeological sites within this general area may have data relevant to the debate. Particularly relevant would be evidence for population growth within the purported homeland, evidence for changes in interaction spheres, and evidence for the development of new adaptive strategies (Bettinger and Baumhoff, 1982). Sutton and others (2007) have suggested that the expansion of Numic-speaking people out of the southwestern Great Basin may have been correlated with the drought cycles of the Medieval Climatic Anomaly.

Research Questions

1. Is there evidence of significant changes in population density or settlement patterns?
2. Is there evidence of reorganization of economic networks? Changes in the frequency of Coso obsidian might be particularly relevant to this issue, since the frequency of this toolstone declines fairly rapidly to the east.
3. Are there sources of genetic information at any of the sites? In the unlikely event that human remains are present in the Project area, the landowner would need to consult with the state-appointed Most Likely Descendents about respectful treatment. In the context of this consultation it should be determined if DNA-extraction would be permissible. If so, this could be an important data source in the Numic-spread debate.

RESEARCH ISSUES – HISTORIC SITE

Only a single historic period resource is included in the evaluation program, the historic component of the dual component Site 3. This historic component consists of three partially buried refuse deposits that are tightly clustered next to a dirt road that leads from SR-14 to the base of the Tehachapi Range. Historical archaeology research issues are discussed below.

Historical Archaeology

When the historical context of refuse deposits, such as BSS-03, can be determined, then analysis of the assemblage content can yield important insight into social and economic behavior that is difficult or impossible to gain through the study of the documentary record alone (Caltrans, 2007; Praetzellis, 1994; Spencer-Wood, 1987). Deetz (1988:367) pointed out, "… [the] refinement [of historical explanation] is best accomplished by maintaining a balance between the documentary and the material evidence, being always mindful that, to be a productive exercise, the results should provide a more satisfactory explanation than would be forthcoming from either set of data alone." With regard to refuse deposits, historical documents may assist in identifying the household or commercial unit that was likely the consumer of the waste products deposited at the site and, in addition, can outline the socioeconomic characteristics of that unit. By contrast, the archaeological record preserves a glimpse of the actual consumption patterns that occurred in the past and often sheds light on the everyday lives of common people whose stories remain largely untold in historical documents.

Documentary Research

Documentary research will focus on determining whether there is record of a household residence or commercial activity associated with the road leading past Site 3. If such a location can be identified, then additional research will be undertaken to assess the socioeconomic context. Accordingly, the following research questions will be addressed:

1. Can a socioeconomic unit be identified as the likely depositor of the refuse?
2. If so, is it a domestic residence or commercial establishment?
3. What does the documentary record indicate about the dates of occupation?
4. Is the site associated with 20th century agricultural use of the dry lake-bed?

Patterns of Refuse Disposal

In rural/desert contexts such as at Site 3, household refuse was often simply dumped on the surface in a deserted area accessible by car or pick-up truck. In the case of Site 3, though, it appears that more effort went in to disposal practice, that is, pits were dug to contain the refuse. The archaeological investigation will more fully describe this disposal practice, addressing the following questions:

1. Can the depth of the disposal pit be determined?
2. Was it mechanically excavated?
3. What kinds of materials were disposed of in the trash dumps? Are there sets of artifacts not represented in the trash refuse?
4. What can be determined about the socioeconomic unit responsible for the disposal

Consumer Behavior

Detecting the kinds of items purchased or owned by a population, and the ways in which these items are obtained, has been termed "consumer studies." Historical archaeologists have noted the development of a consumer-oriented culture within the United States during the late 19th century, due to a general wide availability of consumer goods (Spencer-Wood, 1987). This trend has continued into the 20th century and is discernable in both rural and urban contexts, although some researchers have noted different emphases on purchasing behavior (Van Wormer, 1991). Cultural items from a recognizable historical context have potential for illuminating behavioral patterns and preferences of a residential population. The following research questions are applicable:

1. Does the artifact assemblage reflect the range of artifacts expected to be consumed in a rural household?
2. Do the artifacts identified give any indication of the economic status of the household unit?
3. How do the types and numbers of artifacts compare with other known rural sites in southern California?
4. Is there evidence of food consumption?
5. Is there evidence of products consumed by specific age, gender or ethnic groups?
6. What can the archaeological deposits tell us about the daily life of the residents, and their choices of available consumer goods?

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CHAPTER 4
FIELD AND ANALYTICAL METHODS

INTRODUCTION

This chapter outlines the basic approaches used for the acquisition of data necessary to address the research questions identified in the research design. This program has three main constituents: identification of intact deposits, acquisition of datable materials, and an assessment of CRHR eligibility. These constituents are dictated by management needs and the desire to increase our understanding of human activity in the area

These objectives can be summarized as follows:

- Identify the potential for cultural features that may be present,
- Assess the potential for chronological control,
- Assess the potential for spatial variability, and
- Assess eligibility for the CRHR.

To meet the information requirements of each of the questions identified within the research design, surface and subsurface investigations were conducted accordingly for each of the sites.

ARCHIVAL RESEARCH

Archival research was undertaken in an effort to identify a building location and ultimately the identity of the people associated with the material identified at Site 3. EDAW archaeologist Christy Dolan reviewed historical topographic maps to determine whether there were any structures that could be related to the refuse found at the site. The maps that showed the area around Site 3 included the following:

- 1915 Mojave 1:125000 scale topographic map;
- 1923 Mojave 1:125000 scale topographic map;
- 1943 Cross Mt. 1:50000 scale topographic map;
- 1947 Mojave 1:50000 scale topographic map; and
- 1956 Mojave 1:16500 scale topographic map.

These maps were reviewed to determine when the northwest-southeast trending road just south of Site 3 was established and whether there were any structures in the vicinity, including the foothills west of Site 3.

FIELD METHODS

Surface Documentation

Prior to any subsurface work or collection, a resurvey at 3-m intervals was conducted of the site area and its immediate surroundings. The site boundaries were refined based upon the surface findings. Surface artifact concentrations or other cultural features were marked using pinflags during the close-interval survey. The spatial relationship among features within multicomponent sites is considered critical information in evaluating the sites. This is particularly true for materials associated with trails but also applies to the distribution of lithic materials, ceramics, and rock features. Accurate mapping is necessary to assess whether spatial associations are fortuitous or represent different activities within a single period of occupation. Mapping of cultural features was accomplished with the assistance of a submeter Global Positioning System (GPS). This mapping method was also used for the site boundaries, surface collection, and subsurface tests (see below). California Department of Parks and Recreation (DPR) primary and archaeological site records were completed to reflect the results of the surface mapping and subsurface investigations.

Many of the sites in the project area appear to be shallow surface deposits. At such sites surface collection is an appropriate method to sample the artifact assemblage. Since no dense artifact concentrations were encountered during the evaluation program, surface collection was accomplished by point proveniencing individual diagnostic artifacts. Collected artifacts were GPS-mapped as they were collected and bagged in accordance with a unique numerical designation, which was entered into the GPS database and recorded in the field notebook.

Excavations

Shovel Test Pits (STPs)

At Site 10 where there was a surface artifact scatter and a potential for a subsurface scatter, initial subsurface exploration was accomplished through the excavation of STPs. An STP, as defined herein, consists of a 30 cm in diameter circular excavation, removed in 10 cm increments, designed to detect the presence or absence of subsurface artifacts. Excavated soils were dry-screened through 1/8-inch wire mesh. All excavated areas were backfilled. STPs were placed at intervals along the north-south and east-west axes of Site 10 and were excavated to depth sufficient to demonstrate the presence or absence of a subsurface component. Due to the shallow soils in most of the Project Area, an excavation depth of 30 to 40 cm was sufficient.

Test Excavation Units (TEUs)

Subsurface deposits were explored at one site (Site 13) through the use of two hand excavated trenches. These trenches were divided into fifteen 0.5-by-1-m TEUs in order to further delineate deposits. Stratigraphic profiles were made of at least one wall of each trench. The profiled sidewall of each trench was also photographed. A unit excavation notebook was completed describing each of the excavated units. All excavated areas were backfilled. Archaeologists used GPS to map the hand-excavated trench locations. All recovered cultural materials were recorded by provenience and transported to the EDAW facilities for processing.

Mechanical Excavation

A total of eight archaeological trenches were mechanically excavated in north-south and east-west transects across four sites (Site 8, Site 9, Site 11, and Site 12). Trench locations at each site were carefully selected to achieve maximum coverage of fire-affected rock (FAR) concentrations. The backhoe trenches were each approximately 10 m in length. Trench depth was typically no greater than 1 m to allow safe access for recordation. Stratigraphic profiles were made of at least one wall of each trench, along with plan views of all exposed features. The profiled side-wall of each trench was photographed and all identified features were photographed. All excavations were recorded using GPS to map trench locations. Trenches were backfilled prior to leaving the project area. All recovered cultural materials were recorded by provenience and transported to the EDAW facilities for processing.

ANALYTICAL METHODS

Identification and cataloging of materials was completed by EDAW staff under the direction of the project archaeologist. A standard system of cataloging cultural material was used to document the recovered artifacts. Flotation was conducted on a bulk soil sample collected from Site 12 using 1/16-inch mesh hardware cloth. The sample was micro-sorted and carefully examined for small residue.

Each artifact or group of artifacts was counted, weighed, and/or measured and given consecutive catalog numbers. Each item was analyzed for specific attributes particular to that material class.

A computerized master catalog was created in a database program and is included in Attachment D. All items are temporarily stored at EDAW.

SPECIAL STUDIES

When present, a sample of organic materials suitable for radiometric dating was processed from each site and submitted to Beta Analytic for dating. Due to the sample sizes, Accelerated Mass Spectrometer (AMS) dating was necessary to achieve reliable results.

The one obsidian artifact collected was submitted for sourcing and hydration analysis. Copies of specialist studies are appended to this report as attachments.

CURATION

Material collected from the BSEP will be curated at qualified curatorial facility in southern California. Material will be labeled and stored in archival materials. A copy of the catalog will accompany the collection.

CHAPTER 5
SITE DESCRIPTIONS AND RESULTS

INTRODUCTION

The BSEP survey identified 59 archaeological resources. Of these sites, 18 could be affected by the Project. DPR forms for these resources, including site maps are provided in Attachment 4. Based on surface observations, six sites (CA-KER-5264H, Site 16, Site 17, Site 18, Site 19, and Site BSPL-H-1) were recommended as not eligible based on survey-level data (Apple and Glenny, 2008). The remaining 12 sites appear to possess the potential to qualify for the CRHR but could not be definitively evaluated on the basis of the surface survey. Four of these sites, CA-KER-3366H, Site 6, Site 54, and Site BSPL-H-02 will be avoided and were not evaluated. The current investigations address the evaluation of the remaining eight resources.

Survey-Level Assessments

Eighteen of the sites identified during the survey could potentially be impacted by the Project. Based on surface observations and documentation, six of these are recommended not eligible for the CRHR and not significant under the uniqueness criterion of the California Environmental Quality Act (CEQA) (see Chapter 7, Management Recommendations). The remaining 12 sites were recommended potentially eligible (Apple and Glenny, 2008). Table 1 lists the sites, with a description and assessment of each site provided below.

CA-KER-5264H

This site was originally recorded as a small historic debris scatter, measuring 180 feet east-west by 90 feet north-south. Reported artifacts included approximately 75 glass fragments, approximately 15 pieces of ceramics, round nails, a glove, and some unidentifiable metal. The site area is slightly impacted by a dirt track directly beneath the utility lines. The current survey did not relocate the artifacts listed at CA-KER-5464H. It appears the material was collected as part of the Fremont Valley Pipeline Project (Smith and Raven-Jennings, 1997).

Based on proximity of the artifacts to the utility line and the presence of a glove, CA-KER-5264H may be associated with the construction of the wooden pole utility line that crosses the site, but there is no clear indication of this. Even if an association did exist, it would not be significant. Since the site artifacts appear to have been collected, the site does not retain integrity.

Table 1
Archaeological Site Assessments Based on Surface Documentation

P-Number/ Trinomial or Temporary Number	Site Type	Date	Eligibility Recommendation	Action
15-003366/CA-KER-3366H	Southern Pacific Railroad	Late 19th to 20th century	Potentially eligible	Avoid; No evaluation
15-006415/CA-KER-5264H	Debris scatter	20th century	Not eligible	None
Site 3	Historic debris and lithic scatter	Prehistoric/late 19th to mid 20th century	Potentially eligible	Evaluate
Site 6	Lithic scatter and historic debris	Prehistoric/early to mid 20th century	Potentially eligible	Avoid; No evaluation
Site 8	Fire-affected rock and lithic	Prehistoric	Potentially eligible	Evaluate
Site 9	Fire-affected rock	Prehistoric	Potentially eligible	Evaluate
Site 10	Camp	Prehistoric	Potentially eligible	Evaluate
Site 11	Fire-affected rock	Prehistoric	Potentially eligible	Evaluate
Site 12	Fire-affected rock	Prehistoric	Potentially eligible	Evaluate
Site 13	Fire-affected rock, groundstone, projectile point	Prehistoric	Potentially eligible	Evaluate
Site 16	Refuse scatter	Early to mid 20th century	Not eligible	None
Site 17	Lithic scatter	Prehistoric	Not eligible	None
Site 18	Lithic scatter	Prehistoric	Not eligible	None
Site 19	Lithic scatter	Prehistoric	Not eligible	None
Site 54	Lithic scatter	Prehistoric	Potentially eligible	Avoid; No evaluation
Site 59	Trail	Prehistoric	Potentially eligible	Evaluate
Site BSPL-H-1	Debris scatter	Early to mid 20th century	Not eligible	None
Site BSPL-H-2	Foundation and refuse	20th century	Potentially eligible	Avoid; No evaluation

Site CA-KER-5264H lacks clear or significant associations with important events or people. It does not qualify under Criterion 3. The site's data content is limited and without significant associations it does not qualify under Criterion 4. This site is recommended not eligible for the CRHR.

Site 16

Site 16 is a debris scatter consisting of both modern and historic artifacts in a 15 m by 20 m area. The historic component contains aqua, green and brown glass, and ceramics. The modern debris consists of non diagnostic metal fragments, modern auto parts, and a modern can opener. The site appears to be the result of multiple debris dumps, with no clear associations. The site is situated in an old agricultural field. The area has been impacted by past agricultural activities.

This site does not meet Criterion 1, 2, or 3 of the CRHR. The only CRHR criterion that Site 16 might be eligible under is Criterion 4. The site's integrity and data content, however, are limited. Based on the site's low potential to contribute to regional research, Site 16 is recommended not eligible for the CRHR.

Site 17

Site 17 consists of a low density lithic scatter covering a 15 m by 20 m area. The site is situated in an old agricultural field. Artifacts include three flakes and a bifacial tool. All the items are CCS. The site has been impacted by agricultural activities and the area is deflated. The site possesses a low potential for an intact significant buried deposit.

This site does not meet CRHR Criteria 1, 2, or 3. The only criterion that Site 17 might be eligible under is Criterion 4. However, the site's integrity and data content are very limited. Based on the site's low potential to contribute to regional research, Site 17 is recommended not eligible for the CRHR.

Site 18

Site 18 is a low density lithic scatter measuring 18 m by 45 m. The site is located in an old agricultural field in low sand dunes. Observed artifacts include a core chopper, a core fragment, and four CCS flakes. The area is deflated and barren and has been impacted by past agricultural activities.

Site 18 does not qualify for the CRHR under the first three criteria of the CRHR. The only criterion that this site might be significant under is Criterion 4, but the site's integrity and data content are limited. Based on Site 18's low potential to contribute to regional research, it is assessed as not eligible for the CRHR.

Site 19

This site consists of a low density lithic scatter encompassing a 13 m by 35 m area. Six CCS flakes were observed. The area is deflated, leaving numerous small natural rocks exposed on the surface (Plate 1). The site possesses a low potential for a significant intact buried deposit. The site is located in an old agricultural field. The area has been impacted by past agricultural activities.

Plate 1. Site 19 overview. View to the west.

This site does not meet CRHR Criteria 1, 2, or 3. The only criterion that Site 19 could potentially be eligible under is Criterion 4. However, the site's integrity and data content are very limited. Based on its low potential to contribute to regional research, Site 19 is recommended not eligible for the CRHR.

Site BSPL-H-01

This site is a historic refuse concentration with cans, glass, and some non diagnostic metal fragments. The site measures approximately 20 m by 20 m and is situated in an area with sparse creosote with burro grass and bottle bush. The site contains material from the 1920s through the 1960s. Observed items include white ceramics, window glass, tobacco cans, green aqua glass and some hole-in-top cans.

Site BSPL-H-01 appears to reflect more than one disposal event. None the material is very diagnostic. Given its location, it most likely represents roadside dumping. This site does not meet any of the CRHR criteria. It has no important associations; does not represent a type, period, region, or method of construction, or the work of an important creative individual, or possess high artistic values; and has limited data potential. Site BSPL-H-01 is recommended not eligible for the CRHR.

Assessments Based on Additional Documentation and Excavation

The recent evaluation efforts involved an intensive surface survey and at some sites, subsurface excavations using STPs, TEUs, and mechanical equipment. Resurvey and detailed mapping were carried out at the sites. Each cultural resource and the investigations performed there were documented on the appropriate DPR forms (Attachment 4). Additional archival research was also conducted for Site 3.

Fieldwork associated with this evaluation program was carried out July 30 through August 14, 2008. Each of the cultural resources in this study was examined using the methodology outlined in the preceding sections. Table 2 summarizes the level of effort for each site.

Table 2
Evaluation Level of Effort

Site No.	Description	Area (m^2)	Research/ Documentation	Surface Collection	STPs	TEUs	Mechanical Trenches
3	Historic debris scatter and lithics	3,690	Yes	No	0	0	0
8	Fire-affected rock	480	Yes	No	0	0	2
9	Fire-affected rock	79	Yes	No	0	0	2
10	Camp	1,790	Yes	Yes	11	0	0
11	Fire-affected rock	100	Yes	No	0	0	2
12	Fire-affected rock	275	Yes	No	0	0	4
13	Fire-affected rock	852	Yes	Yes	0	15	0
59	Trail	-	Yes	No	0	0	0

Each site was examined to determine the extent of its surface features and associated artifact scatters. Results of the field observations, surface collections, and excavations are presented in this chapter.

As discussed in more detail below, the subsurface investigation identified buried cultural features at four prehistoric sites interpreted to have been hearths. These consisted of pits filled with fire-affected rock and/or charcoal stained earth.

As discussed in more detail below, the subsurface investigation identified buried cultural features at four prehistoric sites interpreted to have been hearths. These consisted of pits filled with fire-affected rock and/or charcoal stained earth.

Site 3

Site 3 is a mixed historic and prehistoric site with three concentrations of historic domestic debris and automotive parts. The prehistoric component consists of a sparse lithic scatter. The resource is approximately 20 miles north of the town of Mojave, along SR 14. This site encompasses a 3,690 m^2 area situated on a gently sloping alluvial fan on the eastern side of the Tehachapi range (Plate 2). Creosote dominates the vegetation in this vicinity.

Plate 2. Site 3 overview. View to the south.

Previous Investigations

In October 2007, EDAW archaeologists conducted an intensive pedestrian survey that identified this site. At that time, this site was recorded and marked with a nail at the datum, and its coordinates were taken with a submeter GPS unit.

Current Investigations

Currently no residences or other structures that date to the early to mid-20th century are located in close proximity to the site. The three concentrations of historic debris evidence a similar disposal method, and the overall similarity of materials in all three concentrations suggests that the historic materials may have had one source and were most likely placed at the site by the same individual or individuals in a relatively short time span. The site's placement near a dirt road connecting SR 14 and the foothills of the Sierras seem to indicate that a probable source for the material might be a dwelling in the nearby mountains.

Archival research was undertaken in an effort to identify a building location and ultimately the identity of the people associated with the material. A series of USGS maps for the area were reviewed. The 1915 and 1923 maps did not show the road nor did they show any structures. The 1943 and 1947 maps showed the road beginning at what was then called Route 6 (along the current alignment of SR 14) and continuing approximately 1,100 ft to the northwest and terminating at a wash. No structures are shown within a mile of the area. The 1956 map showed the road heading northwest from Route 6 approximately 2,800 ft where it appears to terminate at the intersection with what would be the transmission line road today. There are no structures shown in the vicinity.

Surface Elements

The surface component of this site consists of three artifact concentrations, which appear to be partially buried. Concentration 1 has both prehistoric and historic artifacts, while Concentrations 2 and 3 only contain historic artifacts. Concentration 1 measures 5.5 m north-south and 6 m east-west. The prehistoric component consists of eight flakes, one core, and one unmodified nodule of obsidian. The historic component includes bottle glass fragments, ceramic fragments, automotive parts, hardware, a bullet casing, tin cans, a railroad spike, and milled lumber. Concentration 2 measures 4 m north-south and 3 m east-west, and consists of ceramic tile fragments, automotive parts, hardware, and tin cans. Concentration 3 measures 5 m north-south and 5 m east-west and consists of glass fragments, ceramic tile fragments, automotive parts, hardware, a bottlecap, and three nails. Although many of the items are not temporally diagnostic, those that are indicate a date span of early to mid-20th century. Although some household refuse is included, the assemblage is dominated by construction-related debris and miscellaneous hardware.

A trail (Site 59 see below) is approximately 10 m east of Site 3. There is no indication that the two sites are associated.

Subsurface Elements

No subsurface investigation was conducted at this site.

Evaluation

This site appears to be the result of three incidences of early to mid-20th century dumping of miscellaneous debris. One of the dump episodes co-occurred with the location of a small lithic scatter. The surface inspection indicated that shallow depressions were excavated and filled with debris and then partially covered by backfilling. The native soil is cobbly and it would have taken some effort to excavate and backfill the pits, suggesting that mechanical equipment may have been used. Given this and the apparent single source of the material, archival research was conducted in an attempt to establish associations for the historic period material. No likely sources of the material were found. As such, Site 3 does not have any distinctive historical association and does not contain important information. Accordingly, it does not meet any of the criteria for the CRHR.

Site 8

This scatter of FAR encompasses a 630 m^2 area situated on the floor of Fremont Valley, in an area now devoid of vegetation (Plate 3). The site is situated approximately 20 miles north of the town of Mojave along SR 14.

Previous Investigations

In October of 2007, EDAW archaeologists conducted an intensive pedestrian survey that identified this site. At that time, this site was recorded and marked with a nail at the datum, and its coordinates were taken with a submeter GPS unit.

Plate 3. Site 8 overview. View to the north.

Current Investigations

Mechanical trenching was conducted at Site 8.

Surface Elements

The surface component of this site consists of two concentrations of FAR: Concentration 1 and Concentration 2. Concentration 1 consists of approximately 350 pieces of FAR and measures 12 m north-south and 10 m east-west. Concentration 2 consists of approximately 150 pieces of FAR and measures 5 m north-south, and 7 m east-west. The FAR in these concentrations are fist-sized and smaller, round and subangular and are made up of granite and basalt. A close interval survey of the area located one volcanic flake. No other artifacts were identified on the surface.

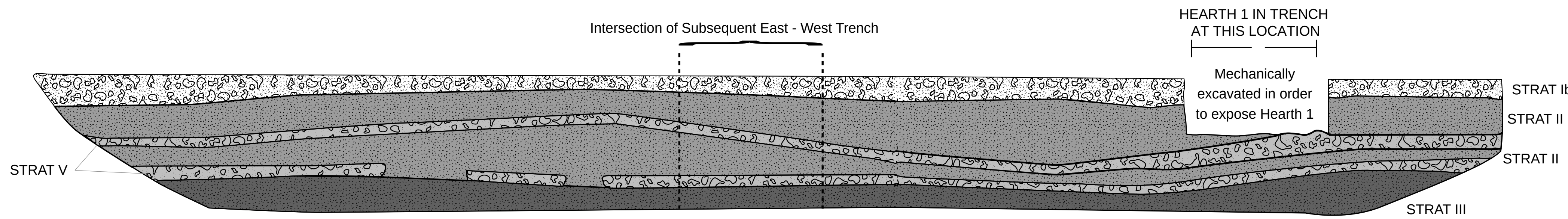
Subsurface Elements

Mechanical trenching was conducted in Concentration 1. A north-south trench measuring 10.25 m and an east-west trench measuring 8.6 m were excavated by backhoe. The trenches were approximately 1 m wide and had a maximum depth of approximately 1 m. The trenches intersected in approximately the center of the concentration.

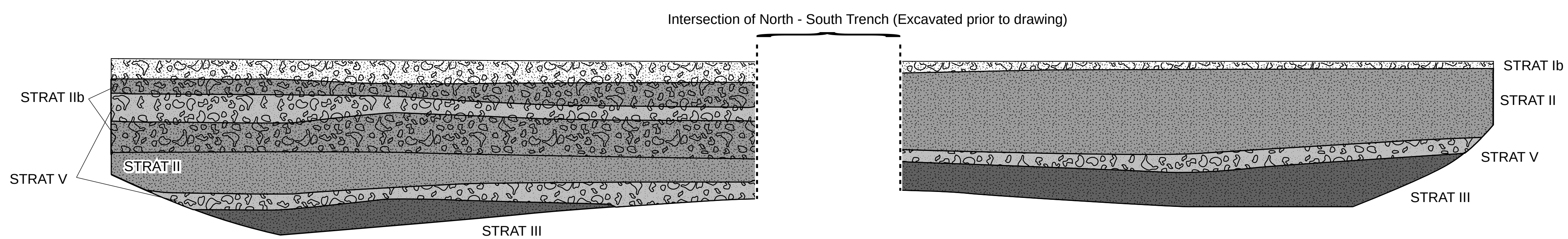
The soil at this site is composed of silty sand with varying levels of compaction and moisture. There are three different strata: plow zone, root zone, and lake bed. There is a general trend towards an increase in both moisture and compaction with depth.

Mechanical excavation at Site 8 exposed a single fire-affected rock feature, interpreted as a hearth (Hearth 1) in the east wall of the north-south trench (Plate 4). The hearth was found in stratigraphic layer II and III (Figure 3) with the top of the hearth measuring 70 cm from surface and the bottom 85 cm from surface. The hearth consisted of 67 pieces of FAR and measured approximately 79 cm north-south and 84 cm east-west. There was evidence of charcoal staining in the matrix directly above the hearth (stratigraphic layer I). A total net weight of 3.9 g of charcoal was collected from the hearth. The collected charcoal sample was bagged and taken back to EDAW facilities. No additional artifacts were recovered.

Plate 4. Hearth at Site 8.



North - South Trench, East Wall



East - West Trench, North Wall

STRAT Ib	TAN / SILTY SAND WITH GRAVEL / SLIGHT COMPACTION / PLOW ZONE
STRAT II	TAN / SILTY SAND / MEDIUM COMPACTION / SLIGHT MOISTURE / ROOT ZONE
STRAT IIb	TAN / SILTY SAND WITH GRAVEL / MEDIUM COMPACTION / SLIGHT MOISTURE / ROOT ZONE
STRAT III	TAN / FINE GRAINED SILTY SAND / MEDIUM COMPACTION / SLIGHT MOISTURE / LAKE BED
STRAT V	WHITE AND TAN / MOTTLED CALICHE, SAND, AND LARGE GRAINED GRAVEL / HARD COMPACTION

0 .5 1 Meter

Figure 3
Site 8, Trench Profile

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The charcoal sample (Beta-248247) from Hearth 1 yielded a conventional radiocarbon date of 560 ± 40 B.P. Calibrated to 2-sigma this would date to A.D. 1290 to 1420.

Evaluation

Although there is a very low density of artifacts (other than FAR) at this site, mechanical testing has demonstrated that at least one subsurface prehistoric feature is present, retaining good integrity. The surface scatter of FAR is sufficiently dense and widespread to indicate that additional subsurface features (Site Structure Research Issue) may be present. A charcoal sample recovered from Hearth 1 was of sufficient size for radiocarbon dating, using Accelerator Mass Spectometry (AMS), showing that the site can be placed within a temporal framework (Chronology Research Issue). Additional organic residues are likely to exist within the subsurface features and these would be useful in addressing the Subsistence, Settlement, and Mobility Research Issue and the Cultural Affiliation and Linguistic Prehistory Research Issue. Accordingly, this site has the potential to yield important archaeological information; it is evaluated as eligible for the CRHR under Criterion 4.

Site 9

This scatter of FAR encompasses a 78 m^2 area situated on the valley floor of Fremont Valley, east of the foot of the Tehachapi Mountains. The surface has been deflated and lacks any vegetation.

Previous Investigations

In October of 2007, EDAW archaeologists conducted an intensive pedestrian survey that identified this site. At that time, this site was recorded and marked with a nail at the datum, and its coordinates were taken with a submeter GPS unit.

Current Investigations

Mechanical trenching was conducted at Site 9.

Surface Elements

The surface component of this site consists of a concentration of FAR measuring 10 m north-south and 10 m east-west. It is made up of approximately 150 pieces of fist-sized, and smaller, rounded, angular and subangular fire blackened rock that range between 5 cm and 8 cm in size.

Subsurface Elements

Mechanical trenching was conducted at this site (Plate 5). A north-south trench measuring 7.2 m and an east-west trench measuring 8.2 m were excavated with a backhoe with the two trenches intersected in the center of the concentration. The trenches were approximately 1 m wide and had a maximum depth of approximately 1 m.

Plate 5. Trenching at Site 9. View to the northwest.

The soil at this site is composed of silty sand with varying levels of compaction and moisture. It is broken generally into three different strata: plow zone, root zone, and lake bed. There is a general trend toward an increase in both moisture and compaction with depth.

A single feature (Hearth 1), consisting primarily of a shallow pit filled with charcoal-stained earth, was exposed in the west sidewall of the north-south trench at Site 9 (Plate 6). The hearth was found in stratigraphic layer I with the top of the hearth measuring 25 cm from surface and the bottom 35 cm from surface. The matrix immediately surrounding the hearth was charcoal stained and differed from stratigraphic layer I in compaction and color. The matrix was therefore represented as a different stratigraphic layer, stratigraphic layer IV (see Figure 4). The hearth measured 75 cm north-south. No charcoal was collected from the feature.

Plate 6. Hearth at Site 9. View to the west.

Evaluation

Although no artifacts or FAR was found directly associated with the hearth feature, it is clearly of cultural origin. Mechanical testing has demonstrated that at least one subsurface prehistoric feature is present, retaining good integrity. The surface scatter of FAR surrounding this feature is sufficiently dense to indicate the likelihood of additional subsurface features (Site Structure Research Issue). Abundant charcoal observed in Hearth 1 demonstrates that the site can be placed within a temporal framework (Chronology Research Issue). Additional organic residues are likely to exist within this and other subsurface features, and these would be useful in addressing the Subsistence, Settlement, and Mobility Research Issue and the Cultural Affiliation and Linguistic Prehistory Research Issue. Accordingly, this site has the potential to yield important archaeological information; it is evaluated as eligible for the CRHR under Criterion 4.

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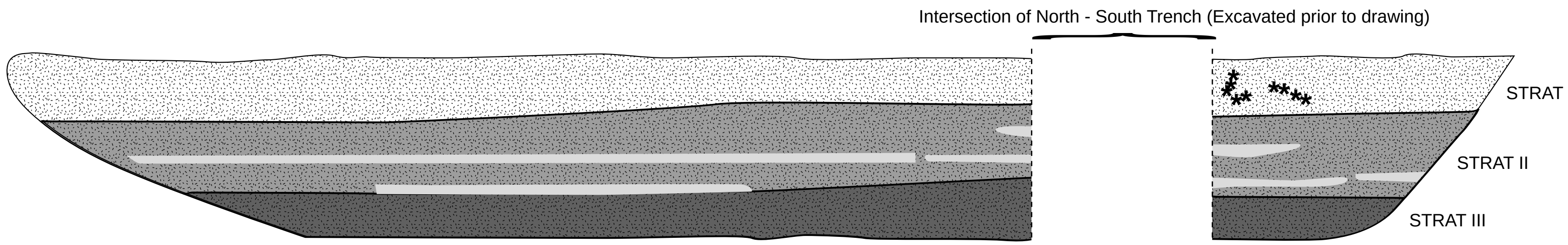
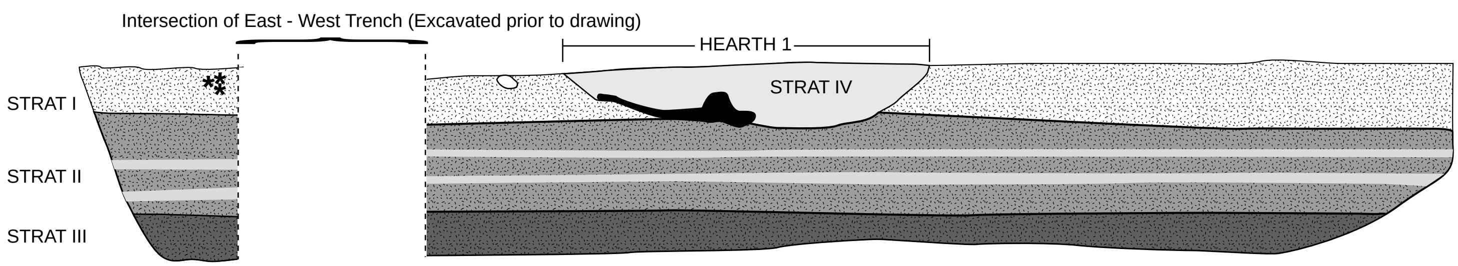


East - West Trench Profile, South Wall



North - South Trench Profile, West Wall

STRAT I TAN / SILTY SAND / SLIGHT COMPATCION / SLIGHT MOISTURE / PLOW ZONE

STRAT II TAN / SILTY SAND / MEDIUM COMPACTION / SLIGHT MOISTURE / ROOT ZONE

STRAT III TAN / FINE GRAINED SILTY SAND / MEDIUM COMPACTION / SLIGHT MOISTURE / LAKE BED

STRAT IV MEDIUM BROWN / CHARCOAL STAINED SILTY SAND / MEDIUM COMPACTION

PINKISH OXIDIZED SOIL WITH HEAVY CHARCOAL STAINING / SILTY SAND / MEDIUM COMPACTION / HEARTH MATERIAL

CHARCOAL FLECKS

FIRE AFFECTED ROCK

SILT DEPOSIT - LIGHT BROWN TO TAN SILT / MEDIUM TO HEAVY COMPACTION / VERY FINE GRAINED

0 .5 1 Meter

Figure 4
Site 9
Trench Profile

Site 10

This site encompasses an irregularly shaped 2,262 m^2 area situated on a low ridge on the valley floor of Fremont Valley, east of the foot of the Tehachapi Mountains. Almost no vegetation is visible on the site surface, which consists of a rocky surface with plow furrows visible across the site (north-south). The site slopes south-north with a gentle gradient. The area is made up of deflated sandy, clayey soil (Plate 7).

Plate 7. Site 10 overview. View to the north.

<u>Previous Investigations</u>

In October of 2007, EDAW archaeologists recorded this site as consisting of a prehistoric lithic scatter, with flaked and groundstone artifacts including four bifaces, one utilized flake, one core, one mano fragment, and approximately 30 flakes.

Current Investigations

Close interval survey was conducted and limited surface collection were conducted at Site 10, along with excavation of 11 STPs.

Surface Elements

In July of 2008, EDAW archaeologists revisited this site. Close interval survey revealed that the surface component was found to be the same as previously recorded.

Four CCS biface fragments were mapped and collected from the surface. All are in varying stages of manufacture. Three of these appear to have been broken prior to completion, while the fourth ([Site 10]-4) may have been reworked. Artifact (Site 10)-1 is a biface preform fragment, split longitudinally. The material is a yellow CCS. It measures 5.7 cm in length and about 1.5 cm thick. It is bi-convex in cross section, with no pressure flaking evident.

Biface (Site 10)-2 is a yellow CCS preform. The biface is 4.7 cm long, 2.7 cm wide, and 1.3 cm thick. It has been roughly shaped, but has little evidence of thinning. It is also bi-convex in cross section. Hinge fractures along one margin may have been the reason for its being discarded.

Artifact (Site 10)-3 is the tip of a CCS biface, with a bending break. The biface measures 2.5 cm in length and is relatively thin and flat. A manufacturing error has removed a portion of the tip. Pressure flaking is evident on both surfaces, and it is plano-convex in cross section. This specimen appears to have been near completion when broken.

Artifact (Site 10)-4 appears to be a biface tip fragment of yellow CCS. One margin is straight and the other is curved, resulting in an off-center tip. It has been thinned by pressure flaking, and is plano-convex in cross section. A series of flakes along the dorsal surface of the curved margin terminated in hinge fractures, leaving a ridge paralleling the margin. It has a bending break through the mid section and was likely being reworked prior to this final fracture.

Subsurface Elements

Eleven STPs were excavated across this site. Ten of the STPs were arranged at 20 m intervals in two lines: a north-south line and an east-west line. An eleventh STP was placed between the first and second STPs on the north line. The STPs yielded two CCS biface thinning flakes. Both were from STP 1, one flake at 10 to 20 cm and one flake at 20 to 30 cm.

Evaluation

This sparse scatter of flaked and groundstone yielded no evidence of a subsurface deposit and no material that can be used to place the site in a temporal framework. There is no evidence regarding associations or that it contains important information. Consequently, it is evaluated as not eligible for the CRHR.

Site 11

This site encompasses an approximately 100 m^2 area situated on the valley floor of Fremont Valley, east of the foot of the Tehachapi Mountains. The surface soils are deflated and consist of silts. Vegetation in the area consists of small patches of ankle-high desert grass, and there is a low density of rock in the area other than those associated with the feature (Plate 8).

Plate 8. Site 11 overview. View to the north.

Previous Investigations

In October of 2007, EDAW archaeologists conducted an intensive pedestrian survey that identified this site. At that time, this site was recorded and marked with a nail at the datum, and its coordinates were taken with a submeter GPS unit.

Current Investigations

Mechanical trenching was conducted at Site 11.

Surface Elements

The surface component of this site consists of a concentration of FAR measuring 16 m north-south and 8 m east-west. It is made up of approximately 230 pieces of FAR that range in size from 2 cm to 8 cm.

Subsurface Elements

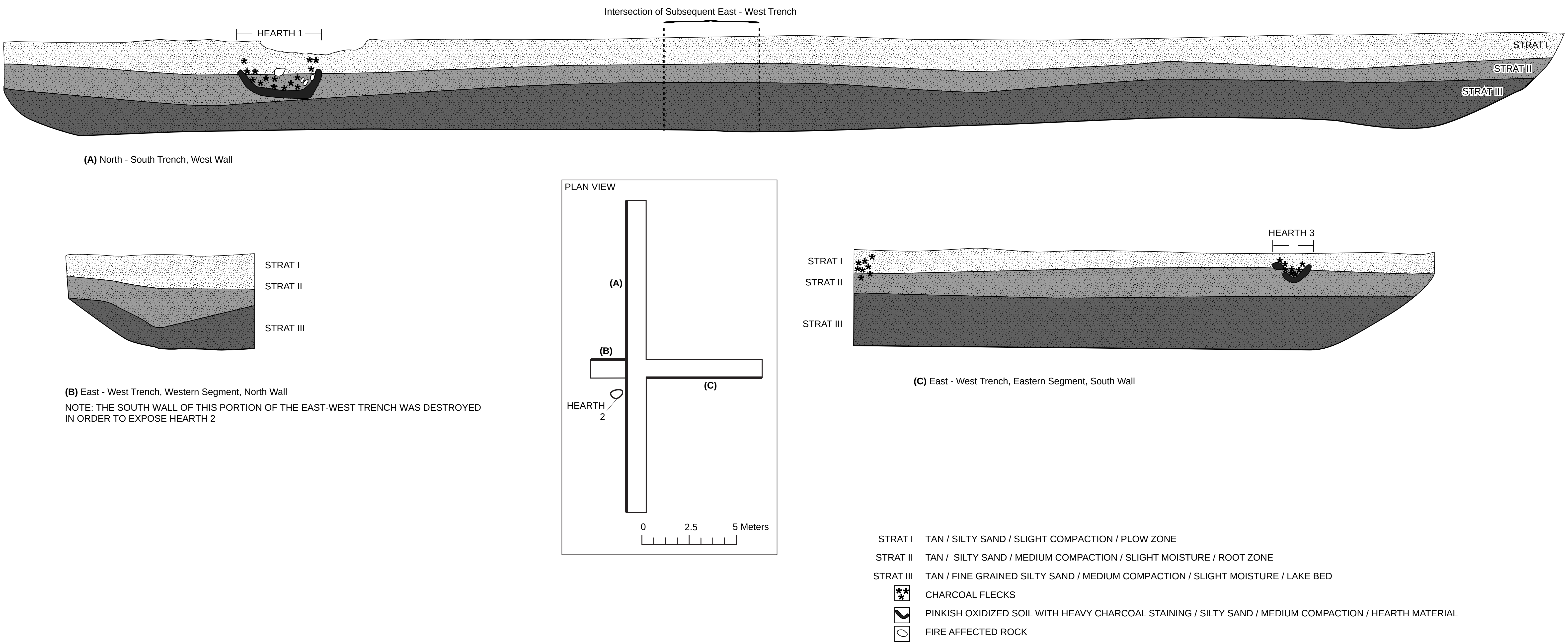
Mechanical trenching was conducted at this site. A north-south trench measuring approximately 16.4 m and an east-west trench measuring 9 m were excavated with a backhoe. The trenches were approximately 1 m wide and had a maximum depth of approximately 1 m (the two trenches intersected in the center of the concentration).

The soil at this site is composed of silty sand with varying levels of compaction and moisture. It is broken generally into three different strata: plow zone, root zone, and lake bed. There is a general trend toward an increase in both moisture and compaction with depth. (The stratigraphic profiles of the trench walls are shown in Figure 5)

Three subsurface features, interpreted as hearths, were identified in the course of trenching. No artifacts were identified in association with the hearths, but charcoal was present and samples were collected (Table 3).

Table 3
Cultural Materials Summary

Provenience	Charcoal (gm)
Hearth 1	47.8
Hearth 2	66.2
Hearth 3	27.2
Total	141.2



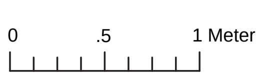


Figure 5
Site 11, Trench Profile

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Hearth 1

Hearth 1 (Plate 9) was exposed in the north-south trench at Site 11. The hearth was found in stratigraphic layers I and II (see trench profile), 2.5 m from the southern extent of the north-south trench. The top of the hearth measures 30 cm from the surface and the bottom of the hearth measures 55 cm from the surface. The feature consists of 30 FAR pieces and measures 86 cm north-south and 55 cm east-west. A total net weight of 50 g of charcoal was collected from the hearth. In addition, a single avian bone fragment was found within the hearth. Analysis of the bone fragment suggests that the bone is intrusive as there is no evidence of burning or soil staining. The collected sample was bagged and taken back to EDAW facilities.

Plate 9. Hearth 1 at Site 11.

Hearth 2

Hearth 2 (Plate 10) was exposed in the north-south trench of Site 11. The hearth was found in stratigraphic layers I and II, 0.5 m north of Hearth 1. The top of the feature measures 25 cm from the surface and the bottom of the feature measures 40 cm from the surface. The hearth consists of 35 pieces of FAR and measures 42 cm north-south and 62 cm east-west. A total net weight of 67.9 g of charcoal was collected form the feature. In addition, a single avian bone fragment was found within the hearth. Analysis of the bone fragment suggests that the bone is intrusive as there is no evidence of burning or soil staining. All cultural material was collected, bagged, and taken back to the EDAW facilities.

Plate 10. Hearth 1 remnant in sidewall of trench at Site 11.

Hearth 3

Hearth 3 was exposed in the sidewall of the southern segment of the east-west trench at Site 11. The hearth was found in stratigraphic layers I and II, with the top of the hearth measuring 13 cm from surface and the bottom of the hearth measuring 25 cm from surface. The hearth measures 45 cm east-west.

A sample of charcoal from Hearth 1 was submitted for AMS dating. Sample Beta-245914 produced a conventional radiocarbon date of 480 ± 40 B.P. At a 2-sigma calibration, this would date from A.D. 1270 to 1320 or A.D. 1350 to 1390.

Evaluation

Testing at Site 11 revealed three distinct hearth features retaining good integrity. Although this is a small site, the presence of multiple features in the test trenches indicates the likelihood that additional subsurface features exist there (Site Structure Research Issue). The radiocarbon date shows that the site can be placed within a temporal framework (Chronology Research Issue). Charcoal samples from the other hearths are also of sufficient size for AMS dating, which will refine and possible extend the temporal placement of the site. Additional organic residues are likely to exist within the subsurface features and these would be useful in addressing the Subsistence, Settlement, and Mobility Research Issue and the Cultural Affiliation and Linguistic Prehistory Research Issue. Accordingly, this site has the potential to yield important archaeological information; it is evaluated as eligible for the CRHR under Criterion 4.

Site 12

This site encompasses a 275 m^2 area situated on the valley floor of Fremont Valley, east of the southern Sierras. The site sits in a currently unused agricultural field barren of vegetation except for dead grasses. The surface has very few rocks in the area that are not related to the feature (Plate 11).

Previous Investigations

In October of 2007, EDAW archaeologists conducted an intensive pedestrian survey that identified this site. At that time, this site was recorded and marked with a nail at the datum, and coordinates were taken with a submeter GPS unit.

Current Investigations

Mechanical trenching was conducted at Site 12.

Surface Elements

The surface component of this site consists of two concentrations of FAR, Concentration 1 and Concentration 2. Concentration 1 consists of approximately 330 pieces of FAR and measures 10 m north-south and 12 m east-west. Concentration 2 consists of approximately 250 pieces of FAR and measures 12 m north-south, and 8 m east-west. The FAR in these concentrations are fist-sized and smaller, round and subangular, and are made up of granite and basalt.

Plate 11. Site 12 overview. View to the southeast.

Subsurface Elements

Mechanical trenching was conducted in both FAR concentrations at this site. In Concentration 1, a north-south trench measuring 14 m and an east-west trench measuring 12.5 m were excavated (the two trenches intersected in the center of the concentration). In Concentration 2, a north-south trench measuring 13.3 m and an east-west trench measuring 8.5 m were excavated (the two trenches intersected in a T pattern in the center of the concentration). In both concentrations, the trenches were excavated with a backhoe. They were approximately 1 m wide and had a maximum depth of approximately 1 m.

The soil at this site is composed of silty sand with varying levels of compaction and moisture. It is broken generally into three different strata: plow zone, root zone, and lake bed. There is a general trend toward an increase in both moisture and compaction with depth.

A single hearth was exposed in the north-south trench at Site 12. The hearth was found in stratigraphic layers I and II, with the top of the hearth measuring 36.5 cm from the surface and the bottom of the hearth measuring 50 cm from the surface. The hearth consists of four large pieces of FAR and measures 46 cm north-south and 46 cm east-west. A total net weight of 13 g of charcoal was collected from the feature. The collected sample was bagged and taken back to the EDAW facilities.

A charcoal sample from the hearth was submitted for AMS dating. It yielded a conventional date of 190 ± 40 B.P. (Beta-247915). Calibrated to 2-sigma this would date from A.D. 1650 to 1950.

Evaluation

Mechanical testing has demonstrated that at least one subsurface prehistoric feature is present, retaining good integrity. The surface scatter of FAR is sufficiently dense and widespread to indicate that additional subsurface features (Site Structure Research Issue) are likely. A charcoal sample recovered from Hearth 1 was of sufficient size for AMS dating, showing that the site can be placed within a temporal framework (Chronology Research Issue). Additional organic residues are likely to exist within the subsurface features and these would be useful in addressing the Subsistence, Settlement, and Mobility Research Issue and the Cultural Affiliation and Linguistic Prehistory Research Issue. Accordingly, this site has the potential to yield important archaeological information; it is evaluated as eligible for the CRHR under Criterion 4.

Site 13

This scatter of fire-affected rock encompasses a 852 m^2 area situated on the valley floor in Fremont valley, east of the southern Sierras. The surface has been deflated and the soils are dry and cracking and consist of loose silt. There are no other rocks in the area and creosote and desert grasses are the dominant flora (Plate 12).

Previous Investigations

In October of 2007, EDAW archaeologists conducted an intensive pedestrian survey that identified this site. At that time, this site was recorded and marked with a nail at the datum, and its coordinates were taken with a submeter GPS unit.

Current Investigations

Field work at Site 13 included survey, limited surface collection, and excavation of test units.

Plate 12. Site 13 overview. View to the north.

Surface Elements

The surface component of this site consists of a scatter of FAR and artifacts over a 31 by 35 m area. The FAR scatter is made up of approximately 25 pieces of fire blackened and cracked granite and schist that are fist-sized and smaller, rounded, angular, and subangular and range in size between 2 cm and 8 cm. A metate fragment and an obsidian biface were collected from the surface.

The biface ([Site 13]-3) is a tip and midsection fragment resulting from a bending break through the midsection. It measures 4.5 cm in length, 2.2 cm in width, and is 0.8 cm thick. It is unfinished and was broken during manufacture.

A single piece of groundstone ([Site 13]-68) was collected from the surface of Site 13. This metate fragment of volcanic material measures 6.1 cm long, 5.7 cm wide, and 8.3 cm thick. The fragment has remnants of two ground surfaces situated perpendicular to each other, with pecking visible on one of the ground surfaces. The fragment is not large enough to determine if the metate was shaped. The fracturing is from exposure to heat.

Subsurface Elements

Hand trenching was conducted at this site. A north-south trench measuring 12 m and an east-west trench measuring 3.5 m were hand excavated (the two trenches intersected in the FAR concentration).

Subsurface deposits were explored at one site (Site 13) through the use of two hand-excavated trenches. These trenches were divided into sixteen 0.5-by-1-m TEUs to further delineate deposits. Stratigraphic profiles were made of one wall of each trench. The profiled sidewall of each trench was also photographed. All excavations were recorded in meters and centimeters, and each of the excavated units were described in a unit excavation notebook. All excavated areas were backfilled. Archaeologists used GPS to map the hand-excavated trench locations. All recovered cultural materials were recorded by provenience and transported to the EDAW facilities for processing.

The soil at this site is composed of silty sand with varying levels of compaction and moisture. It is broken into three different strata: plow zone, root zone, and lake bed. There is a general trend toward an increase in both moisture and compaction with depth.

No features were identified, but charcoal was scattered throughout the excavated area at depths between 0 and 40 cm. Fire-affected rock was encountered in the subsurface in six of the units (Table 4). A piece of debitage was recovered from 0 to 10 cm below surface in Trench A Unit 9. The volcanic debitage was a 3.1 cm core reduction flake.

A sample of charcoal from the 0 to 10 m level of Unit 3A was submitted for AMS radiocarbon assay. The sample (Beta-247916) dated to 880 ± 40 B.P. in conventional radiocarbon years. A 2-sigma calibration dates to A.D. 1040 to 1240 (920 to 700 B.P.).

<u>Evaluation</u>

Although no distinctive hearth features were identified during trenching, there is sufficient subsurface FAR to suggest that features probably do exist at the site. Additionally, charcoal was found to a depth of at least 30 cm, again suggesting that the site could contain features with sufficient integrity and sufficient site structure to be archaeologically useful. Additionally, radiocarbon dating was successful here and yielded the oldest date from the BSEP, indicating that this site could be important in addressing the Subsistence, Settlement, and Mobility Research Issue and the Cultural Affiliation and Linguistic Prehistory Research Issue. It is

Table 4
Summary of Recovered Materials

Provenience	Biface	Lithics	Groundstone	Charcoal	FAR
Surface Collection 1	1				
Surface Collection 2			1		
Unit A1				4.8	116.5
Unit A2				1.2	
Unit A3				0.5	137.4
Unit A4				3.6	95.2
Unit A5				1.0	
Unit A6				2.2	73.1
Unit A7/B1				1.9	217.9
Unit A8				3.8	305.4
Unit A9		1		5.8	482.8
Unit A10				5.1	156.3
Unit A11				3.5	199.4
Unit A12				2.7	208.7
Unit B2				1.4	302.3
Unit B3				0.6	68.4
Unit B4				0.2	14.8
Total	**1**	**1**	**1**	**38.3**	**2,378.2**

considered likely that this site contains additional organic residues that would be important in reconstructing prehistoric land use in Fremont Valley. Consequently, the site is evaluated as eligible for the CRHR under Criterion 4.

Site 59

This site is a prehistoric trail that roughly parallels SR 14 for approximately 2 km. Site 59 would be crossed by Transmission Line Option 1. The trail is approximately 30 cm to 35 cm in width (Plate 13). The preservation of the trail is variable, with some sections clearly visible and other sections obliterated by erosion and/or off-road vehicle tracks.

Previous Investigations

In October of 2007, EDAW archaeologists conducted an intensive pedestrian survey that identified this site. At that time, this site was recorded and its coordinates were taken with a submeter GPS unit.

Plate 13. Site 59 overview. View to the north.

<u>Current Investigations</u>

The trail alignment was intensively surveyed and mapped.

Surface Elements

A close interval survey was conducted along the trail. A submeter GSP was used to map the alignment. Although the trail winds over and between several sites, both historic and prehistoric, no cultural material was identified within the survey corridor along the trail.

Subsurface Elements

No subsurface investigations were conducted.

Evaluation

This trail site lacks distinctive historical associations and does not contain important information beyond what was recorded during the survey and submeter mapping. Consequently, it is evaluated as not eligible for the CRHR.

CHAPTER 6
DISCUSSION

The archaeological evaluation program addressed a total of eight sites, the majority of which are small prehistoric sites located on relatively flat valley floor deposits that had been impacted by 20th century agriculture. While these sites have relatively sparse artifact assemblages, several were found to have subsurface features with relatively good integrity. The following discussion focuses on these sites in the context of the research issues presented in Chapter 4, but addresses briefly the other site types as well.

PREHISTORIC SITES

Chronology

The sites produced sufficient charcoal from well-controlled contexts to provide a useful series of radiocarbon dates (Table 5), data which indicate that this complex of sites was occupied during the Late prehistoric period from possibly as early as A.D. 1040 through the early contact period. Interestingly, at least three of the four radiocarbon dates would place the occupations as possibly falling within the Medieval Climatic Anomaly (A.D. 890–A.D. 1350). This period saw generally elevated temperatures throughout the northern hemisphere and was reflected in much of California by epic drought cycles (Stine, 1994; Jones et al., 1999; West et al., 2007).

Table 5
Radiocarbon Results

Sample	Source	Material	Measured Radiocarbon Age	13C/12C Ratio (0/00)	Conventional Radiocarbon Age
Beta-248247	Site 8 Hearth 1, 70-80 cm	Charred material	560 ± 40 B.P.	-22.9	590 ± 40 B.P.
Beta-247914	Site 11 Hearth, 30-60 cm	Charred material	480 ± 40 B.P.	-12.8	680 ± 40 B.P.
Beta-247915	Site 12 Hearth 1, 30-40 cm	Charred material	100.3±0.5 pMC	-11.8	190 ± 40 B.P.
Beta-247916	Site 13, 0-10 cm	Charred material	650 ± 40 B.P.	-10.9	880 ± 40 B.P.

As noted in Chapter 4, radiocarbon assay is the preferred dating method in the region because it provides the best available precision and reliability. However, chronological studies would also benefit from the presence of other data sources, and the latter are not well represented within the samples collected during the BSEP evaluation investigations. A single obsidian biface was found within the project area. Sourced to the Coso volcanic field, this biface yielded a mean hydration rim measurement of 5.7 microns. Due to variability in effective hydration temperature and other as yet poorly understood factors (Cleland, 2006; Rogers, 2006), a single obsidian date is only a weak temporal indicator. Nonetheless, applying the most widely used hydration rate for Coso obsidian would suggest the possibility of a somewhat earlier occupation than has been shown so far in the radiocarbon results. A 5.7 micron rim would suggest a Saratoga Springs or late Gypsum date. Beyond the sites with fire affected rock,, the lithic scatter and the trail failed to yield any evidence of temporal affiliation.

Site Structure

While the sites with fire affected rock have been impacted on the surface by agricultural plowing, the testing program demonstrated that subsurface features retain stratigraphic integrity below the plow zone. Additionally, there was shown to be a high correspondence between surface scatters of FAR and the presence of subsurface features. This association suggests that, while plowing disrupted the vertical integrity of plow zone, horizontal integrity remains somewhat intact. For short term occupations, such as those expected to prevail at these sites, the retention of horizontal integrity suggests that assemblages would not be expected to be highly mixed due to plowing and that the investigation of intersite variability would be possible. Also relevant to the site structure issue would be input regarding the depositional and erosional context of the sites. The investigations that have been done to date indicate that the lakebed and the fans to the west are accretionary environments (Kleinfelder, 2008, and that late period sites can be found below the lakebed surface..

Subsistence, Settlement, and Mobility

In Chapter 4, it was suggested that Native American groups with logistical base camps in the canyons issuing from the Tehachapi Mountains could have exploited resources available in the BSEP area. The assemblage composition of the sites supports this suggestion. The low artifact density alone argues against the alternative scenario that residential camps were established within the Project area. However, if data recovery is required, additional excavation would be necessary to recover sufficient information to make a definitive analysis of site function. In particular, block exposures in areas where intact features have been found would be necessary to recover related artifact assemblages. If data recovery is conducted, equally important, residue analysis of intact FAR features and charcoal lenses would be useful to identify the botanical resources that were being targeted by prehistoric populations.

Prehistoric Native American settlement systems probably responded to paleoclimatic change. As noted in Chapter 4, the project area would be expected to have a greater resource potential during more mesic times rather than more arid cycles. The radiocarbon data indicates that many of the sites with fire affected rock were occupied during the MCA, when drought cycles prevailed but were temporarily ameliorated by more mesic conditions. This certainly suggests that the sites have a high potential to provide very useful data on Native American adaptive strategies during the MCA. It is noteworthy in this regard that one of the radiocarbon samples yielded a 13C/12C (δ13C) ratio of -22.9 0/00, which is consistent with a C3 carbon path. This path is typically found in marsh vegetation, but not in arid land plants. The δ13C ratio of the other three samples is consistent with arid land plants.

Chapter 4 pointed out that nonsubsistence-related activities may also influence Native American land-use patterns. To date, there is no evidence to suggest ceremonial or other nonsubsistence activities were important determinants of the site locations. Nonetheless, if data recovery is required, residue analysis of the hearth features should be conducted to better define their function.

Lithic Technology and Utilization

Too few artifacts were found during the testing program to provide much insight into this research issue. It does not appear that the BSEP sites offer a good potential to address this issue.

Cultural Affiliation and Linguistic Prehistory

Very little data are available at the BSEP sites to address this research issue directly. However, recent archaeological interpretations of the possible late spread of the Numic languages out of the southwestern Mojave Desert have focused on the role of climate change during the MCA (Sutton et al., 2007). Because many of the small BSEP sites appear to date to this period, they could provide an important test of these archaeological reconstructions.

HISTORIC PERIOD SITE

Documentary research conducted for a single historic period site addressed during the evaluation program failed to find information relevant to its historical associations. The two partially buried refuse dumps at this site appear to have building materials as well as some domestic trash. Surface examination yielded no clues as to the sociocultural context. Thus, this site has little information to add about the research issues of Patterns of Refuse Disposal or Consumer Behavior.

CHAPTER 7
MANAGEMENT RECOMMENDATIONS

INTRODUCTION

CEQA directs lead agencies to first determine whether a cultural resource is a "historically significant" cultural resource. The current evaluation program assessed sites that might be affected by BSEP.

EVALUATION CRITERIA

CEQA defines a historical resource as:

- A resource listed in, or determined to be eligible by the State Historical Resources Commission for listing in the CRHR.
- A resource included in a local register of historical resources identified as significant in a historical resources survey shall be presumed to be historically or culturally significant, Public agencies must treat any resource significant unless the preponderance of evidence demonstrated that it is not historically or culturally significant.
- Any object, building, structure, site area, record, or manuscript which a lead agency determines to be historically significant to significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be a historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a cultural resource shall be considered by the lead agency to be "historically significant" if the resources meets the criteria for listing on the CRHR, including the following:

    (1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

    (2) Is associated with the lives of persons significant in our past;

    (3) Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of an important creative individual, or possesses high artistic value; or

(4) Has yielded, or may be likely to yield, information important in prehistory or history.

For most archaeological resources this involves evaluation of their ability to address important research questions (Criterion 4). For sites with built or historic period components, this can involve assessment under one or several of the other criteria.

Under CEQA, an archaeological resource can also be a "unique archaeological resource" as defined as:

> An archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:
>
> (1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
>
> (2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.
>
> (3) Is directly associated with a scientifically recognized important prehistoric or historic event or person. [Public Resources Code Section 21083.2(g)]

EVALUATIONS

Nine sites are recommended not eligible for CRHR and not unique under CEQA (Table 6). Four sites (CA-KER-3366H, Site 6, Site 54, and Site BSPL-H-2) are identified as potentially eligible and will be avoided by BSEP. Five sites, Site 8, Site 9, Site 11, Site 12, and Site 13, are recommended eligible for the CRHR under Criterion 4 based on their potential to yield information about prehistory.

MANAGEMENT RECOMMENDATIONS

BSEP will avoid four potentially eligible sites and one eligible site (Site 8) and potentially impact four sites recommended eligible for the CRHR (Table 6). The four eligible sites that will potentially be affected, Site 9, Site 11, Site 12, and Site 13, are all fire affected rock scatters. Hearths and/or dateable material were identified at these sites. If avoidance is not feasible, mitigation in the form of archaeological data recovery is recommended. Any investigations should be conducted under a research design focused on the data potential of the sites.

Table 6
Management Recommendations for Archaeological Sites Potentially Affected by BSEP

P-Number/ Trinomial or Temporary Number	Site Type/Context	CRHR Recommendation	Project Facility	Recommendation
15-003366/CA-KER-3366H	Southern Pacific Railroad/Historic travel in the Mojave Desert	Potentially significant under Criterion 1 of CRHR	Plant site	Avoid
15-006415/CA-KER-5264H	Debris scatter/Historic occupation of the Mojave Desert	Not eligible	Plant site	None
Site 3	Historic debris and lithic scatter/Historic and prehistoric occupation of Mojave Desert	Not eligible	Transmission Line Option 2 (southern)	None
Site 6	Lithic scatter and refuse/ Prehistoric and historic occupation of Mojave Desert	Potentially significant under Criterion 4 of CRHR	Transmission Line Option 2 (southern)	Avoid
Site 8	Fire-affected rock/Prehistoric occupation of Mojave Desert	Eligible under Criterion 4 of CRHR	Plant site/ Rerouted wash	Avoid
Site 9	Fire-affected rock/Prehistoric occupation of Mojave Desert	Eligible under Criterion 4 of CRHR	Plant site/ Rerouted wash	Avoid or data recovery
Site 10	Camp/Prehistoric occupation of Mojave Desert	Not eligible	Plant site/ Rerouted wash	None
Site 11	Fire-affected rock/Prehistoric occupation of Mojave Desert	Eligible under Criterion 4 of CRHR	Plant site/ Rerouted wash	Avoid or data recovery
Site 12	Fire-affected rock/Prehistoric occupation of Mojave Desert	Eligible under Criterion 4 of CRHR	Plant site/ Rerouted wash	Avoid or data recovery
Site 13	Fire-affected rock/Prehistoric occupation of Mojave Desert	Eligible under Criterion 4 of CRHR	Plant site	Avoid or data recovery
Site 16	Refuse scatter/Historic occupation of Mojave Desert	Not eligible	Plant Site	None

P-Number/ Trinomial or Temporary Number	Site Type/Context	CRHR Recommendation	Project Facility	Recommendation
Site 17	Lithic scatter/Prehistoric occupation of Mojave Desert	Not eligible	Plant Site	None
Site 18	Lithic scatter/Prehistoric occupation of Mojave Desert	Not eligible	Plant Site	None
Site 19	Lithic scatter/Prehistoric occupation of Mojave Desert	Not eligible	Plant Site	None
Site 54	Lithic scatter/Prehistoric occupation of Mojave Desert	Potentially significant under Criterion 4 of CRHR	Transmission Line Option 1 (northern)	Avoid
Site 59	Trail/Prehistoric travel in Mojave Desert	Not eligible	Transmission Line Option 2 (southern)	None
Site BSPL-H-1	Refuse scatter/Historic occupation of the Mojave Desert	Not eligible	Pipeline	None
Site BSPL-H-2	Foundation and refuse/ Historic occupation of Mojave Desert	Potentially significant under Criterion 4 of CRHR	Pipeline	Avoid

CHAPTER 8
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Caltrans

2007 A Historical Context and Archaeological Research Design for Agricultural Properties in California. California Department of Transportation, Sacramento.

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ATTACHMENT 1
RESUMES OF KEY PERSONNEL

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REBECCA MCCORKLE APPLE, RPA

Principal/Manager, Cultural Resources Group/
Senior Archaeologist

SUMMARY

Expertise with CEQA/NEPA requirements

Experience with Section 106 compliance and mitigation programs

Over 20 years experience in cultural resource management

EDUCATION

MA, Anthropology, San Diego State University, 1990

BA, Anthropology, San Diego State University, 1978

AFFILIATIONS

Society for American Archaeology

Society for California Archaeology

CERTIFICATIONS

Register of Professional Archaeologists

Certified Archaeology Consultant, County of San Diego

ACADEMIC AWARDS AND SCHOLARSHIPS

Phi Kappa Phi

Phi Beta Kappa

University Scholar, 1987 and 1988

PAPERS AND PUBLICATIONS

Mapping and Managing Pathway to the Past. Paper presented at the 22nd Annual ESRI International User Conference, San Diego, California (2002).

Introduction to Recent Archeological Investigations at the Salton Sea Test Base, Imperial County California. Proceedings of the Society for California Archaeology, Volume 12. Fresno, California (1999).

Introduction to Recent Archaeological Investigations at Salton Sea Test Base, Imperial County, California. Paper presented at the 32nd Annual Meeting for Society for California Archaeology, San Diego (1998).

A Lake Mojave Period Site Near Silver Lake, California (with A. York). Presented at the 26th Annual Meeting of the Society for California Archaeology, Pasadena (1992).

Recent Archaeological Investigations in the North Las Vegas Valley (with J.H. Cleland and M.S. Kelly). In Crossing the Borders: Quaternary Studies in Eastern California and Southwestern Nevada. San Bernardino County Museum Association Special Publication (1991).

Preliminary Project Results of the San Diego County Studies for the Southwest Powerlink Transmission Project. Presented at the 17th Annual Meeting of the Society for California Archaeology, San Diego (1983).

Rebecca Apple has over 20 years of experience in cultural resource management and serves as senior archaeologist for EDAW. Her experience includes managing cultural resources compliance efforts for large complex projects. She is knowledgeable in the procedures and guidelines associated with implementation of NHPA and CEQA. She has managed numerous cultural resource projects, including prehistoric, historic, and ethnographic studies. She has directed inventories, evaluations, data recovery efforts, and monitoring programs. She has also prepared management plans and conducted feasibility studies. Her work frequently includes consultation with municipal, state, and federal agencies, as well as Native American representatives and the public. As part of interdisciplinary teams, she has managed cultural resources investigations and authored cultural resource sections for ISs, EAs, EIRs, and EISs. Her experience includes cultural resource investigations for pipelines, transmission lines, power plants, highways, landfills, water resource facilities, military installations, and commercial and residential development.

ENERGY AND TRANSMISSION PROJECTS

Beacon Solar, California City, CA
Task Manager
CLIENT: ENSR/Beacon Solar, LLC/FPLE
Responsible for oversight of archaeological and architectural surveys, technical reports, coordination with CEC staff, and preparation of AFC sections for a 2,000–acre solar project.

Yuma Lateral Pipeline Project, Yuma, AZ
Project Manager
CLIENT: North Baja LLC (TransCanada)
Responsible for cultural services, conducting records searches, archival research, Native American consultation, and survey of the preferred alignment. Identified resources included the Yuma Valley Railroad, a National Register-eligible property.

Harper Lake Cultural Resources Constraints Study, San Bernardino County, CA
Task Manager
CLIENT: ENSR/Harper Lake, LLC
Responsible for field reconnaissance and constraints analysis for a proposed 3,300-acre specific plan area. Potential development included a diary and energy park.

North Baja Pipeline Project, Ehrenberg, Arizona to Mexican Border
Project Manager
CLIENT: Foster Wheeler
Responsible for cultural services, conducting records searches, archival research, Native American consultation, survey of the preferred alignment and alternatives, site evaluation, and data recovery.

DeAnza Pipeline Constraints and Permitting Analysis, Ehrenberg, AZ to Calexico, CA
Resource Manager
CLIENT: AEP
Responsible for cultural services, providing information on distribution of natural and cultural resources along the proposed pipeline corridor in report

format, with accompanying maps showing these resources and other constraints.

SEMPRA On-call Cultural Services, CA
Resource Manager
CLIENT: SEMPRA Energy
Resource manager for cultural resource task orders. Most recent task order dealt with artifact curation for a City project.

Imperial Irrigation District Cultural Survey, Imperial County, CA
Project Manager
CLIENT: Imperial Irrigation District
Responsible for cultural resources component of two transmission line studies. Survey and testing were conducted in conjunction with pole replacement along the R and L transmission lines.

Mead-Adelanto Transmission Line, Clark County, NV, and San Bernardino County, CA
Resource Manager
CLIENT: Los Angeles Department of Water and Power
Cultural resource survey.

Sycamore Canyon Substation to Rancho Carmel Substation 69-kV Transmission Line Project, San Diego County, CA
Project Manager
CLIENT: San Diego Gas & Electric
Responsible for cultural resources component of a PEA document for submittal to the CPUC that evaluated the potential environmental impacts of a proposed 69-kV transmission line.

Coso Known Geothermal Resource Area, Inyo County, CA
Resource Manager
CLIENT: Los Angeles Department of Water and Power
Responsible for data recovery investigations at two geothermal well-pads located in the Sugarloaf Mountain Obsidian Source National Register District.

Santa Ynez Unit Development, Santa Barbara County, CA
Field Director
CLIENT: Exxon Corporation
Supervised data recovery excavations of a prehistoric coastal site.

Big Creek Expansion Project Transmission Line, South Central, CA
Data Manager
CLIENT: Southern California Edison
Responsible for cultural resource impact assessment of alternative routes for a proposed transmission line from the Big Creek Hydroelectric Project in the Sierras to the Los Angeles Basin.

Kern River Gas Transmission Project, WY, UT, NV, and CA
Task and Resource Manager
CLIENT: Kern River Gas Transmission Company
Inventory, evaluation, data recovery, and construction monitoring for California portion of this Class I overview.

Argus Cogeneration Expansion, San Bernardino and Inyo Counties, CA
Project Archaeologist
CLIENT: Kerr-McGee
Supervised cultural resource survey and documentation for a water pipeline.

REBECCA MCCORKLE APPLE

Geothermal Public Power Line Project, North Central CA
Resource Manager
CLIENT: Sacramento Municipal Utility District
Responsible for cultural resource surveys for a proposed transmission line from the Geysers Geothermal Area to Sacramento.

Southwest Powerlink 500-kV Transmission Line EIR/EIS, Imperial and San Diego Counties, CA
Resource Manager
CLIENT: San Diego Gas & Electric
Participated in Section 106 compliance activities, including data recovery, analysis, and report preparation.

MILITARY PROJECTS

Integrated Cultural Resources Management Plan and Cultural Affiliation Study, Chocolate Mountains Aerial Gunnery Range, Marine Corps Air Station Yuma, Riverside, and Imperial Counties, CA
Co-Principal Investigator
CLIENT: U.S. Navy, Naval Facilities Engineering Command, Southwest and MCAS Yuma
Preparing an ICRMP for CMAGR to guide cultural resources compliance efforts to facilitate CMAGR mission. ICRMP will summarize existing inventory and provide a process to streamline the inventory and evaluation process. Components of the ICRMP are a Regional Archaeological Research Design and a Cultural Affiliation Study.

Archaeological Evaluation of Sites on San Clemente Island, Los Angeles County, CA
Principal Investigator
CLIENT: U.S. Navy Southwest Division and Navy Region Southwest
Responsible for National Register of Historic Places Evaluation of four archaeological sites on San Clemente Island.

Cultural Resources Survey and Evaluation for Spring Hill and Associated Access Roads, Riverside County, CA
Principal Investigator
CLIENT: U.S. Navy, Naval Facilities Engineering Command, Southwest and MCAS Yuma
Directed archaeological resource survey of proposed facility to improve communications for aircraft and vehicles with the Chocolate Mountain Aerial Gunnery Range (CMAGR). Two sites were evaluated for eligibility to the National Register of Historic Places. One site appeared to contain very limited information potential and did not qualify for the NRHP. Site CA-RIV-8236 appeared to possess information relevant to addressing regional research issues and was recommended eligible for the NRHP.

Integrated Cultural Resources Management Plan Naval Base Point Loma, San Diego, CA
Project Manager
CLIENT: U.S. Navy, Naval Facilities Engineering Command and Naval Base Point Loma
Preparing an ICRMP for CMAGR to guide cultural resources compliance efforts to facilitate CMAGR mission. ICRMP will summarize existing inventory and provide a process to streamline the inventory and evaluation process. Components of the ICRMP are a Regional Archaeological Research Design and a Cultural Affiliation Study.

REBECCA MCCORKLE APPLE

Archaeological Survey for the Chocolate Mountains Aerial Gunnery Range Central Training Area, Marine Corps Air Station Yuma, Imperial County, CA
Resource Manager
CLIENT: U.S. Navy, Southwest Division and MCAS Yuma
Responsible for cultural resource survey of proposed central training area on CMAGR. The 1,580-acre survey identified fours sites on R-2507S and four on R-2507 N. One of the sites on the South Range (the remains of a ranch complex) and three of the sites on the North Range (rock art, ceramics scatter, and a rock ring) were identified as potentially eligible for the National Register of Historic Places.

Chocolate Mountains Aerial Gunnery Range: Cultural Resources Survey of 12 Targets and Monitoring of 14 Archaeological Sites, Riverside and Imperial Counties, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division and MCAS Yuma
Directed cultural resource survey of 1,523 acres and site monitoring program on CMAGR. Inventoried site types were lithic scatters, trail segments, pot-drops, rock features, and a mining area. Monitoring program included lithic scatters, rock art, cleared circles, mining complexes, and a segment of historic road.

Cultural Resources Survey of Six Areas on the Chocolate Mountains Aerial Gunnery Range, Imperial County, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division and MCAS Yuma
Directed cultural resource survey of proposed Forward Air Reporting Position, range access, and target areas.

Evaluation of 24 Sites at the Chocolate Mountains Aerial Gunnery Range, Imperial County, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division and MCAS Yuma
Responsible for National Register of Historic Places evaluation of 24 sites in the Chocolate Mountains.

Historic and Archaeological Resources Protection Plan, Chocolate Mountain Aerial Gunnery Range, Imperial and Riverside Counties, CA
Project Manager
CLIENT: U.S. Navy, Southwest Division and MCAS Yuma
Directed archival archaeological research and field visit for the Chocolate Mountain Aerial Gunnery Range. Prepared HARP Plan for the installation.

Evaluation of Two Sites, MCAS Yuma, AZ
Project Manager
CLIENT: U.S. Navy, Southwest Division and MCAS Yuma
Evaluation of two archaeological sites near the MCAS Yuma airfield.

San Clemente Island Operations Management Plan EIS, Naval Auxiliary Air Field, San Clemente Island, Los Angeles County, CA
Resource Manager
CLIENT: U.S. Navy, Southwest Division and SRS Technologies
Assessed current cultural resource inventory and supplemented in specific areas. Project involved preparation of technical report documenting inventory efforts, including shipwreck study. Impact analysis conducted for existing and proposed military operations on San Clemente Island.

REBECCA MCCORKLE APPLE

Indefinite Quantity Contract for Cultural Resource Services, CA and AZ
Project Manager
CLIENT: U.S. Navy, Southwest Division
Contract manager for multiple task orders on a variety of projects involving archaeological surveys and archaeological evaluations throughout California and Arizona. Tasks include managing budget, overseeing staff, acting as point of contact, and preparation of final reports.

Archaeological Support for Environmental Assessment of Wind Farm Project, Naval Auxiliary Landing Field, San Clemente Island, Los Angeles County, CA
Resource Manager
CLIENT: U.S. Navy, Southwest Division
Prepared cultural resource portion of the EA and placed protective signs at nine archaeological sites near or adjacent to the Wind Farm construction area.

Special Warfare Training and Range Survey, Naval Auxiliary Landing Field, San Clemente Island, Los Angeles County, CA
Senior Archaeologist
CLIENT: U.S. Navy, Southwest Division
Performed cultural resource survey of proposed training ranges on San Clemente Island. Prepared technical report in support of an EA.

Evaluation of Six Sites near the Missile Impact Range, Naval Auxiliary Landing Field, San Clemente Island, Los Angeles County, CA
Project Manager
CLIENT: U.S. Navy, North Island, Natural Resources Office
Provided technical assistance for the NRHP evaluation of six archaeological sites on the Central Plateau of San Clemente Island.

Historic and Archaeological Resources Protection Plan, MCAS Yuma, AZ
Project Manager
CLIENT: U.S. Navy, Southwest Division and MCAS Yuma
Directed archival archaeological research and building inventory for MCAS Yuma. Lead author on Historic and Archeological Resources Protection Plan for the installation.

Pumped-Hydro Storage Wind/Energy System, Naval Auxiliary Air Field, San Clemente Island, Los Angeles County, CA
Resource Manager
CLIENT: U.S. Navy, Southwest Division
Relocated and recorded 76 archaeological sites in proposed water storage and wind/energy development area. Prepared existing conditions report.

Tactical Aircrew Combat Training System Range Upgrade, MCAS Yuma, AZ
Project Manager
CLIENT: U.S. Navy, Southwest Division
Performed cultural resource survey of proposed transmission line and 17 threat emitter stations. Prepared testing plan.

Cultural Resource Inventory Survey at Salton Sea Test Base, Imperial County, CA
Project Archaeologist
CLIENT: U.S. Navy, Southwest Division
Conducted intensive cultural resource survey for approximately 6,000 acres and evaluation program for 170 sites. Survey and test excavations were conducted in compliance with the NHPA, NAGPRA, and other federal regulations.

REBECCA MCCORKLE APPLE

Historic and Archeological Resources Protection Plans, Los Angeles, Imperial, and San Diego Counties, CA
Resource Manager
CLIENT: U.S. Navy, Southwest Division
Prepared HARP Plans for the following six Naval installations: Morris Dam Test Facility, Azusa; Naval Air Facility, El Centro; Naval Shipyard, Long Beach; Point Loma Complex, San Diego; Naval Station, San Diego; and the Naval Radio Receiving Facility, Imperial Beach.

Cultural Resources Technical Studies, MCAS Yuma, Yuma Training Range Complex, AZ and CA
Project Archaeologist
CLIENT: U.S. Navy, Southwest Division
Directed cultural resource sample survey in the Chocolate Mountains Gunnery Range.

Mission Trails Regional Park Explosive Ordnance Demolition Environmental Assessment, San Diego County, CA
Project Manager
CLIENT: U.S. Army Corps of Engineers
Directed cultural resource survey in support of an environmental assessment addressing the removal of ordnance from the former location of Camp Elliott.

Archeological Survey of Sierra I Impact Area, MCB Camp Pendleton, San Diego County, CA
Resource Manager
CLIENT: U.S. Marine Corps
Performed cultural resource survey of approximately 2,500 acres on the northern portion of MCB Camp Pendleton.

WATER PROJECTS

Emergency Storage Project, San Diego County, CA
Resource Manager
CLIENT: San Diego County Water Authority
Responsible for the cultural Resources Evaluation Program and Treatment Program. Assisted SDCWA with Native American consultation, implementation of a programmatic agreement, and coordination with ACOE. Project involved evaluation of over 20 cultural resources including San Vicente Dam. Under a Historic Properties Treatment Plan prepared by EDAW, research designs were prepared and carried out for prehistoric and historic period resources. Treatment measures included data recovery, site stabilization, and preparation of Historic American Engineering Record documentation for San Vicente Dam. Prepared Public Interpretive Plan.

North City Water Treatment Plant, San Diego, CA
Resource Manager
CLIENT: City of San Diego Water Department
Managed cultural resource component of the North City Water Treatment Plant EIR. Project included survey and limited testing.

Balboa Park Wastewater Treatment, San Diego County, CA
Archaeologist
CLIENT: City of San Diego
Participated in cultural resource documentation for a facility siting study.

Mission Valley Water Reclamation Plant, San Diego County, CA
Resource Manager
CLIENT: City of San Diego
Responsible for archaeological testing and monitoring program in an area of potential archaeological sensitivity.

REBECCA MCCORKLE APPLE

North Metro Interceptor Sewer, San Diego County, CA
Resource Manager
CLIENT: City of San Diego
Responsible for cultural resource investigations for constraints analysis of proposed sewer alignments.

Freeman Junction, Kern County, CA
Resource Manager
CLIENT: Los Angeles Department of Water and Power
Responsible for the survey of portions of 1st Los Angeles Aqueduct for cap strengthening project.

Eastern Sierra Hydroelectric Relicensing, Mono and Inyo Counties, CA
Field Director
CLIENT: Southern California Edison
Participated in assessment of 22 sites within three hydroelectric project areas.

Pit 3, 4, and 5 Hydroelectric Relicensing Project, Shasta County, CA
Project Archaeologist
CLIENT: Pacific Gas and Electric Company
Directed limited data recovery efforts at six archaeological sites threatened by shoreline erosion prior to stabilization.

Rose Canyon Trunk Sewer EIR, San Diego County, CA
Archaeologist
CLIENT: City of San Diego
Conducted windshield reconnaissance and records search and prepared overview for proposed sewer.

Pamo Dam and Reservoir, San Diego County, CA
Archaeologist
CLIENT: San Diego County Water Authority
Assisted in preparation of research design and conducted archaeological monitoring of geotechnical investigations.

Reservoir 657-2, San Diego County, CA
Archaeologist
CLIENT: Otay Water District
Supervised survey and report preparation of proposed covered reservoir site in Spring Valley.

Mokelumne River Hydroelectric Relicensing, Alpine, Amador, and Calaveras Counties, CA
Crew Chief
CLIENT: Pacific Gas and Electric Company
Participated in archaeological test excavations and NRHP evaluations.

TRANSPORTATION PROJECTS

Southern Nevada Supplemental Airport EIS, Clark County, NV
Co-Principal Investigator
CLIENT: ENSR, VHB, and Clark County Department of Aviation
Responsible for cultural resource inventory of over 17,000 acres for a BLM and transfer. Class III survey also included Radar and Navaid facilities and retention basins. Class I studies for multiple alternatives. Project involved consultation with BLM, USFS, FAA, SHPO, Native American groups, and 106 other interested parties.

REBECCA MCCORKLE APPLE

SR-76 East, San Diego County, CA
Principal Investigator
CLIENT: Caltrans and SANDAG
Responsible for the cultural resource inventory and evaluation program for the SR-76 East widening project. Oversaw the survey of three alternative routes for archaeological and architectural resources, along with Extend Phase I excavations, ASR, HRER, and HPSR.

SR-56, San Diego County, CA
Resource Manager
CLIENT: City of San Diego
Responsible for the cultural resource evaluation program for the SR-56 EIR. Evaluated 16 sites along two alternative freeway alignments.

La Costa Avenue/I-5 Interchange, San Diego County, CA
Project Archaeologist
CLIENT: Caltrans
Directed an archaeological survey of proposed interchange improvements in the City of Carlsbad. The project requires close coordination with City and Caltrans staff.

SA 680/SF 728 Roadway Project Environmental Studies/EIR, San Diego County, CA
Project Archaeologist
CLIENT: County of San Diego
Directed the test excavation and NRHP evaluation of four sites on the proposed project alignment. These investigations addressed the potential association of the sites with the Harris Site Complex.

SR-79, Riverside County, CA
Resource Manager
CLIENT: Riverside County Transportation Commission
Responsible for cultural resource investigations for widening and realigning two highway segments. Prepared cultural resource sections for ISs and coordinated archaeological survey reports, historic architectural survey reports, and historic study report.

Victorville La Mesa/Nisqually Road Overpass, San Bernardino County, CA
Project Archaeologist
CLIENT: City of Victorville
Supervised survey and prepared positive archaeological survey report and historic property survey report.

LANDFILL AND WASTE-RELATED PROJECTS

Elsmere Canyon Landfill, Los Angeles County, CA
Project Archaeologist
CLIENT: Elsmere Corporation
Directed cultural resource assessment for the EIR/EIS.

Southwest San Diego Landfill Siting Study, San Diego County, CA
Resource Manager
CLIENT: County of San Diego
Responsible for cultural resource assessments of potential landfill sites throughout the southwestern quadrant of San Diego County. Ranked the relative sensitivity of each potential site.

REBECCA MCCORKLE APPLE

LAND DEVELOPMENT PROJECTS

Heber Dunes Off-Highway Vehicle Park, Imperial County, CA
Cultural Resources Project Manager
CLIENT: State of California Department of Parks and Recreation Off-Highway Motor Vehicle Recreation Division
State Parks recently acquired Heber Dunes and is in the process of preparing a General Plan and EIR for the Park. As part of these efforts approximately 350 acres were inventoried for cultural resources.

Laborde Canyon Off-Highway Vehicle Park, Riverside County, CA
Cultural Resources Project Manager
CLIENT: State of California Department of Parks and Recreation Off-Highway Motor Vehicle Recreation Division and Riverside County Economic Development Authority
The areas of the SVRA that would be open to some level of OHV use would cover approximately 1,480 acres within the 2,640-acre Laborde Canyon site. EDAW was contracted to conduct environmental studies for the Laborde Canyon site, including a cultural resource records search and an intensive cultural resources pedestrian survey of the proposed OHV park. Two prehistoric sites and the Lockheed Facility (Beaumont Site No. 2) were recorded within the study area during the survey. A preliminary assessment of the complex at Beaumont Site No. 2 was made to determine eligibility for the California Register of Historical Resources.

Data Recovery for Goat Canyon Retention Basin Border Field State Park, San Diego County, CA
Cultural Resources Project Manager
CLIENT: State of California Department of Parks and Recreation
Conducted data recovery under stringent time constraints based on wildlife issues and construction schedule. Excavation of 50 units at CA-SDI-16,047 Locus B indicated that the site was a buried temporary camp whose occupants exploited littoral, near-shore, and terrestrial subsistence resources. Data recovery investigations successfully collected data important in local and regional prehistory. The identification of a single component locus dating to the Archaic-Late transition is an important contribution.

Fairbanks Country Villas, San Diego, CA
Project Manager
CLIENT: Del Mar Land Management Company
Prepared testing plan and implemented testing program for proposed residential development.

Inmate Reception Center, San Diego County, CA
Project Manager
CLIENT: County of San Diego
Responsible for testing and data recovery of half a city block in downtown San Diego.

343 Sansome Street, San Francisco County, CA
Project Archaeologist
CLIENT: Gerald D. Hines Interests
Participated in archaeological data recovery excavations at a Gold Rush-period site in downtown San Francisco.

North Las Vegas Land Transfer, Clark County, NV
Project Archaeologist
CLIENT: City of North Las Vegas
Directed cultural resource survey of 4,000-acre land transfer from the BLM to the City of North Las Vegas.

REBECCA MCCORKLE APPLE

Apex Industrial Park, Clark County, NV
Project Archaeologist
CLIENT: Kerr-McGee
Conducted archaeological survey and NRHP evaluations for BLM land transfer.

Walnut Hills Subdivision, San Diego County, CA
Archaeological Monitor
CLIENT: Fargo Industries
Conducted archaeological monitoring of site preparation and grading in San Marcos.

Alcoholism Service Center, San Diego County, CA
Project Archaeologist
CLIENT: Fellowship Center, Inc.
Conducted archaeological survey of proposed rehabilitation center adjacent to Mission San Luis Rey in Oceanside.

OTHER PROJECTS

Peñasquitos Park, San Diego County, CA
Archaeologist
CLIENT: County of San Diego
Participated in survey, including documentation of three adobes.

Old Town State Historic Park, San Diego County, CA
Archaeologist
CLIENT: California Department of Parks and Recreation/FIR
Participated in excavation before placement of underground utilities in San Diego.

Rancho Guajome Adobe, San Diego County, CA
Archaeologist
CLIENT: County of San Diego
Participated in excavation, cataloging, and analysis for work conducted before building stabilization efforts.

Anza Borrego Desert State Park, Riverside County, CA
Archaeologist
CLIENT: California Department of Parks and Recreation
Participated in resource inventory survey.

Glamis Imperial Project, Imperial County, CA
Archaeologist
CLIENT: Glamis Imperial Corporation
Conducted cultural resource survey for proposed gold mine.

Fort Cady Boric Acid Mining and Processing Facility, San Bernardino County, CA
Project Archaeologist
CLIENT: Fort Cady Minerals Corporation
Directed survey, testing, and evaluation of 24 sites in Newberry Springs.

Rialto-to-El Paso Fiber Optics Cable, San Bernardino and Riverside Counties, CA
Archaeologist
CLIENT: U.S. Sprint
Conducted cultural resource survey along western extent of project.

REBECCA MCCORKLE APPLE

SELECTED REPORTS

A View Across the Cultural Landscape of the Lower Colorado Desert: Cultural Resource Investigations for the North Baja Pipeline Project (with Jamie Cleland). Prepared for TetraTech and North Baja, LLC. EDAW, Inc., San Diego (2003).

Cultural Resources Evaluation for the North Baja Gas Pipeline (with C. Dolan, J. Underwood, and J.H. Cleland). Prepared for Foster Wheeler Environmental, Inc. EDAW, Inc., San Diego (2001).

Historical and Archeological Resources Protection Plan (HARP) for the Chocolate Mountain Aerial Gunnery Range, Imperial County, California (with J.H. Cleland). Prepared for U.S. Navy Southwest Division, Naval Facilities Engineering Command. EDAW, Inc., San Diego (2001).

Archaeological Resources Evaluation Report State Route 56 Between Coast and Foothill, City of San Diego, California (with J.H. Cleland, A. York, T. Wahoff, and D. James). Prepared for the City of San Diego. KEA Environmental, Inc., San Diego (1997).

Archeological Survey and Evaluation Program for the Salton Sea Test Base, Imperial County, California (with A. York, A. Pignolo, J.H. Cleland, and S. Van Wormer). Prepared for U.S. Navy, Southwest Division, Naval Facilities Engineering Command. KEA Environmental, Inc., San Diego (1997).

Two Sides of the River: Cultural Resources Technical Studies Undertaken as Part of Environmental Documentation for Military Use of the MCAS Yuma Training Range Complex in Arizona and California (with G. Woodall, L. Peterson, and J.S. Bruder). Prepared for the Southwest Division Naval Facilities Engineering Command and MCAS Yuma. Dames & Moore Intermountain Cultural Resource Services Research Paper No. 5, San Diego (1993).

Bank Stabilization at Lake Britton: Limited Data Recovery (with A. MacDougall). Prepared for Pacific Gas and Electric. Dames & Moore, San Diego (1990).

Kern River Pipeline Cultural Resource Survey Report (with J.H. Cleland, A.L. York, and P. Friedman). Submitted to the Federal Energy Regulatory Commission. Dames & Moore, San Diego (1990).

Sugarloaf Mountain in Prehistory: Archaeological Testing and Data Recovery for the Exploratory Drilling Program II and the Unit No. 1 Project (with J.H. Cleland and E. Nilsson). Prepared for the Los Angeles Department of Water and Power. Dames & Moore, San Diego (1990).

An Archaeological Research Design for the Evaluation of Cultural Resources in Pamo Valley, San Diego, California (with J.H. Cleland, J.R. Cook, and J. Schaefer). Wirth Environmental Services, a Division of Dames & Moore, San Diego (1985).

JAMES CLELAND, PHD
Principal

SUMMARY

Principal for archaeological and historical studies

Thirty years of experience directing cultural resource programs

Section 106 compliance specialist

Expert testimony

Award winning projects

Extensive experience with gas transmission and other linear projects

EDUCATION

PhD, Anthropology, University of Virginia, 1977

MA, Anthropology, University of Virginia, 1974

BA, Anthropology, University of Michigan, 1969

AFFILIATIONS

Society for California Archaeology

American Anthropological Association

Society for American Archaeology

CERTIFICATIONS

Register of Professional Archaeologists

National Preservation Institute. Identification and management of traditional cultural places

National Preservation Institute – Section 106. Working with the revised regulations

Principal archaeologist for EDAW, Dr. James Cleland has more than 30 years of experience conducting archaeological, historical, and ethnographic studies. He is thoroughly familiar with regulations and guidelines implementing the NHPA, NEPA, and CEQA. He has authored the cultural resources sections of many EAs, EISs, and EIRs and has provided expert testimony before federal and state administrative agencies regarding the consideration of cultural resources in environmental review.

Dr. Cleland has directed cultural resources investigations throughout the United States and abroad. He manages the full spectrum of technical studies, including archaeological overviews and surveys, test excavations, historical research, historic structures surveys, Native American contact programs, cultural landscape investigations, evaluations of significance for NRHP eligibility, data recovery excavations, construction monitoring, long-term resource planning, and pure research. Spanning a broad spectrum of development and resource management projects, his work has included military activities, power plants, transmission lines, pipelines, oil and gas processing plants, water resource facilities, highways, timber sales, landfills, and commercial and residential developments. His project work has been recognized for excellence by the American Cultural Resources Association, the California Preservation Foundation, the Earth Sciences Research Institute, and the Association of Environmental Professionals.

Dr. Cleland has presented numerous professional papers on cultural resources management and archaeological research. Topics have included the siting and evaluation of large linear projects, approaches to the evaluation of archaeological significance, obsidian hydration and chronology building, hunter-gatherer cultural adaptation, cultural landscapes, and urban historical archaeology. He is a past-president of the Society for California Archaeology and served on the governor's Heritage Resource Task Force in California, helping to guide the formulation of archaeological and historic preservation policy at the state level.

LAND DEVELOPMENT PROJECTS

Hellman Ranch Specific Plan, Orange County, CA
Principal Investigator
CLIENT: City of Seal Beach
Responsible for archaeological evaluation and data recovery of 10 Native American sites in the coastal zone. Work included Native American consultation, burial repatriation and in situ preservation, and on- site cultural interpretation.

Ballpark Infrastructure and remediation, San Diego, CA
Principal-in-Charge
CLIENT: Centre City Development Corporation
Responsible for the archaeological monitoring and data recovery in the downtown East Village area for the proposed ballpark. Required hazardous materials certification. Project received Award of Excellence for Archaeology from the City of San Diego Historical Resources Board.

West Bench Master Plan, Salt Lake County, UT
Cultural Resource Specialist
CLIENT: Kennecott Land Company
Conducted cultural resources assessment of a 93,000-acre master plan

development. Senior review of the cultural resources element of the specific plan.

Bixby Ranch Old Town Center, Orange County, CA
Principal Investigator
CLIENT: City of Seal Beach
Responsible for cultural resources survey, monitoring, and data recovery of proposed commercial development.

101 California Project, San Diego County, CA
Principal Investigator
CLIENT: Catellus, Inc.
Responsible for archaeological testing and data recovery at the San Diego Barracks site (1850 through 1920) for this mid- to high-rise development project in downtown San Diego.

Inmate Reception Center, San Diego County, CA
Principal Investigator
CLIENT: County of San Diego, Department of Public Works
Responsible for major data recovery project at Victorian-Period urban site.

Leopalace Resort, Yona, Guam
Archaeologist and Peer Reviewer
CLIENT: Mayama Development, Inc.
Assisted in the Section 106 consultation with the territorial historic preservation officer, provided peer review of the archaeological data recovery fieldwork, and provided field support to help expedite completion of the archaeological mitigation. Work was done prior to joining EDAW.

North Las Vegas Land Transfer, Clark County, NV
Principal Investigator
CLIENT: City of North Las Vegas
Responsible for cultural resource survey of 4,000-acre land transfer from the Bureau of Land Management to the City of North Las Vegas. Directed cultural resource component of the EIS, assisted Bureau of Land Management in Section 106 consultation, and conducted geoarchaeological testing of an early Holocene spring deposit. Work was done prior to joining EDAW.

Apex Industrial Park, Clark County, NV
Principal Investigator
CLIENT: Kerr-McGee
Responsible for archaeological survey and NRHP evaluations for BLM land transfer. Work was done prior to joining EDAW.

343 Sansome Street, San Francisco County, CA
Principal Investigator
CLIENT: Gerald D. Hines Interests
Directed archaeological test and data recovery excavations at a Gold Rush-Period site in downtown San Francisco. Work was done prior to joining EDAW.

Sierra Vista Development, Cochise County, AZ
Archaeologist
CLIENT: Tenneco
Performed historical and archaeological assessment of a major housing and urban development-assisted project in Fort Huachuca. Work was done prior to joining EDAW.

JAMES CLELAND, PHD

San Diego River Project, San Diego County, CA
Project Director
CLIENT: County of San Diego
Directed cultural resource investigations for a flood control, reclamation, and recreational development master plan. Work was done prior to joining EDAW.

Marina/Columbia Redevelopment Project, San Diego County, CA
Principal Investigator
CLIENT: Centre City Development Corporation
Directed historical research, archaeological site identification, and archaeological test excavations for the 75-block redevelopment area in San Diego. Consulted in the development of a management plan for subsurface cultural resources. Work was done prior to joining EDAW.

ENERGY AND TRANSMISSION PROJECTS

North Baja Pipeline, Ehrenberg, AZ, and Riverside and Imperial Counties, CA
Principal Investigator
CLIENT: Foster Wheeler Environmental
Cultural resources survey, evaluation, and mitigation for an 80-mile natural gas pipeline, under FERC and BLM guidelines.

Line 1903 All American Pipeline Conversion, Kern, San Bernardino, and Riverside Counties, CA
Principal Investigator
CLIENT: ENSR International and El Paso Natural Gas
Directed the cultural resources survey and NRHP evaluation of a 250-mile pipeline project, converting from petroleum to natural gas.

Palomar Energy Project, Escondido, CA
Principal Investigator
CLIENT: ENSR International and Sempra Energy
Directed cultural resources investigation for MW cogeneration plant with associated linear facilities in support of California Energy Commission Application for Certification.

Desert Crossing Pipeline, Clark County, NV, and Mohave County, AZ
Principal Investigator
CLIENT: Natural Resources Group
Directed the cultural resources research design for a natural gas pipeline project. Archaeology survey near Red Lake, Arizona, for gas storage facility.

Valley-Rainbow Transmission Project, Riverside and San Diego, Counties, CA
Principal Investigator
CLIENT: San Diego Gas and Electric Company
Directed cultural resources surveys for the evaluation of alternative transmission line corridors. Included Class I, Class II, and Class III surveys.

Lucerne-to-Big Bear Transmission Line, San Bernardino County, CA
Principal Investigator
CLIENT: USDA Forest Service and Southern California Edison Company
Responsible for cultural resources survey and NRHP evaluation of a 20-mile transmission line through San Bernardino National Forest, and EIR/EIS analysis. Traditional cultural property evaluation of the Gold Mountain-Baldwin Lake district.

Mead-Adelanto Transmission Line, Clark County, NV, and San Bernardino County, CA
Principal Investigator
CLIENT: Los Angeles Department of Water and Power
Responsible for cultural resource survey of a 180-mile interstate transmission line. Work done prior to joining EDAW.

Questar Southern Trails Pipeline, NM, UT, AZ, and CA
Discipline Manager
CLIENT: ENSR International and FERC
Responsible for cultural resource investigations for FERC third-party EIS addressing the conversion of an existing crude-oil pipeline to natural gas. The project runs from northeastern New Mexico to Long Beach, California.

Vector Pipeline EIS, IL, IN, and MI
Discipline Manager
CLIENT: RMI and FERC
Responsible for cultural resource investigations for FERC third-party EIS for a 325-mile corridor of a natural gas pipeline.

Viking Voyageur Pipeline Project, MN, WI, and IL
Discipline Manager
CLIENT: Entrix and FERC
Responsible for cultural resource investigations for FERC third-party EIS for a 770-mile corridor of Viking Voyageur gas transmission pipeline.

Tuscarora Pipeline Project, Klamath County, OR, to Washoe County, NV
Cultural Resource Coordinator
CLIENT: Tuscarora Gas Transmission Company
Responsible for a 229-mile natural gas pipeline from Malin, Oregon, to Reno, Nevada. Coordinated and managed survey, evaluation, and data recovery. Prepared nontechnical public report.

Los Padres National Forest Oil and Gas Leasing, Santa Barbara, Ventura, and Monterey Counties, CA
Principal Investigator
CLIENT: Los Padres National Forest
Responsible for cultural resource overview of potential lease areas (743,000 acres).

Boulder Line Historical Assessment, San Bernardino County, CA
Principal Investigator
CLIENT: Los Angeles Department of Water and Power
Responsible for NRHP evaluation of Boulder Lines 1 and 2.

Kern River Gas Transmission Project, WY, UT, NV, and CA
Principal Investigator
CLIENT: Kern River Gas Transmission Company
Responsible for cultural resources. Prepared the cultural resources component of the environmental report submitted to FERC, presented expert testimony at FERC licensing hearings, directed the intensive archaeological survey of the 680-mile route, managed the eligibility evaluation of over 250 sites for NRHP, developed and implemented a data recovery research design for 150 NRHP-eligible resources, directed monitoring of construction in sensitive areas, and coauthored survey and data recovery reports. Work done prior to joining EDAW.

JAMES CLELAND, PHD

California-to-Oregon Transmission Project, OR and CA
Principal Investigator
CLIENT: Transmission Authority of Northern California
Directed archaeological, historic, and ethnographic survey of the 340-mile route; archaeological test excavations; and archaeological data recovery. Work done prior to joining EDAW.

Santa Ynez Unit Development, Santa Barbara County, CA
Principal Investigator
CLIENT: Exxon Corporation
Directed test excavations and significance evaluations of historic and prehistoric sites in oil and gas project area. Prepared historic properties treatment plan, approved by the ACOE, California Office of Historic Preservation, and Advisory Council on Historic Preservation. Work done prior to joining EDAW.

Coso Known Geothermal Resource Area, Inyo County, CA
Principal Investigator
CLIENT: Los Angeles Department of Water and Power
Directed archaeological survey, evaluation, and data recovery at 12 geothermal well-pads located in the Sugarloaf Mountain Obsidian Source National Register District. Coauthored historic properties treatment plan, and evaluation and data recovery reports. Work done prior to joining EDAW.

Devers-Serrano-Villa Park Proposed 230-kV Transmission Line, Orange, Riverside, and San Bernardino Counties, CA
Principal Investigator
CLIENT: California Public Utilities Commission
Directed cultural resource investigations for the EIR/EIS for Southern California Edison's proposed 230-kV transmission line, including comparative assessment of the impact of alternative routes. Presented expert testimony at CPUC licensing hearings. Work done prior to joining EDAW.

BiCEP Transmission Line, South-Central CA
Discipline Manager
CLIENT: Southern California Edison
Directed cultural resource impact assessment of alternative routes for a proposed transmission line from the Big Creek Hydroelectric Project in the Sierra Mountains to the Los Angeles Basin. Work done prior to joining EDAW.

Argus Cogeneration Expansion, San Bernardino and Inyo Counties, CA
Discipline Manager
CLIENT: Kerr-McGee
Directed cultural resource survey of proposed cogeneration plant site, transmission line, water pipeline, and well-field. Prepared cultural resources sections of AFC for California Energy Commission. Work done prior to joining EDAW.

Geothermal Public Power Line Project, North-Central CA
Discipline Manager
CLIENT: Sacramento Municipal Utility District
Directed cultural resources investigations, including archaeology, history, and ethnography, for siting and licensing of a proposed transmission line from the Geysers Geothermal Area to Sacramento. Included preparation of cultural resource sections of the notice of intent and application for certification, and presentation of testimony for adjudicatory hearings held by the California Energy Commission. Work done prior to joining EDAW.

Potrero Unit No. 7, San Francisco County, CA
Principal Investigator
CLIENT: Pacific Gas & Electric Company
Conducted cultural resource inventory and evaluation for proposed combined cycle generating plant, underground 230-kV transmission line, and fuel-oil pipeline. Involved intensive historical documentation for an 8-mile-long study area along San Francisco's urban waterfront. Participated in California Energy Commission public workshop. Work done prior to joining EDAW.

MILITARY PROJECTS

Naval Air Weapons Station, China Lake, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division
Directed archaeological survey of over 8,000 acres and NRHP evaluation of eight archaeological sites.

Naval Postgraduate School, Monterey, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division
Directed archaeological survey and subsurface exploration of the 100-acre laboratory and recreation area.

Chocolate Mountains Aerial Gunnery Range, Imperial and Riverside Counties, California.
Principal Investigator
CLIENT: Naval Facilities Engineering Command, Southwest and Marine Corps Air Station, Yuma
Developed regional archaeological research design, including programmatic approaches to the evaluation of key resource types. Managed the preparation of a cultural affiliation study.

Naval Space Surveillance Field Stations, San Diego, CA, and Gila River, AZ
Principal Investigator
CLIENT: U.S. Navy, Southwest Division
Directed NRHP evaluation of three archaeological sites in San Diego County. Prepared integrated cultural resources management plan for NSSFS Gila River.

Archaeological Test Excavation, Naval Weapons Station, Seal Beach, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division
Responsible for test excavations of three subsurface prehistoric shell middens. National register evaluations.

Air Combat Command Cold War-Era Facilities, Langley Air Force Base, Hampton City Region, VA
Senior Reviewer
CLIENT: U.S. Army Corps of Engineer, Ft. Worth District
Senior reviewer for nationwide historical context development for ACC bomber and fighter facilities.

JAMES CLELAND, PHD

Perimeter Vehicle Entry Phased Array Warning System National Register Nomination, Beale Air Force Base, Yuba County, CA
Senior Reviewer
CLIENT: Beale Air Force Base and Parsons Engineering Science
Senior reviewer to NRHP evaluation and nomination of a highly technical, Cold War-era radar facility.

Cultural Resource Inventory Survey at Salton Sea Test Base, Imperial County, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division
Responsible for intensive cultural resource surveys of approximately 6,000 acres. Provided oversight for compliance with NHPA and the NAGPRA.

Evaluation of Six Sites Near the Missile Impact Range, Naval Auxiliary Landing Field, San Clemente Island, Los Angeles County, CA
Principal-in-Charge
CLIENT: U.S. Navy, North Island, Natural Resources Office
Responsible for the NRHP evaluation of six archaeological sites on the Central Plateau of San Clemente Island.

Long Beach Naval Shipyard/Naval Station Base Closure, Los Angeles County, CA
Discipline Manager
CLIENT: U.S. Navy, Southwest Division
Responsible for cultural resource analysis of alternative reuse plans, including development of adaptive reuse alternatives for the Roosevelt Historic District. Adaptive reuse plan won Cultural Resources Award from California Preservation Foundation.

MCAS Yuma Ordnance Storage Expansion, Yuma County, AZ
Principal Archaeologist
CLIENT: U.S. Navy, Southwest Division
Performed cultural resource analysis, including records search, oral history, and draft programmatic agreement.

MCAS El Toro Base Closure, Orange County, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division
Responsible for cultural resource surveys and evaluation.

P-527 Effluent Treatment Project, Camp Pendleton, San Diego County, CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division
Responsible for archaeological survey, evaluation, and data recovery.

Pumped-Hydro Storage Wind/Energy System, Naval Auxiliary Air Field, San Clemente Island, Los Angeles County, CA
Principal-in-Charge
CLIENT: U.S. Navy, Southwest Division
Responsible for relocating and recording 76 archaeological sites in a proposed water storage and wind/energy development area. Prepared existing conditions report.

JAMES CLELAND, PHD

Historic and Archeological Resources Protection Plans for Various Locations in Southern CA
Principal Investigator
CLIENT: U.S. Navy, Southwest Division
Responsible for HARP Plans for six Naval installations: Morris Dam Test Facility, Azusa; Naval Air Facility, El Centro; Naval Shipyard, Long Beach; Point Loma Complex, San Diego; Naval Station, San Diego; and the Naval Radio Receiving Facility, Imperial Beach.

Space Launch Complex 2W, Vandenberg Air Force Base, San Luis Obispo County, CA
Principal Investigator
CLIENT: McDonnell-Douglas
Directed archaeological survey and historical assessment of the proposed upgrading of the complex to support the launching of Delta II vehicles. Historical assessment included NRHP evaluation of space launch facilities dating to the 1950s and 1960s. Work done prior to joining EDAW.

MCAS Yuma EIS, Imperial County, CA
Project Director for Cultural Resources
CLIENT: U.S. Navy, Southwest Division
Directed cultural resource inventories of areas in California potentially affected by operations at MCAS Yuma, Arizona. Work included archaeological sample survey of the Chocolate Mountains Gunnery Range, identification of traditional cultural properties in low-fly zones, and preparation of the EIS.

Sugarloaf Mountain Archaeological District Cultural Resource Management Plan, Inyo County, CA
Principal Author
CLIENT: U.S. Navy, Southwest Division
Authored management plan for the Sugarloaf Mountain Obsidian Source National Register District. Developed a framework for the survey, evaluation, and treatment of resources that may be affected by geothermal development of the Coso Known Geothermal Resource Area. Work done prior to joining EDAW.

National Training Center, Fort Irwin, San Bernardino County, CA
Project Manager
CLIENT: National Park Service, Interagency Archeological Services Branch
Managed large-scale archaeological survey, evaluation, and data recovery project in support of the development of the National Training Center. Performed intensive survey of 100,000 acres, NRHP evaluation of over 100 sites, and data recovery at 25 sites. Work done Prior to joining EDAW.

Beale Air Force Base Cultural Resource Project, Yuba County, CA
Principal Investigator
CLIENT: National Park Service, Interagency Archeological Services Branch
Prepared cultural resource management plan for the entire base and directed archaeological survey of a 2,000-acre tract proposed for excessing. Work done prior to joining EDAW.

Defense Material Readiness Command (DARCOM) Archaeological Overviews, Lassen, San Joaquin, Sacramento, Stanislaus, and Napa Counties, CA, Umatilla County, OR, and Mineral County, NV
Principal Investigator
CLIENT: National Park Service, Interagency Archeological Services Branch
Prepared archaeological overviews and management plans for seven installations of DARCOM in the western region. Installations included Sierra Army Depot, Hawthorne Army Depot, Umatilla Activity, Sharpe Army Depot,

Sacramento Army Depot, Riverbank Army Ammunition Plant, and Benecia Army Cemetery. Work done prior to joining EDAW.

WATER PROJECTS

Emergency Storage Project, San Diego County, CA
Principal Investigator
CLIENT: San Diego County Water Authority
Responsible for cultural resources evaluation, archaeological data recovery, and construction monitoring of major water projects involving construction of dams and associated pipelines.

Pit 3, 4, and 5 Hydroelectric Relicensing Project, Shasta County, CA
Principal Investigator
CLIENT: Pacific Gas & Electric Company
Responsible for the evaluation of 22 sites in the Lake Britton National Register District and for data recovery at seven sites affected by shoreline erosion and recreational facilities. Assisted in the development of the cultural resource management plan and directed the data recovery plan, both of which were approved under FERC relicensing stipulations. Work done prior to joining EDAW.

P5EII Pipeline, San Diego County, CA
Principal Investigator
CLIENT: San Diego County Water Authority
Responsible for archaeological testing, data recovery, and construction monitoring.

Lake Hodges Environmental Impact Study, San Diego County, CA
Principal Archaeologist
CLIENT: City of San Diego
Performed cultural resource survey of existing shoreline to assess impacts of changed operations.

Pit 1 Hydroelectric Relicensing, Shasta County, CA
Principal Investigator
CLIENT: Pacific Gas & Electric Company
Directed archaeological and historical evaluation of the project area to support preparation of Exhibit E of the relicensing application. Performed archaeological survey, and limited test excavation and historical evaluation of the operating system. Prior employer.

Mokelumne River Hydroelectric Relicensing, Alpine, Amador, and Calaveras Counties, CA
Principal Investigator
CLIENT: Pacific Gas & Electric Company
Conducted multiple phases of cultural resource investigations to support relicensing application to FERC. Prepared cultural resource survey, NRHP evaluations, Native American resources survey, data recovery research design, and cultural resource management plan; and performed archaeological test excavations. Prior employer.

Elk Creek Dam, Douglas County, OR
Principal Investigator
CLIENT: U.S. Army Corps of Engineers
Principal investigator for the NRHP evaluation of 27 sites in the area of potential effect. Prior employer.

JAMES CLELAND, PHD

Eastern Sierra Hydroelectric Relicensing, Mono and Inyo Counties, CA
Principal Investigator
CLIENT: Southern California Edison
Directed NRHP assessment of 22 sites within three hydroelectric project areas. Prior employer.

Clark County Flood Control Master Plan, NV
Principal Investigator
CLIENT: Clark County Regional Flood Control District
Directed cultural resource investigations for the EIS. Master plan covered the entire county and had a 20-year team horizon. Prior employer.

Gibraltar Dam Upgrade, Santa Barbara County, CA
Principal Investigator
CLIENT: City of Santa Barbara
Directed cultural resource survey and historical assessment of the existing facilities for proposed strengthening and raising of Gibraltar Dam. Prior employer.

Pamo Dam and Reservoir, San Diego County, CA
Principal Investigator
CLIENT: San Diego County Water Authority
Principal investigator for cultural resources. Prepared a research design for testing and evaluating 100 sites in the proposed project area, assisted in the Section 106 consultation with the ACOE and the state historic preservation officer, directed the drafting of a programmatic MOA under 36CFR800, and supervised archaeological monitoring of geotechnical investigations. Prior employer.

Douglasdale Road Wastewater Treatment Plant, Richmond City Region, VA
Archaeologist
CLIENT: U.S. Army Corps of Engineers, Norfolk District
Conducted archaeological survey and historical assessment of proposed wastewater treatment plant on the James River and Kanawha Canal in Richmond. Prior employer.

TRANSPORTATION PROJECTS

Southern Nevada Supplemental Airport EIS, Clark County, NV
Co-Principal Investigator for Cultural Resources
CLIENT: Federal Aviation Administration, Bureau of Land Management, and Clark County Division of Aviation
Developed cultural context report and research design. Oversaw Class III survey of 17,000 acres in eastern Mojave Desert.

Guadalupe Corridor, State Route 87, Santa Clara County, CA
Senior Reviewer
CLIENT: Caltrans District 4
Senior reviewer for development and implementation of historical properties treatment plan for SR-87 freeway in San Jose. Investigated buried prehistoric and historic archaeological sites, including one of San Jose's China Towns.

JAMES CLELAND, PHD

Sorrento Overhead, Del Mar, CA
Project Manager
CLIENT: City of Del Mar
Managed Caltrans HPSR for seismic retrofit of a National Register-eligible railroad overpass. Provided City of Del Mar consultation regarding Section 4(f) evaluation of project alternatives.

Palomar Street Widening, Chula Vista, CA
Principal Investigator
CLIENT: City of Chula Vista
Principal investigator for cultural resources surveys of Caltrans local assistance project. Preparation of Negative Archaeological Survey Report, Historical Architectural Survey Report, and Historic Properties Survey Report.

SR-56 Middle Segment EIR, San Diego County, CA
Principal Investigator
CLIENT: City of San Diego
Principal investigator for cultural resource survey and evaluation conducted under Caltrans guidelines.

La Costa Avenue Interchange, Carlsbad, CA
Principal Investigator
CLIENT: City of Carlsbad
Principal investigator for I-5 interchange improvement project. Prepared Archaeological Survey Report, Extended Phase I Report and Historic Properties Survey Report under Caltrans guidelines.

Cole Grade Road, San Diego County, CA
Principal Investigator
CLIENT: County of San Diego
Principal investigator for archaeological testing under CEQA.

SA-680 Freeway, San Diego County, CA
Principal Investigator
CLIENT: County of San Diego
Principal investigator for archaeological testing of four sites in the area of potential effect of proposed freeway.

SR-41 South, Fresno County, CA
Principal Investigator
CLIENT: Fresno County Transportation Authority and Caltrans District 6
Principal investigator for archaeological and historical assessment of the widening and possible realignment of Route 41 south of Fresno. Prepared reports to Caltrans' standards, including the archaeological survey report, the historical architectural survey report, and the historic properties survey report. Prior employer.

Interstate 77, Wythe County, VA
Field Director
CLIENT: Virginia Historical Landmarks Commission
Directed data recovery fieldwork at Fort Chiswell historic site. Prior employer.

JAMES CLELAND, PHD

HAZARDOUS WASTE-RELATED AND PROJECTS

Topock Compressor Station Corrective Measures Study EIR
San Bernardino County, CA
Cultural Resource Team Leader
CLIENT: California Department of Toxic Substances Control
Investigated potential impacts to cultural resources of groundwater and soils remediation alternatives, including potential to the Topock Maze traditional cultural property.

Station A Remediation, San Diego, CA
Principal Investigator
CLIENT: Sempra Energy
Principal investigator for the archaeological monitoring of the remediation of SDG&E's historic Station A. Required hazardous materials certification.

Kettner and Cedar Remediation, San Diego County, CA
Principal Investigator
CLIENT: County of San Diego
Performed cultural resource monitoring of hazardous waste remediation in San Diego.

Edwards Air Force Base Installation Restoration Program,
Kern County, CA
Principal Investigator
CLIENT: Jacobs Engineering
Directed cultural resource surveys and evaluations of well closures and PRLs. Assisted in the Section 106 consultation. Prior employer.

Elsmere Canyon Landfill, Los Angeles County, CA
Discipline Manager
CLIENT: Elsmere Corporation
Directed cultural resource assessment for the EIR/EIS. Prior employer.

Weldon Canyon Landfill, Ventura County, CA
Senior Archaeologist
CLIENT: Waste Management, Inc.
Conducted cultural resource surveys of proposed landfill site. Prior employer.

Eagle Mine Remediation, Lake County, CO
Discipline Manager
CLIENT: Gulf+Western
Directed historical research of land use at the Eagle Mine Superfund Site in Leadville. Prior employer.

OTHER PROJECTS

Imperial Dunes Cultural Landscape Report, Imperial County, CA
Principal Investigator
CLIENT: Bureau of Land Management
Principal investigator for ethnographic assessment to the Imperial Dunes as a Native American Cultural Landscape.

JAMES CLELAND, PHD

San Diego Presidio, Conditions Assessment Report,
San Diego County, CA
Principal Investigator
CLIENT: City of San Diego, Park and Recreation Department
Principal investigator for preparation of conditions assessment report, focusing on current condition and recommendations for preservation of adobe foundations and associated cultural materials.

Glamis Imperial Project, Imperial County, CA
Principal Archaeologist
CLIENT: Glamis Imperial Corporation
Performed cultural resource survey and NRHP evaluation for proposed open pit gold mine. Traditional cultural property evaluation of the Indian Pass-Running Man district.

Zhongshan Mountain National Park, Nanjing China
Cultural Resource Specialist
CLIENT: City of Nanjing Planning Department
Assisted in the development of a master plan for a nationally significant Ming Dynasty cultural lansdscape.

Outer Continental Shelf Cultural Resource Sensitivity Assessment,
CA, OR, and WA
Principal Investigator
CLIENT: Minerals Management Service
Directed archaeological records search, literature review, and geological investigations to assess the potential for submerged prehistoric sites from Morro Bay to the Canadian border. Compiled data on over 2,700 sites in the onshore coastal zone and identification of offshore areas with archaeological potential. Prior employer.

Crump Memorial Park, Henrico County, VA
Principal Investigator
CLIENT: Henrico County
Conducted test excavation of early Woodland-Period site in the County park. Prior employer.

Ellerson's Millrace, Richmond City Region, VA
Field Director
CLIENT: National Park Service
Directed test excavation of historic millrace in Richmond National Battlefield Park in Richmond. Prior employer.

Pakistan Lithics Project, Indus Valley, Pakistan
Archaeologist
CLIENT: American Institute of Pakistan Studies
Performed comparative analysis of pre-Harappan, early Harappan, and mature Harappan stone tool industries. Prior employer.

Cultural Resource Overview of Shenandoah National Park,
Page County, VA
Archaeologist
CLIENT: National Park Service
Conducted literature review and authored archaeological portion of the overview. Prior employer.

JAMES CLELAND, PHD

Allahdino Expedition, Karachi, Pakistan
Archaeologist
CLIENT: American Museum of Natural History
Analyzed flaked stone tools from a Harappan-Period site. Prior employer.

PUBLICATIONS AND PROFESSIONAL PAPERS

Large Scale Cultural Landscapes in Rights-of-Way Management. In *The Eighth International Symposium on Environmental Concerns in Rights-of-Way Management,* edited by John W. Goodrich-Mahoney, Lawrence P. Abrahamson, Jennifer L. Ballard, and Susan M. Tikalsky. Elsevier, Amsterdam (2008).

Settlement Trends and Sociocultural Change on the Southern California Coast: Complementary Views from Seal Beach and Camp Pendleton. Paper presented at the 73rd Annual Meeting of the Society for American Archaeology, Vancouver, British Columbia (2008).

Chronology and Distribution of Archaeological Components in Seal Beach, California. Paper presented at the 40th Annual Meeting of the Society for California Archaeology, Ventura (2006).

The Confines of Space: Circular Surface Features in the Colorado Desert. Paper presented at the 70th Annual Meeting of the Society for American Archaeology, Salt Lake City (2005).

The Radiocarbon Chronology of the North Stallard Site, CA-IMP-7911/H on the Lower Colorado River, California. Paper presented at the Three-Corners Conference, Las Vegas, Nevada (2005).

Preservation of Quechan Cultural Sites. Paper presented at the 38th Annual Meeting of the Society for California Archaeology, Riverside, California (2004).

The Sacred and the Mundane: Cultural Landscape Concepts and Archaeological Interpretation in the Colorado Desert. Paper presented at the 38th Annual Meeting of the Society for California Archaeology, Riverside, California (2004).

Archaeological Investigations at CA-IMP-7911/H, the North Stallard Locality on the Lower Colorado River, California. Paper presented at the 38th Annual Meeting of the Society for California Archaeology, Riverside, California (2004).

Stratified Patayan Sites Near Palo Verde, Lower Colorado River. Paper presented at the 37th Annual Meeting of the Society for California Archaeology, Sacramento, California (2003).

On the Trail of Dreams: Archaeological and Ethnographic Recordation of the Palo Verde Point Petroglyphs and Geoglyphs (with Rebecca Apple). Paper presented at the 36th Annual Meeting of the Society for California Archaeology, San Diego, California (2002).

Protohistoric Recessional Shorelines at Lake Cahuilla, California (with Rebecca Apple and Andrew York). Paper presented at the Millennium Conference: The Human Journey and Ancient Life in California's Deserts, Barstow, California (2001).

The Tides of History: Modeling Native American Use of Recessional Shorelines (with Angela Johnson). Paper presented at the 20th Annual ESRI International Users Conference, San Diego, California (2000).

JAMES CLELAND, PHD

Late Prehistoric and Protohistoric Use of Recessional Shorelines of Lake Cahuilla, California (with A. York, S. Rose, and C. Bowden-Renna). Poster Session Paper presented at the 26th Great Basin Anthropological Conference, Bend, Oregon (1998).

Very Low Elevation Early and Middle Holocene Occupation at the Salton Sea Test Base, California (with R. McCorkle Apple and T. Wahoff). Poster Session Paper presented at the 26th Great Basin Anthropological Conference, Bend, Oregon (1998).

Archaeological Investigations for the Lucerne to Big Bear Transmission Line (with A. York). Paper presented at the 32nd Annual Meeting of the Society for California Archaeology, San Diego, California (1998).

Paleo-Indian to Protohistoric: The Chronology of Human Occupation of the Salton Sea Test Base. Paper presented at the 32nd Annual Meeting of the Society for California Archaeology, San Diego, California (1998).

Resource Intensification, Environmental Stress and the Emergence of Complex Hunter-Gatherers on the Middle Pit River, California. Paper presented at the 61st Annual Meeting of the Society for American Archaeology, New Orleans, Louisiana (1996).

A Summary of Archaeological and Paleoecological Investigations at Lake Britton. Paper presented at the Sacramento River Ecosystem in Prehistory: An Archaeological Symposium, sponsored by the Central California Archaeological Foundation, Chico, California (1996).

Environment, Settlement, and Subsistence Change, Middle Pit River, California (with J.C. Chatters and W.G. Spaulding). Paper presented at the 29th Annual Meeting of the Society for California Archaeology, Eureka, California (1995).

Environment, Settlement, and Subsistence Change on the Middle Pit River, California. Paper presented at the 29th Annual Meeting of the Society for California Archaeology, Eureka, California (1994).

Cultural Resource Management in the Eastern Mojave. Paper presented at the East Mojave Desert Symposium/Workshop, University of California, Riverside (1992).

Recent Archaeological Investigations in the North Las Vegas Valley (with R. McCorkle Apple and M.S. Kelly). *Crossing the Borders: Quaternary Studies in Eastern California and Southwestern Nevada.* San Bernardino County Museum Association Special Publication, Redlands, California (1991).

Obsidian Hydration Dating at Coso: Part III. Paper presented at the 24th Annual Meeting of the Society for California Archaeology, Foster City, California (1990).

Multi-Stage Research in the Siting and Assessment of Linear Projects. Paper presented at the 54th Annual Meeting of the Society for American Archaeology, Atlanta, Georgia (1989).

Induced Hydration Rates for Coso Obsidian: An Update. Paper presented at the 23rd Annual Meeting of the Society for California Archaeology, Los Angeles, California (1989).

Problems in the Hydration Dating of Coso Obsidian at the Source. Paper presented at the 22nd Annual Meeting of the Society for California Archaeology, Redding, California (1988).

JAMES CLELAND, PHD

A Tentative Culture-Historical Sequence for the Mokelumne River Canyon: Proceedings of the Society for California Archaeology 1, edited by S.M. Hector, L.E. Christenson, G.T. Gross, and M.D. Rosen. Society for California Archaeology, San Diego, California (1988).

Achieving Cultural Resource Compliance along Multistate Rights-of-Way in the West (with A.E. Rogge and C.M. Woods). *Proceedings Fourth Symposium on Environmental Concerns in Rights-of-Way Management*, edited by W.R. Byrnes and H.A. Holt. Purdue University, West Lafayette, Indiana (1987).

Direct-Historical and Optimal-Foraging Approaches to Subsistence at Lake Britton. Paper presented at the 21st Annual Meeting of the Society for California Archaeology, Fresno, California (1987).

A Tentative Culture-Historical Sequence for the Mokelumne River Canyon. Paper presented at the 21st Annual Meeting of the Society for California Archaeology, Fresno, California (1987).

Assessing Archaeological Sensitivity and Impacts of Transmission Lines. Paper presented at the Third National Conference on Cultural Resource Management in the Electric Utility Industry, St. Louis, Missouri (1986).

Current Approaches to the Evaluation of Archaeological Significance. Paper presented at the 20th Annual Meeting of the Society for California Archaeology, Santa Rosa, California (1986).

A Systematic Approach to Lithic Analysis in the Indus Region: Archaeological Studies in India and Pakistan, edited by Jerome Jacobson. Oxford and IBH Press, Delhi, India (1986).

The Use of Research Designs in the Evaluation of Archaeological Significance. Paper presented at the 20th Annual Meeting of the Society for California Archaeology, Santa Rosa, California (1986).

Fort Irwin: Research and Management in the Face of Massive Damage (with M.M. Lyneis and C.N. Warren). Paper presented at the Annual Meeting of the Society for American Archaeology, Pittsburgh, Pennsylvania (1983).

Lithic Resource Procurement and Exchange Systems. Symposium Chair. 17th Annual Meeting of the Society for California Archaeology, San Diego, California (1983).

Managing Cultural Resources in a Large Urban Redevelopment Project. Paper presented at the Conference on Archaeology and Local Government, the California Office of Historic Preservation, Ventura, California (1981).

Historical Archaeology in Environmental Planning. Paper presented at the National Conference on Land Use and Resource Management, Edison Electric Institute, Portland, Oregon (1980).

Urban Archaeology and Cultural Resource Management: An Example from Downtown San Diego. Paper presented at the Annual Meeting of the Southwestern Anthropological Association, San Diego, California (1980).

The Use of Geographic Models in Urban Historical Archaeology. Paper presented at the Workshop on Historical Archaeology, Lowie Museum, Berkeley, California (1980).

The Use of Backhoe Trenching in Identifying Buried Historical Sites. Paper presented at the Workshop on Historical Archaeology, University of Nevada, Reno (1979).

The Lithic Industry at Allahdino: A Metric and Quantitative Analysis of a Harappan Activity System (with M.A. Hoffman*). Collected Papers of the Allahdino Expedition,* #2, New York, New York (1977).

Preliminary Report on the Fort Chiswell Salvage Project (with T.C. Funk). Quarterly Bulletin of the Archaeological Society of Virginia (1976).

SELECTED REPORTS

Peak to Playa: Southern Nevada Supplemental Airport Environmental Impact Statement Cultural Resources Report. EDAW, Inc., San Diego (2008).

Piecing Together the Prehistory of Land Hill. A Place Remembered, Orange County, California. EDAW Cultural Publications 3, San Diego (2007).

Regional Archaeological Research Design for the Chocolate Mountain Aerial Gunnery Range, Imperial and Riverside Counties, California (with Jackson Underwood and Tanya Wahoff). EDAW, Inc., San Diego (2005).

A View across the Cultural Landscape of the Lower Colorado Desert: Cultural Resources Investigations for the North Baja Pipeline Project (with Rebecca Apple). EDAW, Inc., San Diego (2003).

Imperial San Dunes as a Native American Cultural Landscape (with John Russell, Clyde Woods, and Jackson Underwood). Bureau of Land Management, Sacramento, and EDAW, Inc., San Diego (2002).

Class II Archaeological Survey of Imperial San Dunes (with Jackson Underwood). Bureau of Land Management, Sacramento, and EDAW, Inc., San Diego (2002).

Historic Properties Treatment Plan for the Emergency Storage Project (with Rebecca Apple). San Diego County Water Authority and EDAW, Inc., San Diego (2001).

San Diego Presidio Condition Assessment Report (with A. Crosby, B. Smillie, S. Molentin, and C. Dolan). KEA Environmental Inc., San Diego (1999).

Cultural Resources Investigations for the Lucerne Valley and Big Bear Valley Transmission Line and Substation Project, San Bernardino County, California (with A.L. York and C. Dolan). KEA Environmental, Inc., San Diego, California (1998).

Prehistory of the Middle Pit River, Northeastern California: Archaeological Investigations at Lake Britton, Pit 3, 4 & 5 Project (editor). KEA Environmental, Inc., San Diego, California (1997).

A Research Design for the Evaluation of Archaeological Sites within the Hellman Ranch Specific Plan Area (with A. York and M.G. Baksh). KEA Environmental, Inc., San Diego, California (1997).

Heritage Resources Report for the Oil and Gas Leasing EIS, Los Padres National Forest (with R. Allen, S. Heipel, and R.F. Beck). KEA Environmental, Inc., San Diego, California (1996).

African-American Community and Church (with J. Newland). In: Archaeological Investigations in Downtown San Diego, Horton's Addition Block H. KEA Environmental, Inc., San Diego, California (1995).

Mokelumne River Project. Revised Cultural Resource Management Plan (with R. McCorkle Apple). Keller Environmental Associates, Inc., San Diego, California (1993).

Sugarloaf Archaeological District: Cultural Resources Management Plan. Prepared for the Naval Weapons Center, China Lake, California. Dames & Moore, San Diego, California (1991).

Kern River Pipeline Cultural Resource Report, California (with R. McCorkle Apple, A.L. York, and P. Friedman). Submitted to the Federal Energy Regulatory Commission. Dames & Moore, San Diego, California (1990).

Kern River Pipeline, Cultural Resource Report, Nevada (with M.S. Kelly, K.L. Hull, A.J. Macdougall, and P. Friedman). Submitted to the Federal Energy Regulatory Commission. Dames & Moore, San Diego, California (1990).

Mokelumne River Project: Research Design for Data Recovery. Prepared for Pacific Gas & Electric Company. Dames & Moore, San Diego, California (1990).

Sugarloaf Mountain in Prehistory: Archaeological Testing and Data Recovery for the Exploratory Drilling Program II and the Unit No. 1 Project (with R. McCorkle Apple and E. Nilsson). Prepared for the Los Angeles Department of Water and Power. Dames & Moore, San Diego, California (1990).

Cultural Resources Inventory of the California-Oregon Transmission Project (with J.V. Jermann, A.L. York, M.S. Kelly, C.M. Woods, and J.E. Wooley). Prepared for the Transmission Agency of Northern California. Dames & Moore, San Diego, California (1988).

Archaeological Investigations at Lake Britton: Pit 3, 4 and 5 Archaeological Testing Project (with M.S. Kelly and E. Nilsson). Wirth Environmental Services, San Diego, California (1987).

Archaeological Investigations at Sugarloaf Mountain (with M.S. Kelly, E. Nilsson, and A.L. York). Dames & Moore, San Diego, California (1987).

Santa Ynez Unit Development: Archaeological Evaluation Program (with A.L. York, C.M. Woods, and J.G. Costello). Dames & Moore, San Diego, California (1986).

An Archaeological Research Design for the Evaluation of Cultural Resources in Pamo Valley, San Diego, California (with J.R. Cook, J. Schaefer, and R. McCorkle Apple). Wirth Environmental Services, San Diego, California (1985).

Mokelumne River Project: Archaeological Evaluation Program (with A. Pierce and J.C. Smith). Wirth Environmental Services, San Diego, California (1985).

Developing the Bay: An Archaeological and Historical Overview of the Marina/Columbia Redevelopment Area (with D.C. Burkenroad, C.L. Smith, and J.C. Smith). Prepared for the Redevelopment Agency, San Diego, California (1980).

Mokelumne River Project: Cultural Resources Report (with J. Woodward and J.C. Smith). Prepared for Pacific Gas and Electric Company, San Francisco, California (1980).

The San Diego Barracks: An Archaeological Assessment (with D.C. Burkenroad). Prepared for the Redevelopment Agency, San Diego, California (1980).

Potrero 7: Phase I Archaeological Overview and Inventory (with J.C. Smith and C.A. Smith). On file at Pacific Gas and Electric Company, San Francisco, California (1979).

Archaeological Excavations at 44He91, Crump Memorial Park, Henrico County, Virginia (with L.D. Mouer). On file at Virginia Commonwealth University and the Virginia Historical Landmarks Commission, Richmond, Virginia (1978).

Archaeological Reconnaissance at the Douglasdale Road Water Treatment Plant, Richmond, Virginia. On file with the U.S. Army Corps of Engineers, Norfolk, Virginia (1978).

The Shenandoah National Park as a Cultural Resource: An Evaluation of Past Archaeological Surveys and Work in the Shenandoah National Park (with M.A. Hoffman, T.C. Funk, and R.W. Vernon). Denver Service Center, National Park Service, Colorado (1975)

WAYNE GLENNY
Archaeologist

Wayne Glenny has over seven years of experience in the fields of anthropology and archaeology. Mr. Glenny is familiar with many aspects of anthropology and archaeology including, human osteology, primate/human evolution, faunal, lithic, ceramic, and isotopic analyses. He has worked extensively on southern African sites dating to the Early, Middle, and Late Stone Age, the Iron Age and historical time period in South Africa. Mr. Glenny worked as an independent consultant on excavations throughout South Africa. The scopes of these projects have included Phase I record searches, sensitivity studies, small and large-scale surveys, site evaluations, and full data recovery investigations in a wide range of regulatory and geographic settings. In addition, he has complemented this work by publishing results of his research in regional forums; presenting papers at academic conferences; and participating in a number of public outreach efforts relating to cultural resources in South Africa. Mr. Glenny has been working in southern California on various cultural resource projects. Mr. Glenny has also been teaching the subject of anthropology and archaeology for two years. Mr. Glenny has a Commercial Class IV diving qualification in order to conduct maritime archaeological projects.

SUMMARY

Wayne Glenny has over seven years of experience in the fields of anthropology and archaeology. Mr. Glenny is familiar with many aspects of anthropology and archaeology including, human osteology, primate/human evolution, faunal, lithic, ceramic, and isotopic analyses. He has worked extensively on southern African sites dating to the Early, Middle, and Late Stone Age, the Iron Age and historical time period in South Africa. Mr. Glenny worked as an independent consultant on excavations throughout South Africa. The scopes of these projects have included Phase I record searches, sensitivity studies, small and large-scale surveys, site evaluations, and full data recovery investigations in a wide range of regulatory and geographic settings. In addition, he has complemented this work by publishing results of his research in regional forums; presenting papers at academic conferences; and participating in a number of public outreach efforts relating to cultural resources in South Africa.

EDUCATION

The Natal Museum, South Africa, 2006. Commercial Class IV Dive Qualification. Required for participation in Maritime Archaeology.

Master of Science, Archaeology, **University of the Witwatersrand,** South Africa, 2004-2005. Master's by Coursework and Research. Research project entailed the faunal analysis of the micromammal assemblage from Sibudu Cave, KZN. This included taphonomic analyses, species identification and palaeo-environmental reconstruction. Coursework included faunal analysis, palaeo-archaeology (landscapes), palaeo-anthropology, and human osteology.

Honours, Archaeology. **University of Cape Town,** South Africa, 2003. Honours project entailed extensive survey and mapping of several shell middens in Holbaai region on the Vredenburg Peninsula, WC. Coursework included human osteology, primate and human evolution, isotopic analysis, philosophy of science and faunal analysis.

Bachelor of Arts, Archaeology/History, Double major in Archaeology and History. University Of Cape Town (UCT), South Africa, 2000-2002. Published undergraduate paper in Historical Approaches (2002)

South African National Defense Force, South Africa, Officer/Instructor, 1994-1999. Held the rank of Captain in the South African Armoured Corps. Instructor of junior candidate officers on various armoured weapon systems. Honourably discharged in February 1999.

AFFILIATIONS

Association of Environmental Professionals

CERTIFICATION

Registered Engineer-in-Training, South Carolina,1987

ARCHAEOLOGICAL WORK EXPERIENCE

Institute of Cultural Resource Management, South Africa
Associate Archaeologist/Curator
CLIENT: The Natal Museum
Division Leader in the Institute of Cultural Resource Management at the Natal Museum. Supervised and participated in the completion of numerous CRM contracts throughout KwaZulu-Natal. Conducted survey, recording, mapping, monitoring and mitigation of numerous archaeological sites. Liased with local heritage resource agencies. Duties included the running of the CRM unit, composing proposals and budgets, acquiring clients, writing reports, photography, the completion of site record forms, data capture, and coordinating with contractors, engineers and developers.

The Natal Museum, South Africa
Commercial Class IV Dive Qualification
CLIENT: The Natal Museum
Required for participation in Maritime Archaeology.

University of the Witwatersrand, South Africa
Teaching Assistant
CLIENT: University of the Witwatersrand
Taught freshman and sophomore Anthropology courses. Teaching duties included lecturing twice a week, forming lesson plans, grading, and providing course materials. Lectures consisted of artifact identification, lithic analysis, human osteology, primate and human evolution and evolutionary theory.

Archaeological Resource Management, South Africa
Archaeologist
CLIENT: ARM: The University of the Witwatersrand
Participated in the completion of several CRM contracts throughout Gauteng and Northwestern Provinces. Conducted survey, recording, mapping, and excavation of numerous southern African Iron Age sites.

UCT – Archaeology Contracts Office, South Africa
Archaeologist
CLIENT: ACO: University of Cape Town

WAYNE GLENNY

Excavated numerous historic burials (for later reburial) in conjunction with a property development, over an eight-month period.

SELECTED PROJECT EXPERIENCE

Ladysmith Municipality: Ladysmith KwaZulu-Natal, South Africa.
Associate Archaeologist/Curator
CLIENT: Ladysmith Municipality
Ladysmith – Contracted to conduct a cultural survey and record an Anglo-Boer War (1900-1903) site around the besieged town of Ladysmith. Recorded numerous rock walled embattlements and trenches and conducted test excavations on the site.

DOT (KZN) Richmond KwaZulu-Natal, South Africa
Associate Archaeologist/Curator
CLIENT: Department of Transport
Department of Transport, KZN – Contracted to conduct a cultural survey and monitor the construction of bridge footprints.

Charlestown Burial Relocation, Charlestown Zululand, South Africa
Associate Archaeologist/Curator
CLIENT: S & N Engineering.
Charlestown – Contracted for the emergency excavation and relocation of five historical burials discovered during road construction.

Steam Rail: KwaZulu-Natal, South Africa
Associate Archaeologist/Curator
CLIENT: Spoornet
KwaZulu-Natal – Contracted to document the historical steam-train rail lines between numerous historic towns in KwaZulu-Natal.

Field Schools: Various Locations, South Africa
Archaeologist
CLIENT: University of Cape Town, University of the Witwatersrand.
Field School Experience – Participated in numerous archaeological field schools, including Cederburg (UCT, 2000), Eastern Cape (UCT, 2002), Makapansgat (UCT/Arizona State Univ., 2003), Sibudu (Wits, 2004), and Limpopo Valley (Wits, 2004).

Holbaai: Vredenburg Peninsula, Western Cape, South Africa
Archaeologist
CLIENT: University of Cape Town.
University of Cape Town – Honours project involved an extensive survey of shell mega-middens and stone hearths. Involved surface collection, mapping of the site with EDM, photography and drawing of several features. Project included identification and statistical analysis of shell remains from middens, an analysis of Khoisan ceramics (hunter-gatherer), and a spatial analysis of several sites and their landscape distribution.

Ottosdal: North-west Province, South Africa
Archaeologist
CLIENT: R.A.R.I University of the Witwatersrand
Ottosdal – Mapped, with EDM, several hundred rock engravings. Produced several maps showing the spatial relationship of these engravings.

WAYNE GLENNY

Steelpoort: Mesina, Northern Province, South Africa
Archaeologist
CLIENT: University of the Witwatersrand
Steelpoort – Served as crewmember for the excavation of two Iron Age sites. Site features included an iron smelting furnace and an early Bantu homestead.

Klipriviersburg: Gauteng Province, South Africa
Archaeologist
CLIENT: The University of the Witwatersrand
Klipriviersburg – Surveyed and mapped over fourteen late Iron Age stone-walled settlements with EDM. Completed technical drawings of these homesteads and excavated several units at two of these sites.

Thabazimbi: Thabazimbi, Northern Province, South Africa
Archaeologist
CLIENT: The University of the Witwatersrand
Thabazimbi – Mapped three Iron Age sites with EDM. Completed technical drawings of distribution of site features, including stone walling, furnaces, hut floors, an iron age ochre mine, and grainbin foundations.

DOT (KZN), Zululand/KwaZulu-Natal, South Africa
Archaeologist/Curator
CLIENT: DOT
Zululand – Contracted to conduct a cultural survey of numerous road routes for the department of Transport KwaZulu-Natal.

Prestwich Place, Cape Town, South Africa
Archaeologist
CLIENT: The University of Cape Town
Greenpoint Cape Town: Crew member on an excavation of a historic burial ground.

Ashburton: Pietermaritzburg, KwaZulu-Natal, South Africa
Associate Archaeologist/Curator
CLIENT: Smith and Green Consultants
Ashburton – Contracted to survey of an archaeological sensitive area.

FPLE Project Beacon Solar, Mojave, CA
Field Director
CLIENT: Florida Power and Light Energy, LLC, Kern County, CA
FPLE Project Beacon Solar, Mojave, CA – Cultural survey of an area north of Mojave for proposed solar farm.

PUBLICATIONS

2007. Presented results of M.Sc. research at SASQUA conference.

2006. An analysis of the micromammal assemblage from Sibudu Cave, KwaZulu-Natal. *South African Humanities* 18:279-288.

2003. Poster presentation of Honours project at SAA conference.

2002. Pacifist and Fascist views of World War I: a comparative study of ‘All Quiet on the Western Front’ and ‘The Storm of Steel’. *Historical Approaches Vol:* 1: 71-82

ATTACHMENT 2
NATIVE AMERICAN CONTACTS

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Beacon Solar Energy Project
Native American Communication Log

Tribe	Date	Representative	Discussion	Contacted by
Tule River Indian Tribe				
	8/6/08	Neil Peyron, Chairman	Left message offering to update Neil Peyron about the project.	EDAW to Neil Peyron
	8/8/08		Called, but was not available.	EDAW to Neil Peyron
Kern Valley Indian Council				
	8/6/08	Robert Robinson, Historic Preservation Officer	Left message offering to update Robert Robinson about the project.	EDAW to Robert Robinson
	8/8/08		Talked about project and potential for providing future monitors. See ROC from 8/8/08. Also sent email containing maps and contact information.	EDAW to Robert Robinson
Kitanemuk and Yowlumne Tejon Indians				
	8/6/08	Delia Dominguez	Delia is not familiar with the project, and she is also not familiar with the project area. She does not have any input or comment, but would like to receive additional information about the findings of the cultural resource report if future mailings are made to contacts on the NAHC list.	EDAW to Delia Dominguez
San Fernando Band of Mission Indians				
	7/11/08	John Valenzuela, Chairman	Multiple phone calls regarding contract finalization for monitoring via Seven Feathers Corporation.	EDAW to/from John Valenzuela
	7/12/08		Multiple faxes regarding contract finalization for monitoring via Seven Feather Corporation	EDAW to/from John Valenzuela
	7/14/08		Communication via phone and email about a communication error that sent a monitor into the field on Monday 7/14/08 despite no work being done on the project.	EDAW to/from John Valenzuela
	7/16/08		Email sent giving updated information as to when the monitor should meet the crew in the field.	EDAW to John Valenzuela
	7/24/08		Multiple phone calls concerning Seven Feathers Corporation monitoring duties for a CalEd project and possible relationships between the two projects.	EDAW to/from John Valenzuela
	7/25/08		Email sent giving updated information as to when the monitor should meet the crew in the field.	EDAW to John Valenzuela
Tubatulabals of Kern Valley				
	8/6/08	Donna Begay, Chairwoman	Left message offering to update Donna Begay about the project.	EDAW to Donna Begay
	8/8/08		Spoke about project and provided update. The study area is outside of the traditional territory, but could see how the Kern Valley Indian Council would be interested. No specific input at this time.	EDAW to Donna Begay
Independent Contacts				
	8/6/08	Ron Wermuth	Left message to follow up on whether there is any feedback on the project now that a map has been sent.	EDAW to Ron Wermuth

ATTACHMENT 3
PROJECT MAPS

(CONFIDENTIAL)

FILED UNDER SEPARATE CONFIDENTIAL COVER

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ATTACHMENT 4
DPR SITE FORMS

(CONFIDENTIAL)

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ATTACHMENT 5
CATALOGS

(CONFIDENTIAL)

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ATTACHMENT 6
RADIOCARBON DATING

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Miami, Florida 33155 USA
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Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

September 12, 2008

Ms. Tanya Wahoff
EDAW, Inc.
1420 Kettner Boulevard
Suite 620
San Diego, CA 92101
USA

RE: Radiocarbon Dating Results For Samples 8K001-11-1, 8K001-12-2, 8K001-13-3

Dear Ms. Wahoff:

Enclosed are the radiocarbon dating results for three samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Our invoice is enclosed. Please, forward it to the appropriate officer or send VISA charge authorization. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Ms. Tanya Wahoff — Report Date: 9/12/2008

EDAW, Inc. — Material Received: 8/13/2008

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 247914	480 +/- 40 BP	-12.8 o/oo	680 +/- 40 BP

SAMPLE : 8K001-11-1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1270 to 1320 (Cal BP 680 to 630) AND Cal AD 1350 to 1390 (Cal BP 600 to 560)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 247915	100.3 +/- 0.5 pMC	-11.8 o/oo	190 +/- 40 BP

SAMPLE : 8K001-12-2
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1650 to 1700 (Cal BP 300 to 250) AND Cal AD 1720 to 1820 (Cal BP 230 to 130)
Cal AD 1840 to 1880 (Cal BP 110 to 70) AND Cal AD 1920 to 1950 (Cal BP 40 to 0)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 247916	650 +/- 40 BP	-10.9 o/oo	880 +/- 40 BP

SAMPLE : 8K001-13-3
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1040 to 1240 (Cal BP 920 to 700)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

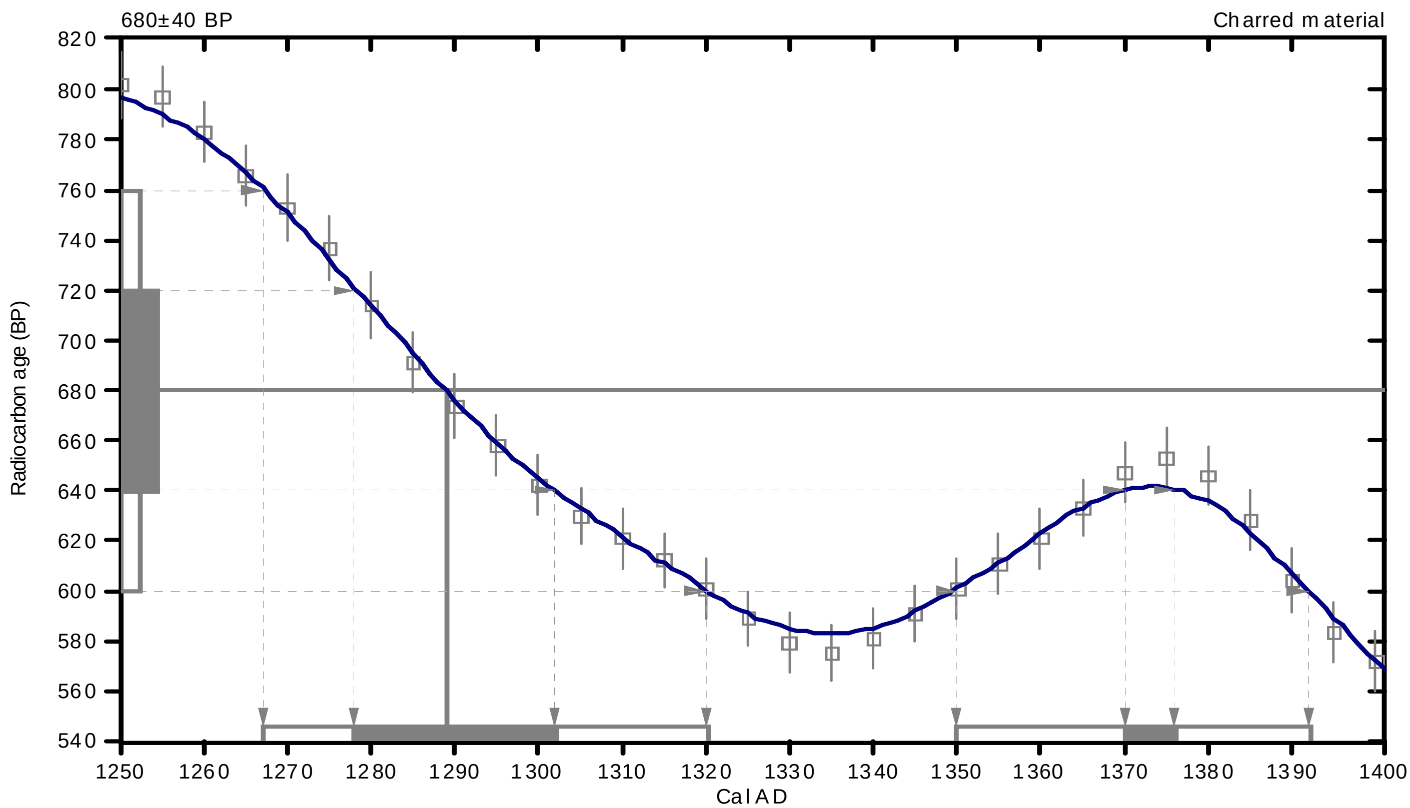
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-12.8:lab. mult=1)

Laboratory number:	**Beta-247914**
Conventional radiocarbon age:	**680±40 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal AD 1270 to 1320 (Cal BP 680 to 630) and** **Cal AD 1350 to 1390 (Cal BP 600 to 560)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal AD 1290 (Cal BP 660)
1 Sigma calibrated results: (68% probability)	Cal AD 1280 to 1300 (Cal BP 670 to 650) and Cal AD 1370 to 1380 (Cal BP 580 to 570)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-11.8:lab. mult=1)

Laboratory number: **Beta-247915**

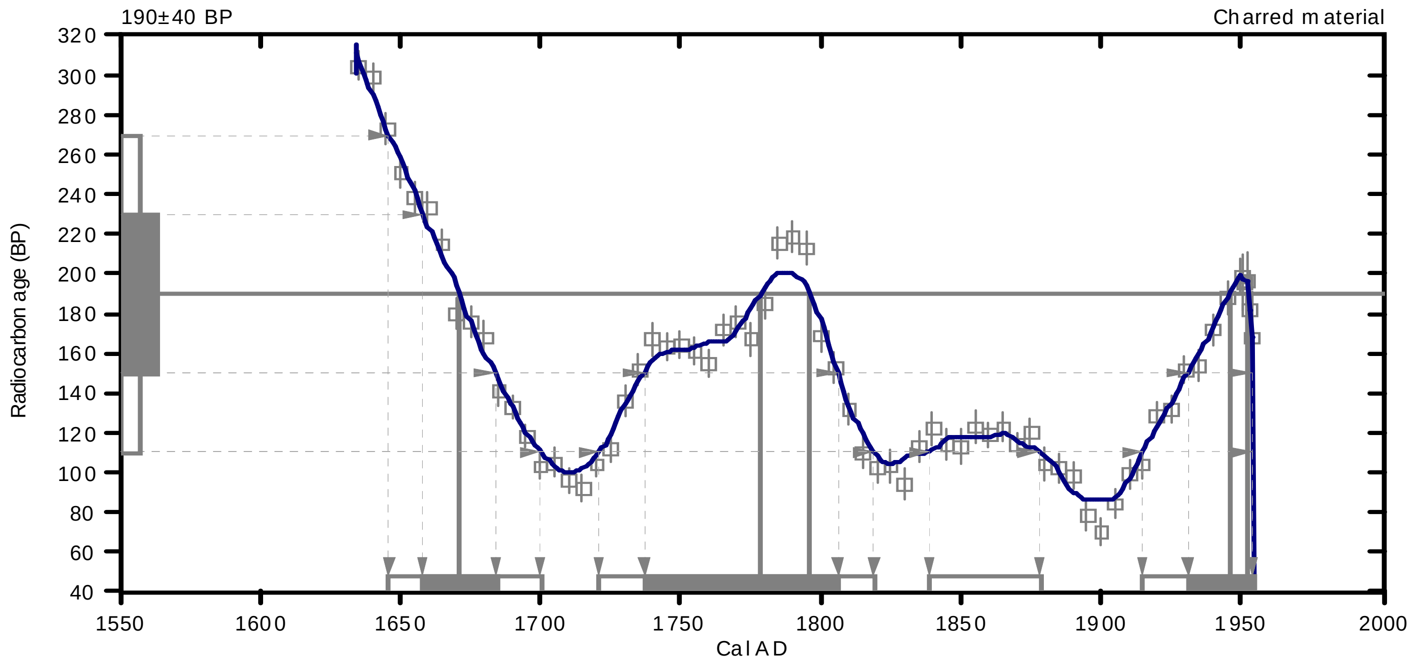
Conventional radiocarbon age: **190±40 BP**

2 Sigma calibrated results: (95% probability)
Cal AD 1650 to 1700 (Cal BP 300 to 250) and
Cal AD 1720 to 1820 (Cal BP 230 to 130) and
Cal AD 1840 to 1880 (Cal BP 110 to 70) and
Cal AD 1920 to 1950 (Cal BP 40 to 0)

Intercept data

Intercepts of radiocarbon age with calibration curve:
Cal AD 1670 (Cal BP 280) and
Cal AD 1780 (Cal BP 170) and
Cal AD 1800 (Cal BP 150) and
Cal AD 1950 (Cal BP 0) and
Cal AD 1950 (Cal BP 0)

1 Sigma calibrated results: (68% probability)
Cal AD 1660 to 1680 (Cal BP 290 to 270) and
Cal AD 1740 to 1810 (Cal BP 210 to 140) and
Cal AD 1930 to 1950 (Cal BP 20 to 0)



References:
Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-10.9:lab. mult=1)

Laboratory number: **Beta-247916**

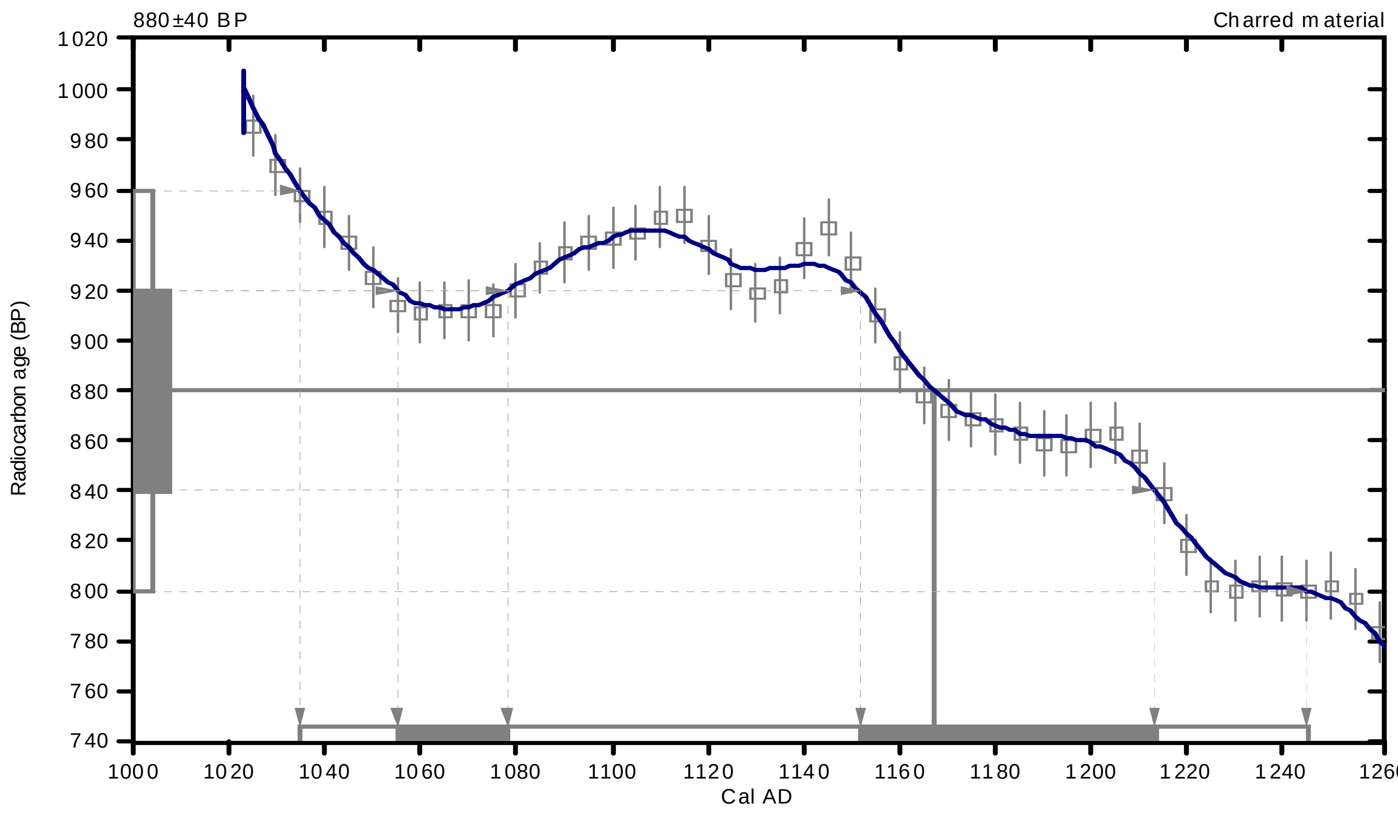
Conventional radiocarbon age: **880±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1040 to 1240 (Cal BP 920 to 700)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1170 (Cal BP 780)

1 Sigma calibrated results: (68% probability) Cal AD 1060 to 1080 (Cal BP 900 to 870) and Cal AD 1150 to 1210 (Cal BP 800 to 740)



References:

Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

September 15, 2008

Dr. James H. Cleland
EDAW, Incorporated
1420 Kettner Boulevard
Suite 620
San Diego, CA 92101
USA

RE: Radiocarbon Dating Result For Sample 8K001-08-1

Dear Jamie:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report sheet and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. It was analyzed with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Our invoice has been sent separately. Our copy is enclosed. Thank you for your prior efforts in arranging payment. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. James H. Cleland — Report Date: 9/15/2008

EDAW, Incorporated — Material Received: 8/21/2008

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 248247	560 +/- 40 BP	-22.9 o/oo	590 +/- 40 BP

SAMPLE : 8K001-08-1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1290 to 1420 (Cal BP 660 to 530)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.9:lab. mult=1)

Laboratory number: **Beta-248247**

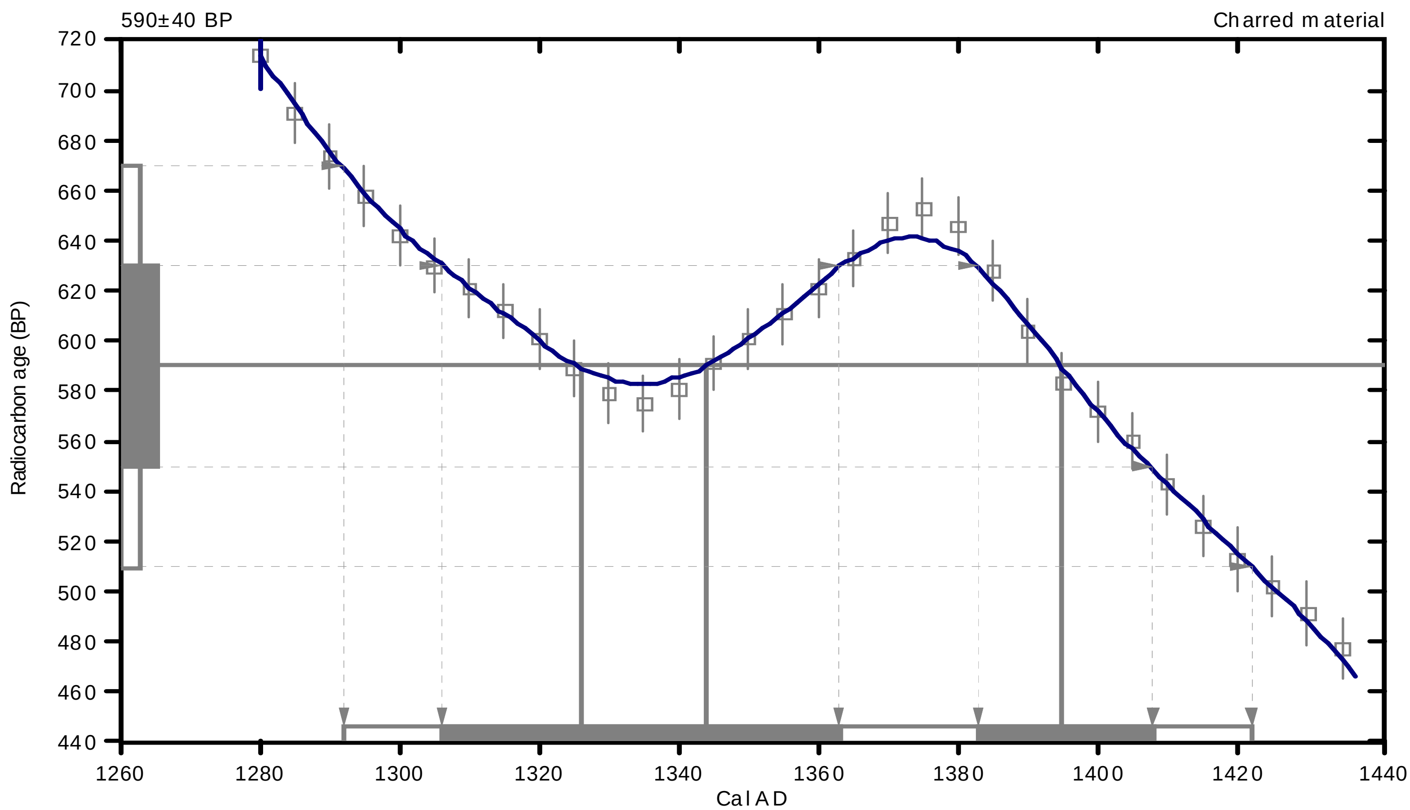
Conventional radiocarbon age: **590±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1290 to 1420 (Cal BP 660 to 530)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1330 (Cal BP 620) and
Cal AD 1340 (Cal BP 610) and
Cal AD 1400 (Cal BP 560)

1 Sigma calibrated results: (68% probability) Cal AD 1310 to 1360 (Cal BP 640 to 590) and
Cal AD 1380 to 1410 (Cal BP 570 to 540)



References:

Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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ATTACHMENT 7
OBSIDIAN HYDRATION

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Geochemical Research Laboratory Letter Report 2008-69

August 14, 2008

Ms. Tanya Wahoff
EDAW, Inc.
1420 Kettner Boulevard, Suite 500
San Diego, CA 92101

Dear Tanya:

This letter contains a table and a figure presenting energy dispersive x-ray fluorescence (edxrf) data generated from the analysis of one obsidian biface fragment artifacts from Site 13 in the Beacon Project, Kern County, California. This research was conducted pursuant to your letter request of August 12, 2008.

Laboratory equipment and analysis conditions, artifact-to-source (geochemical type) attribution procedures, element-specific measurement resolution, and literature references applicable to this specimen, except as noted, are the same as I reported for obsidian from the SNSA Project (see Hughes 2007).

Table 1

Quantitative Composition Estimates for an Obsidian Artifact from Site 13, Kern County, CA

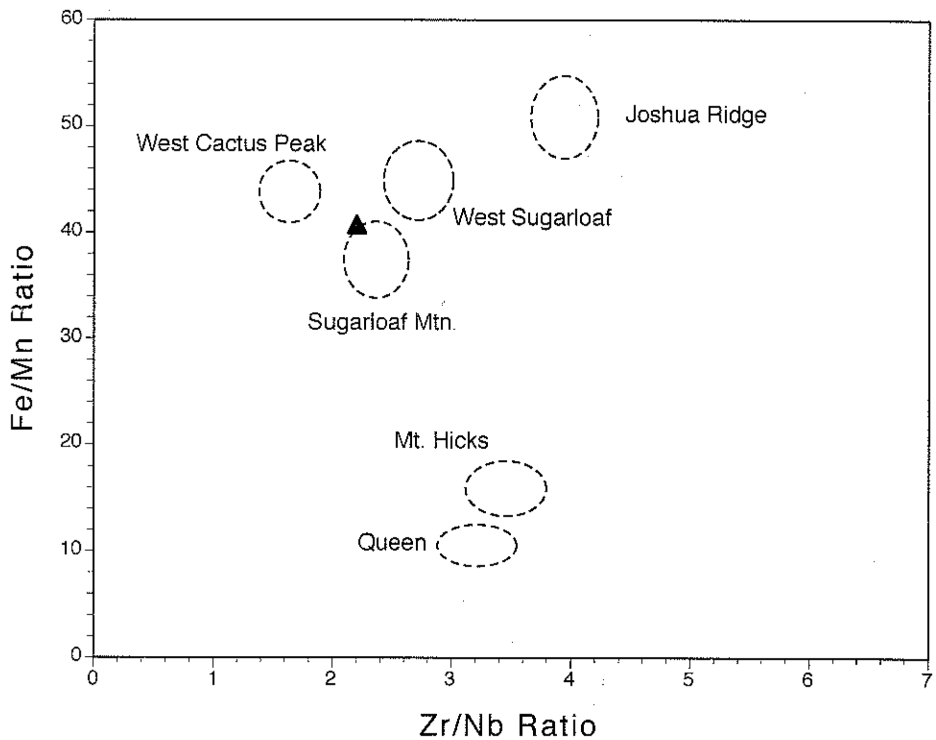
Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	Obsidian Source (Chemical Type)
	Trace Element Concentrations										Ratio		
#1	nm	nm	234 ±4	4 ±3	48 ±3	103 ±4	43 ±3	nm	nm	nm	nm	41	Sugarloaf Mtn., Coso Vol. Field
U.S. Geological Survey Comparative Reference Standard													
RGM-1 (measured)	nm	nm	153 ±4	108 ±3	25 ±3	221 ±4	9 ±3	nm	nm	nm	nm	66	Glass Mtn., CA
RGM-1 (recommended)	32	15	149	108	25	219	9	807	1600	279	1.86	nr	Glass Mtn., CA

Values in parts per million (ppm) except total iron [in weight %] and Fe/Mn intensity ratios; ± = x-ray counting uncertainty and regression fitting error at 120-360 seconds livetime. nm= not measured. nr= not reported.

Data in Figure 1 show that this biface fragment plots within the Fe/Mn vs. Zr/Nb range for Sugarloaf Mountain obsidian, Coso Volcanic Field. Fe/Mn ratios for Coso Volcanic Field obsidians range between 37-60, Mono Craters and Mono Glass Mountain range between 25-35, and Fish Springs ranges between 8-10.

Figure 1

Fe/Mn vs. Zr/Nb Ratios for a Specimen from Site 13, Kern County, CA



Dashed lines represent range of variation in archaeologically-significant obsidian source samples derived from analysis of in-house standards. Filled triangle represents the plot for sample # 1 from Table 1.

I hope this information will help in your analysis and interpretation of the assemblage from this site. Please contact me at my laboratory (phone: [650] 851-1410; e-mail: rehughes@silcon.com) if I can provide any further assistance or information. As you requested, I have forwarded the specimen to Tom Origer for obsidian hydration analysis.

Sincerely,

Richard E. Hughes, Ph.D., RPA
Director, Geochemical Research Laboratory

Reference

Hughes, Richard E.
2007 Energy Dispersive X-ray Fluorescence Analysis of Artifacts from Various Archaeological Sites in the Southern Nevada Supplemental Airport (SNSA) Project, Clark County, Nevada. Geochemical Research Laboratory Letter Report 2007-93 submitted to Tanya Wahoff, EDAW, Inc., December 21, 2007.

ORIGER'S OBSIDIAN LABORATORY
P.O. BOX 1531
ROHNERT PARK, CALIFORNIA 94927
(707) 584-8200, FAX 584-8300
ORIGER@ORIGER.COM

August 21, 2008

Tanya Wahoff
EDAW, Inc.
1420 Kettner Boulevard, Suite 500
San Diego, California 92101

RECEIVED
AUG 25 2008

Dear Tanya:

I write to report the results of obsidian hydration band analysis of one specimen from "Site 13" in Kern County, California. This work was completed following source determination by Richard Hughes, Geochemical Research Laboratory, who forwarded the specimen to us on your behalf.

Procedures typically used by our lab for preparation of thin sections and measurement of hydration bands are described here. Specimens are examined to find two or more surfaces that will yield edges that will be perpendicular to the microslides when preparation of each thin section is done. Generally, two parallel cuts are made at an appropriate location along the edge of each specimen with a four-inch diameter circular saw blade mounted on a lapidary trimsaw. The cuts result in the isolation of small samples with a thickness of about one millimeter. The samples are removed from the specimens and mounted with Lakeside Cement onto etched glass micro-slides.

The thickness of each sample was reduced by manual grinding with a slurry of #600 silicon carbide abrasive on plate glass. Grinding was completed in two steps. The first grinding is stopped when each sample's thickness is reduced by approximately one-half. This eliminates micro-flake scars created by the saw blade during the cutting process. Each slide is then reheated, which liquefies the Lakeside Cement, and the samples are inverted. The newly exposed surfaces are then ground until proper thickness is attained.

Correct thin section thickness is determined by the "touch" technique. A finger is rubbed across the slide, onto the sample, and the difference (sample thickness) is "felt." The second technique used to arrive at proper thin section thickness is the "transparency" test where the micro-slide is held up to a strong source of light and the translucency of each sample is observed. The samples are reduced enough when it readily allows the passage of light. A cover glass is affixed over each sample when grinding is completed. The slides and paperwork are on file under File No. OOL-400.

The hydration bands are measured with a strainfree 60-power objective and a Bausch and Lomb 12.5-power filar micrometer eyepiece mounted on a Nikon Labophot-Pol polarizing microscope. Hydration band measurements have a range of +/- 0.2 microns due to normal equipment limitations. Six measurements are taken at several locations along the edge of the thin section, and the mean of the measurements is calculated and listed on the enclosed data page.

Please don't hesitate to contact me if you have questions regarding this hydration work.

Sincerely,

Thomas M. Origer
Director

Submitter: T. Wahoff - EDAW, Inc August 2008

	Lab#	Sample#	Description	Unit	Depth	Remarks	Measurements	Mean	Source
Site 13 Kern									
	1		Biface Fragment		Surface	none	5.8 5.9 5.9 5.9 6.0 6.1	5.9	

Lab Accession No: OOL-400 Technician: Thomas M. Origer

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Data Request 101:

Please clarify the extent of the evaluation of offsite wells located north and east across the Cantil Fault to reflect the actual information collected in that area during the pumping test and the statistical support for the applicant's conclusions regarding the hydrogeologic conditions in that area.

Response:

Please see response to Data Request No. 98 submitted on October 13, wherein figures were revised to show the extent of information gathered at the end of the pumping tests for Well Nos. 43, 48 and 63. These figures were annotated with the water level information at the end of the test which is summarized in Table 5.17-5, provided in response to Data Request No. 99 submitted on October 13.

Beacon Solar did not have access to water supply wells east of the fault. Therefore, Beacon Solar reached the conclusion that water supply wells east of the fault were not likely affected during each of the pumping tests based upon existing data from previous investigations, distance to these wells and observations of drawdown during the pumping test. The conclusion was drawn from:

- Historical data and mapping that interpreted the fault is a barrier to groundwater flow (see response to Data Request No. 102 below and Figures DR-102a through DR-102d). These figures clearly show differences in head and response to pumping on either side of the fault zone as interpreted by Koehler 1977.

- The drawdown in observation wells in the direction of the Cantil Fault (i.e., Well No. 44 during pumping of Well No. 63 and the USGS well and pumping of Well No. 43) showing more drawdown relative to the other observation wells (see revised Figures 5.17-7, 5.17-8 and 5.17-9 as provided in Data Response No. 98 submitted on October 13). This difference in drawdown is either due to contrasting conductivity in a direction southeast of Well No. 63 and southwest of Well No. 43 or a physical barrier, such as a fault. It is not coincidental that during the pumping of both of these wells drawdown was exaggerated in the direction of the fault, indicating this feature is impedes to groundwater flow.

- The distance to the offsite water supply wells is between about 5,000 feet and 13,100 feet from the pumping wells. The drawdown observed in the observation wells during the test, coupled with the distance to these wells, would suggest that during a short term test (72-hours) it would not be anticipated that there be any measureable drawdown at these distances.

- Lastly, it is important to note that the model calibration supported observations and conclusions reached by the USGS (Koehn 1977). That is the conductance of the Cantil Valley Fault was a sensitive parameter in model calibration and a better calibration resulted from having the fault in the model as a barrier to groundwater flow (please see Data Request No. 115 below).

In summary, the distance to the offsite water supply wells being between about 5,000 and 13,100 feet from the pumping wells, and the presence of a groundwater barrier as interpreted by others and as indicated by the drawdown data led to the conclusion that the offsite water supply wells were not affected during the test.

Data Request 102:

> Please revise and provide to staff the figures pertinent to this data request to reflect the information collected during the site specific tests. Where the interpretation uses assumptions based on previous investigators' basin-wide evaluations, please identify those assumptions separately.

Response:

Please see figures 5.17-7, 5.17-8 and 5.17-9 submitted on October 13 in response to Data Request No. 98 that were revised and annotated to show the cone of depression at the end of the pumping tests. Please also see the above response to Data Request No. 101 as the rationale for why the Cantil Fault is being interpreted as a groundwater barrier. The following is a summary of the rationale for the Cantil Fault as a barrier to groundwater flow from historic studies on the Koehn Sub-basin.

Koehler (1977) states on page 10, "Cantil Valley fault acts as a barrier to groundwater movement". The key figures in Koehler (1977) are Figure 3 (thickness of sediments) (Figure DR-102a, attached), Figure 4 (water levels for 1958) (Figure DR-102b, attached), Figure 5 (water level for 1976) (Figure DR-102c, attached), and especially Figure 6 (water level decline 1958-1976) (Figure DR-102d, attached).

- Sediment Thickness Patterns: Figure DR-102a (sediment thickness) shows that the thickness patterns for the alluvial sediments are much different on the north side of the Cantil Fault than on the south side. On the north side of the fault, the thickness of the sediments increases from around 500 feet near the Garlock Fault to around 800 feet near the Cantil Fault. On the south side of the Cantil Fault, the sediment thickness increases from southwest to northeast toward Koehn Lake, showing no relationship to the Cantil Fault. This pattern of sediment thickness is opposite that found on the north side of the Cantil Fault, suggesting influence of depositional patterns and juxtaposition along the Cantil Fault.

- Figure DR-102b (water levels for 1958). This map of water levels shows that groundwater southwest of Koehn Lake flows from southwest to northeast up the valley toward Koehn Lake. Northeast of Koehn Lake, groundwater flows down the valley from northeast to southwest toward Koehn Lake. The groundwater level contours have an offset across the Cantil Fault that averages about 20 feet, with the water levels being lower on the south side of the Cantil Fault. This offset is not apparent across the Cantil Fault northeast of Koehn Lake.

- Figure DR-102c (water levels for 1976) shows the same pattern, with flow southwest of Koehn Lake now going to the areas of intense pumping both north and south of the Cantil Fault. The water level offset across the Cantil Fault is still around 20 feet, with the water levels south of the fault now being about 20 feet higher on average than north of the fault. In the area of section 2, T31S, R37E and section 34, T30S, R37E, (the areas of most intense pumping) there is an offset in the water levels of at least 20 feet with the closely-spaced contours drawn south of the Cantil Fault stopping at the fault and not crossing the fault to the north side of the valley. This suggests that water level data in the agricultural wells for 1976, as interpreted by Koehler (1977), showed a definite influence of the Cantil Fault.

- Finally, Figure DR-102d (water level decline 1958-1976) shows a definite difference of about 100 feet in groundwater decline across the Cantil Fault, with water level declines in the main area of pumping (Sec 2, T31S, R37E) south of the Cantil Fault being 200 to 240 feet and those in the main area of pumping on the north side of the fault (Sec 34, T30S, R37E) being only 120 feet. This figure shows, without a doubt, that the Cantil Fault is a substantial barrier to groundwater flow. Groundwater flows parallel to the Cantil Fault, but not across the fault.

Data Request 103:

> Please explain how hydrographs collected from wells located on both sides of the Cantil Fault are similar, given the assumption that the fault is a barrier to groundwater movement.

Response:

Figure DR-103 shows hydrographs for selected wells that are on the west and east side of the Cantil Fault (i.e., either side of the fault). These wells are a subset of the wells that have the most groundwater elevation data for the period between about 1958 and 2007. The hydrographs for 24 wells in the Koehn Sub-basin were provided in Appendix J-1 of the AFC. Figure DR-103 shows some of the wells within this group to provide a contrast showing hydrographs on either side of the Cantil Fault.

As shown on Figure DR-103, some of the hydrographs are similar and some are not. Hydrographs reflect changes in groundwater level over time. Since they are a measure of water level change over time, they reflect variation in local recharge and discharge (i.e., local water supply well pumping in this case). The similarity of some hydrographs does not indicate that the Cantil Fault is not a barrier to groundwater flow. Rather, a differential in hydraulic head across the fault is a better indication of a barrier condition. This aspect can be seen in Figures DR-102b, DR-102c and DR-102d as provided in the response to Data Request No. 102 above. These figures illustrate how local pumping centers created significant differences in hydraulic head across the Cantil Fault, which is a definite indication that groundwater flow across the fault is impeded.

Although some hydrographs show a similar rebound pattern, this similarity reflects the storage parameters of the aquifer sediments, and similar conditions of recharge and discharge locally in a post-agricultural pumping environment. The similarity should not be interpreted that the fault is not a barrier to groundwater flow as historic data has shown otherwise.

Data Request 106:

> Please provide a map showing locations of the model calibration targets (the well locations reported in Table 4.2).

Response:

The requested figure showing the model calibration targets is provided as Figure DR-106, as well as the model prediction for 1958 water levels.

Data Request 107:

> Please provide a map that overlays and compares observed (Figure 3.2) and simulated (Figure 4.6) 1958 groundwater level contours. Figure 4.6 is titled “observed vs. simulated 1958”, but there is only one set of contours and the figure does not identify which set is shown (i.e., observed or simulated).

Response:

Figure 4.6 in AFC Appendix J.2 was mislabled. The figure shows the calibrated water level contours for 1958. Figure DR-107 shows the observed water levels for 1958 (Figure 3.2 or DR-102b, attached) in comparison to the predicted water levels from the groundwater model for 1958 (Figure 4.6).

Data Request 108:

> Please provide a map that overlays and compares observed (Figure 3.4) and simulated 1976 groundwater level contours.

Response:

Attached is Figure DR-108, showing the observed (Appendix J.2 Figure 3.4) water levels for 1976 and the predicted water levels from the groundwater model.

Data Request 109:

> Please provide a map that overlays and compares observed (Figure 5.17-3) and simulated 2007 groundwater level contours.

Response:

Attached is Figure DR-109, showing the observed water levels for 2007 and the predicted water levels from the groundwater model for 2007.

Data Request 112:

> Please provide documentation of the specific data sources and calculations used to develop all simulated volumetric water budget components specified in the groundwater model.

Response:

Koehler (1977) estimated the water balance for the Koehn Lake Basin for the period from about 1960 to 1976. He estimated that about 9,500 acre-feet per year (AFY) flowed up the valley toward Koehn Lake from the southwest, using the estimated of transmissivity from Moyle (1969) and the gradients measured for 1958 (Moyle 1969), and for 1976. He estimated runoff recharge to be around 200 AFY and rounded the total recharge to the valley to about 10,000 AFY. Koehler (1977) never specified where the groundwater flowing up Koehn Basin from the southwest originated.

Koehler (1977) then estimated discharge using crop consumption estimates and acreages in production. He estimated discharge of 18,000 AFY to 28,000 AFY from 1960 to 1966 with an average of 20,000 AFY, annually. From 1968 to 1976, Koehler (1977) estimated a discharge of 35,000 to 60,000 AFY with an average of 40,000 AFY, annually. For the whole period from 1960 to 1976, Koehler (1977) estimated discharge as averaging 32,000 AFY. During this period water consumption by crops was estimated northeast of Koehn Lake at 248 AFY in 1965 and 2,232 AFY in 1975, with a spike to 6,200 AFY in 1976 due to the sharp increase in acreage under cultivation northeast of Koehn Lake.

Koehler (1977) then estimated water lost from storage at 365,000 AFY from 1958 to 1976 based on the data available. That averages 22,000 AFY, annually during that period. If the water lost from storage of 22,000 AFY is added to the estimated recharge of 10,000 AFY, that gives a balance with the estimate of 32,000 AFY lost annually during the same period. Koehler (1977) did not estimate the groundwater recharge from northeast of Koehn Lake and he did not estimate the loss due to evaporation from Koehn Lake.

In the development of the conceptual model for the Koehn Sub-basin a different approach was undertake to estimating the water balance and utilized current methods for estimating recharge from runoff along with data from studies in and around Fremont Valley to estimate groundwater flow up the valley from the southwest, down the valley from the northeast, and recharge from mountain-front runoff **(Appendix J to the AFC**). Groundwater inflow was estimated for 1958 and 1976. Groundwater discharge was taken from Koehler's (1977) estimates presented above.

Water Inflow for 1958 and 1976: The following estimates of water inflow were used:

a. Flow into the Koehn Lake Basin from the California City area: 1,000 AFY (Durbin 1978).
b. Flow across the Muroc Fault – not known
c. Recharge to groundwater from mountain-front runoff: 6,800 to 7,800 AFY.
d. Groundwater flow down the valley from northeast of Koehn Lake: 3,000 AFY.
e. TOTAL INFLOW: 10,800 AFY to 11,800 AFY.

Water Balance for 2007: The following estimates were developed for 2007:

a. Recharge from mountain-front runoff: 6,800 AFY to 7,800 AFY
b. Inflow from California City: 1,000 AFY
c. Evaporation from Koehn Lake: 2,800 AFY to 3,000 AFY
d. Water use by HPCC wells: 150 AFY
e. Domestic water use: 50 AFY
f. Agricultural water use: 843 AFY
g. Groundwater inflow from northeast of Koehn Lake: uncertain, maybe 1,000 to 3,000 AFY
h. Groundwater rebound –water going into storage: up to 9,000 AFY.

Table DR-112 provides a comparison of the conceptual hydrogeologic model water balance and the water balance used by the numerical groundwater model.

Groundwater consumption, including evaporation from Koehn Lake, is about 4,000 AFY (please see Appendix J-2). Groundwater inflow to the Koehn Basin is in the range of 7,000 to 10,000 AFY (please see Appendix J-2 and the approach used to derive this estimate), thus making the current groundwater recharge comparable to past recharge estimated by Koehler (1977). The main component of recharge is mountain-front recharge as developed in Appendix J-2 of the AFC. The main differences between the groundwater model and the conceptual hydrogeologic model are: (1) the difference in recharge, and (2) the absence of water loss from Koehn Lake for 1976 and 2007 in the groundwater model. In the conceptual hydrogeologic model, recharge was estimated to be around 6,800 to 7,800 AFY. This level of recharge would not allow the groundwater model to calibrate using the field measured hydraulic conductivities for the project area.

The decision was made to honor the measured field data and adjust the recharge to allow for a reasonable calibration. That resulted in a recharge total of 15,000 AFY. The flow from California City was set close to the estimate of Durbin (1978), which was about 1,000 AFY. Irrigation pumping in 1958 was estimated at around 1,000 AFY. Groundwater use in 2007 was around 1,000 AFY. Groundwater use in 1976 was about 60,000 AFY (Koehler 1977). For 1958, the groundwater model removed all recharge to the Koehn Lake Basin by evaporation from Koehn Lake, modeled as drain outflow. For 1976 and 2007, the water levels in the Koehn Lake Basin near Koehn Lake were below the drain level, and thus there was no outflow. All water loss from the model for these years was through well pumping.

Data Request 114:

> Please provide a sensitivity analysis for the model that includes the plausible ranges for aquifer parameters, recharge, and pumpage, summarized in a tabular format.

Response:

A sensitivity analysis was run on specific yield (Figure DR-114a), hydraulic conductivity (Figure DR-114b), and fault conductance (Figure DR-114c). For hydraulic conductivity, the range of values (see attached Table DR-114) was half the calibrated value to 2 times the calibrated value. This range was chosen because most hydraulic conductivity zones were so sensitive that a larger range produced calibration errors far exceeding acceptable limits. The range for specific yield was from 0.011 to 1.0. The range for the fault conductance was plus or minus one order of magnitude. Specific yield was one of the most sensitive parameters because of the extreme drawdown experienced in the valley during past agricultural pumping and the recent rise in water levels since pumping ceased. Deviation from the ideal value of 0.11 causes water levels to go out of calibration very quickly. The most sensitive hydraulic conductivity values were zones 1 through 4, which are the regional zones away from the Project Site. This is mainly because the on-site hydraulic conductivity zones used to match the aquifer tests have relatively few calibration targets compared to the regional areas. The faults in the model were all sensitive except for the Garlock Fault to the north of the Project Site. The latter is probably not sensitive due to lack of water level data near the fault.

Recharge and pumping were fixed inputs and were not varied during the calibration, except for minor variations where there was not data for 1976 onward. Because recharge and pumping parameters were fixed in the model and not calibration parameters, they were not included in the sensitivity analysis.

Additionally, Table 4.1 from AFC Appendix J.2 has been updated in response to a request made by the CEC during the call on October 7, 2008.

Data Request 115:

> Based on the sensitivity analysis, please report the magnitude of change in the simulated impacts.

Response:

The following figures were provided for the sensitivity analysis. Each of the figures varies a specific model parameter and compares the result to the predicted drawdown from the calibrated model after 30 years of pumping Well No. 48 (shown on AFC Figure 5.17-19).

- Figure DR-115a (specific yield – one half the modeled values)
- Figure DR-115b (specific yield – two times the model values)
- Figure DR-115c (hydraulic conductivity – one half the modeled values)
- Figure DR-115d (hydraulic conductivity – two times the modeled values)
- Figure DR-115e (fault conductance – hydraulic conductivity zone 7 removed)
- Figure DR-115f (fault conductance – removal of the fault from the model)

As noted in response to Data Request No.114, specific yield values were very sensitive in the calibration. The predictions for specific yield values are thus provided for a specific yield value half the calibrated value and twice the calibrated value. In the case of half the calibrated specific yield, the predicted draw downs are very similar to the base case, indicating that steady state has almost been achieved in both cases. In the case of specific yield twice the calibrated value, the draw downs predicted by the model are significantly less than the base case because steady state is a long way from being achieved in 30 years. Similarly drawdown's predicted for half the calibrated hydraulic conductivity values are not significantly different from the base case whereas the prediction where hydraulic conductivity is much higher (twice the calibrated values) shows much less drawdown at 30 years.

During discussions with CEC (October 7, 2008), the low hydraulic conductivity value on-site in zone 7 was questioned. The next sensitivity run eliminated zone 7, making it the same hydraulic conductivity as surrounding zones. This analysis shows very similar results to the base case, except that little drawdown is seen south of the Cantil Valley Fault. The final sensitivity analysis shows the effects of removing the Cantil Valley Fault from the model. This predicts much less drawdown to the northeast and about 5 ft more drawdown south of the fault.

Data Request 117:

Please provide the simulated volumetric budget for all budget components.

Response:

Table DR-117 is provided in response to this request and shows the model mass balance from 1958 through 2007.

Data Request 118:

Please clarify and provide justification for the above discrepancies between simulated and observed conditions.

Response:

The observed water levels for 1958 were those presented in Figure 4 of Koehler (1977). Figure 4.6 in Appendix J to the AFC shows the modeled water levels for the calibration to 1958 for the Koehn Lake Basin (Figure DR-102b shows the observed vs. simulated water levels for 1958). Southwest of Koehn Lake, the water levels on the south side of the Cantil Fault are offset to the southwest relative to those on the north of the Cantil Fault. Examination of the offset for the area between the project and Koehn Lake, the area of most target wells, shows that the water levels south of the Cantil Fault would be the same or slightly lower than those north of the fault. This finding is consistent with Koehler's (1977) interpretation of the water levels, shown in Figure 3.2 of Appendix J to the AFC. The amount of offset across the Cantil Fault is not as pronounced as drawn by Koehler (1977). Also, the influence of pumping on both sides of the fault is not as dramatic in the modeled contours (Figure 4.6) as in Koehler's (1977) hand-drawn contouring of the well data from Moyle (1969).

The model calibration to 1958 differs from Koehler's (1977) interpretation of the water level data for the following reasons: (1) the model did not know the location or the pumping rate of individual wells, so pumping in 1958 was generalized in the model; (2) machine contouring of data will differ from hand contouring because of the difference between a statistical averaging program and the "interpretation" of the mind of the geologist doing the hand contouring. The purpose of the 1958 calibration was to develop a steady-state calibration to a period before most of the irrigation pumping in order to have a steady-state model to use for transient calibrations during the periods when considerable data were available. The goal of the 1958 calibration was not to match the hand contours of Koehler (1977) exactly. That would have involved considerable “guess work” and adjusting of pumping wells and pumping rates to get the desired match.

Data Request 119:

> Please provide plots comparing observed and simulated water levels for the data locations reported in Table 4.3.

Response:

AFC Appendix J.2 Table 4.3 “Residuals and Statics from Transient Calibration to the Pump Test Drawdown” is attached in response to this data request. Also attached are Figures DR-119a (Well No. 43), DR-119b (Well No. 63) and DR-119c (Well No. 63) that illustrate the transient calibration of the pumping test data.

Data Request 120:

> Please provide the geologic data, analysis, and interpretation required to justify the simulated hydraulic conductivity distribution.

Response:

Koehler (1977) used the specific capacity data for irrigation wells in Moyle (1969) to estimate the transmissivity on the north side and on the south side of the Cantil Fault. His estimates were 20,000 feet squared per day (ft2/day) for the transmissivity on the north side of the fault and 8,000 ft2/day for the transmissivity on the south side of the fault. Using the estimates of Koehler (1977), the north side of the Cantil Fault would have an average horizontal hydraulic conductivity (Kh) of 30.8 ft/day assuming an average thickness of the saturated alluvium of 650 feet. On the south side of the Cantil Fault the average Kh is estimated to be 11.5 feet per day (ft/day) assuming an average thickness of 700 feet.

The numerical groundwater model developed for the Koehn Lake Basin used the following Kh values as shown in Figure 4.3 of Appendix J to the AFC report: (1) South of the Cantil Fault, Kh = 43.5 ft/day; (2) North of the Cantil Fault, Kh = 20 ft/day. At the northeast end of the Koehn Lake Basin, Kh values of 0.4 ft/day were used north of the projection of the Cantil Fault and Kh = 0.5 ft/day was used for south of the fault to match the gradient in Figure 4 from Koehler (1977) for the area northeast of Koehn Lake. In the project area, the pumping tests showed that the best match to the pumping test data required Kh values around 50 to 58 ft/day.

The hydraulic conductivity (Kh) values used in the model are shown in Figure 4.3 of Appendix J.2 to the AFC. North of the Cantil Fault, an average Kh of 20 ft/day was used for the area southwest of Koehn Lake. For the area south of the Cantil Fault and southwest of Koehn Lake, and average Kh of 43.5 ft/day was used. For the project area, Kh values from 50 to 58 ft/day were used in an effort to match the ENSR pumping test results.

Koehler (1977) took the specific capacity data from irrigation wells in the Fremont Valley (Moyle 1969) and estimated the transmissivity for the alluvial sediments north and south of the Cantil Fault in the area southwest of Koehn Lake. For the area north of the Cantil Fault, he estimated an average transmissivity of 20,000 ft2/day; for the area south of the Cantil Fault, he estimated a transmissivity of 8,000 ft2/day. As discussed above, this translates into an average Kh of about 30.8 ft/day for the area north of the Cantil Fault and an average Kh of about 11.5 ft/day for the area south of the Cantil Fault. The numerical groundwater model used 20 ft/day for the area north of the Cantil Fault, but had higher Kh values ranging from 50 to 58 ft/day in the project area. Since most of the irrigation wells used by Koehler (1977) were near the proposed project area, the area-weighted Kh for the model north of the Cantil Fault would be reasonably close to the estimate of Koehler (1977) for the alluvial aquifer north of the Cantil Fault.

The main difference between the groundwater model and Koehler (1977) is found south of the Cantil Fault. Koehler (1977) estimated an average transmissivity of 8,000 ft2/day and assuming an average thickness of 700 feet, this gives an average Kh around 11.5 ft/day. This value could easily vary by two times on either side of 11.5 ft/day. The groundwater model needed a Kh of 43.5 ft/day to calibrate to 1958 water levels. This Kh is certainly higher than what was estimated by Koehler (1977) based on specific capacity data from about a dozen wells in Moyle (1969) for this part of the Koehn Basin. The specific capacity data reflect local aquifer conditions near the irrigation wells for pumping conditions in the Koehn Basin during the time period from the 1950's to about 1966. In some cases, irrigation wells may have interfered with one another, causing more drawdown in a well than would be the case if no other pumping wells were operating. That could lead to abnormally low specific capacity data. But, more importantly, the groundwater model is "seeing" the entire basin southwest of Koehn Lake and trying to match water levels for 1958 over a large area with the constraints imposed by the recharge distribution, the selection of Kh values for the project area based on the ENSR pumping tests, and the boundary conditions of the model domain. Thus, the Kh of 43.5 ft/day need to calibrate to water levels southwest of Koehn Lake and south of the Cantil Fault for 1958 reflects a more encompassing view of the basin than the specific capacity data of Koehler (1977). For that reason, the Kh value needed to calibrate the groundwater model may be more reflective of average conditions for the alluvial aquifer southwest of Koehn Lake and in the part of the basin south of the Cantil Fault.

Data Request 121:

> Please provide hydrographs for additional wells. The number and distribution of wells should encompass as much of the geographic area represented by the model as possible.

Response:

Figure DR-121a shows the distribution of wells used in the “verification” run and those additional wells that were added to expand the geographic coverage within the Koehn Sub-basin. In addition to AFC Appendix J-2 hydrographs were provided for verification of the model and shown as Figures 4.7, 4.8 and 4.9. Ten additional wells, some from the additional verification and some new were analyzed and the hydrographs are shown on Figures DR-121b through DR-121k.

Most of the simulated well hydrographs match fairly well considering there is no information on the location and rates of pumping in the area from 1976 to present. The nine wells added in response to the CEC data request were not considered during calibration and so adjustments to local pumping conditions were not made in an attempt to match these hydrographs. The wells that do not match well are most likely caused by local pumping conditions being different from those simulated in the model for the period from 1976 to 2007.

Data Request 122:

> Because recharge and/or pumpage were “changed” in the “verification” run in order to match between observed and simulated groundwater levels, please provide a comparison, using either tables or figures, of estimated and “changed” recharge and pumpage values over the 1958-2007 simulation period.

Response:

First, recharge rates were not changed in any of the calibration runs. Recharge was estimated as part of the model water budget and input to the model as a constant rate over time. Pumping rates were not really changed either from published data. The only adjustments that were made were to the post-1976 time period when no data on pumping rates could be found. The USGS published basin total pumping up to 1976. After that time, there are no estimates of pumping rates. These post-1976 rates were adjusted to match water levels in that time period. The philosophy was that storage and hydraulic conductivity were estimated during time periods when pumping was either known or reliably estimated. For periods when pumping was not known, those rates were adjusted instead of hydraulic conductivity or storage.

Table DR-122 provides the pumping rates used in the modeling and the associated references for each model year during the verification run.

Data Request 123:

Please provide the simulated volumetric budget and compare to previously estimated flow components. Because it is a transient model run, and simulates the period 1958 through 2007, average, annual flow rates will suffice.

Response:

Please see response to Data Request No. 117, where the model mass budget was provided.

Tables

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

Water Balance Components	1958		1976		2007	
	Conceptual Model	Groundwater Model	Conceptual Model	Groundwater Model	Conceptual Model	Groundwater Model
	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	based on recharge cells[4]	3,000	based on recharge cells[4]	1,000-3,000	based on recharge cells[4]
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 rese
3 = "Included with ag pumping" indicates that the model combined domestic and Honda water usage into the agricultural useage.
4 = "Based on recharge cells", refers to flux set by the model NE of Koehn Lake.
-- = Not known or available in literature for the Koehn Sub-basin.

Table DR-114
Sensitivity Analysis Parameter Ranges
Beacon Solar Energy Project
Kern County, California

Parameter	Model Zone	Minimum Value	Calibrated Value	Maximum Value
Kx (ft/d)	1	10	20	40
Kx (ft/d)	2	21.75	43.5	87
Kx (ft/d)	3	0.2	0.4	0.8
Kx (ft/d)	4	0.26	0.52	1.04
Kx (ft/d)	5	34.4	68.8	137.6
Kx (ft/d)	7	0.055	0.11	0.22
Kx (ft/d)	8	25.85	51.7	103.4
Kx (ft/d)	9	25.1	50.2	100.4
Kx (ft/d)	10	29.05	58.1	116.2
Sy	1	0.055	0.11	0.22
Fault K (ft/d)	Garlock	0.5	1	2
Fault K (ft/d)	Cantil Valley	0.000097829	0.000195658	0.000391316
Fault K (ft/d)	Muroc	1.84466E-05	3.69E-05	7.37862E-05
Fault K (ft/d)	Randsburg	0.00098317	0.00196634	0.00393268

Notes

ft/d = Feet per day
Kv = hydraulic conductivity
Sy = specific yield
fault K = fault conductance

Table 4.1 (DR-114)
Summary of Calibrated Model Parameters for the Fremont Valley Model
Beacon Solar Energy Project
Kern County, California

Parameter Type	Zone	Location	Parameter Value	Units
Hydraulic Conductivity	1	Between Cantil Valley and Garlock Faults	20.00	ft/d
Hydraulic Conductivity	2	South of Cantil Valley Fault	43.51	ft/d
Hydraulic Conductivity	3	East End of Valley Between North of Cantil Valley Fault	0.40	ft/d
Hydraulic Conductivity	4	East End of Valley Between South of Cantil Valley Fault	0.53	ft/d
Hydraulic Conductivity	5	North of Garlock Fault	68.80	ft/d
Hydraulic Conductivity	7	Northeast corner of Project Beacon Site	0.11	ft/d
Hydraulic Conductivity	8	Western edge of Project Beacon Site	51.70	ft/d
Hydraulic Conductivity	9	Central part of Project Beacon Site	50.23	ft/d
Hydraulic Conductivity	10	Southeastern corner of Project Beacon Site	58.08	ft/d
Specific Yield	1	Between Cantil Valley and Garlock Faults	0.1100	dimensionless
Specific Yield	2	South of Cantil Valley Fault	0.1100	dimensionless
Specific Yield	3	East End of Valley Between North of Cantil Valley Fault	0.1100	dimensionless
Specific Yield	4	East End of Valley Between South of Cantil Valley Fault	0.1100	dimensionless
Specific Yield	5	North of Garlock Fault	0.1100	dimensionless
Specific Yield	7	Northeast corner of Project Beacon Site	0.1100	dimensionless
Specific Yield	8	Western edge of Project Beacon Site	0.1100	dimensionless
Specific Yield	9	Central part of Project Beacon Site	0.1100	dimensionless
Specific Yield	10	Southeastern corner of Project Beacon Site	0.1100	dimensionless
Storage Coefficient	7	Northeast corner of Project Beacon Site	0.0138	dimensionless
Storage Coefficient	8	Western edge of Project Beacon Site	0.0097	dimensionless
Storage Coefficient	9	Central part of Project Beacon Site	0.0004	dimensionless
Storage Coefficient	10	Southeastern corner of Project Beacon Site	0.0027	dimensionless
Fault Hydraulic Conductivity	0	Garlock Fault	1	ft/d
Fault Hydraulic Conductivity	1	Cantil Valley Fault	0.00020	ft/d
Fault Hydraulic Conductivity	2	Randsburg-Mojave Fault	0.00197	ft/d
Fault Hydraulic Conductivity	3	Muroc Fault	0.000037	ft/d

Notes
ft/d = Feet per day
Kv = hydraulic conductivity
Sy = specific yield
fault K = fault conductance

Table DR-117
Mass Balance for Model Simulation from 1958 to 2007
(all rates in cubic feet per day)
Beacon Solar Energy Project
Kern County, California

Time (days)	Year	Well InflowBasin Inflow from South	GHB InflowFlow Across Muroc Fault	Storage Inflow	Recharge	Well Pumping	Drain OutflowKoehn Lake	Storage Outflow
365	1958	119,342	79,990	0	1,790,148	-100,602	-1,891,114	0
730	1959	119,342	83,047	1,028,478	1,790,148	-1,174,684	-1,845,053	0
1095	1960	119,342	83,047	1,989,604	1,790,148	-2,248,766	-1,732,037	0
1460	1961	119,342	83,047	2,600,960	1,790,148	-3,024,492	-1,567,598	0
1825	1962	119,342	83,047	2,773,908	1,790,148	-3,382,520	-1,382,490	0
2190	1963	119,342	83,047	1,851,247	1,790,148	-2,606,794	-1,234,652	-994
2555	1964	119,342	83,048	1,900,562	1,790,148	-2,785,808	-1,106,005	0
2920	1965	119,342	83,049	1,497,201	1,790,148	-2,487,451	-1,001,034	0
3285	1966	119,342	83,051	1,180,380	1,790,148	-2,248,766	-922,821	-105
3650	1967	119,342	83,053	1,931,941	1,790,148	-3,084,164	-839,094	0
4015	1968	119,342	83,056	2,656,053	1,790,148	-3,919,561	-727,783	0
4380	1969	119,342	83,061	2,944,869	1,790,148	-4,337,260	-598,873	0
4745	1970	119,342	83,067	2,630,129	1,790,148	-4,158,246	-463,155	0
5110	1971	119,342	83,075	2,528,606	1,790,148	-4,158,246	-361,648	0
5475	1972	119,342	83,084	2,556,165	1,790,148	-4,277,588	-269,957	0
5840	1973	119,342	83,094	2,954,765	1,790,148	-4,754,958	-191,267	0
6205	1974	119,342	83,106	2,998,382	1,790,148	-4,874,301	-115,554	0
6570	1975	119,342	83,121	3,227,145	1,790,148	-5,172,657	-45,967	-128
6935	1976	119,342	83,136	5,209,812	1,790,148	-7,201,478	0	0
7300	1977	119,342	83,154	5,269,464	1,790,148	-7,261,150	0	0
7665	1978	119,342	83,173	4,430,945	1,790,148	-6,401,884	0	-20,767
8030	1979	119,342	83,194	4,314,687	1,790,148	-6,306,410	0	0
8395	1980	119,342	83,217	3,445,549	1,790,148	-5,346,717	0	-90,581
8760	1981	119,342	83,241	2,534,245	1,790,148	-4,010,082	0	-515,935
9125	1982	119,342	83,267	2,077,994	1,790,148	-3,571,397	0	-498,396
9490	1983	119,342	83,295	1,853,618	1,790,148	-3,571,397	0	-274,048
9855	1984	119,342	83,324	1,601,833	1,790,148	-3,296,076	0	-297,610
10220	1985	119,342	83,354	1,352,768	1,790,148	-2,796,076	0	-548,575
10585	1986	119,342	83,385	1,158,112	1,790,148	-2,500,602	0	-649,426
10950	1987	119,342	83,417	1,007,940	1,790,148	-2,300,602	0	-699,285
11315	1988	119,342	83,450	899,683	1,790,148	-2,400,602	0	-491,060
11680	1989	119,342	83,484	992,254	1,790,148	-2,500,602	0	-483,666
12045	1990	119,342	83,518	921,043	1,790,148	-2,500,602	0	-412,490
12410	1991	119,342	83,552	847,424	1,790,148	-2,110,602	0	-728,906
12775	1992	119,342	83,587	775,754	1,790,148	-2,100,602	0	-667,268
13140	1993	119,342	83,622	633,733	1,790,148	-2,000,602	0	-625,283
13505	1994	119,342	83,656	620,161	1,790,148	-2,300,602	0	-311,744
13870	1995	119,342	83,691	500,729	1,790,148	-2,100,602	0	-392,345
14235	1996	119,342	83,725	419,901	1,790,148	-880,602	0	-1,531,553
14600	1997	119,342	83,758	354,772	1,790,148	-700,602	0	-1,646,458
14965	1998	119,342	83,791	334,343	1,790,148	-1,000,602	0	-1,326,061
15330	1999	119,342	83,824	250,239	1,790,148	-100,602	0	-2,141,989
15695	2000	119,342	83,856	206,412	1,790,148	-100,602	0	-2,098,194
16060	2001	119,342	83,887	170,372	1,790,148	-100,602	0	-2,062,186
16425	2002	119,342	83,917	140,542	1,790,148	-100,602	0	-2,032,387
16790	2003	119,342	83,947	115,650	1,790,148	-100,602	0	-2,007,524
17155	2004	119,342	83,976	95,575	1,790,148	-100,602	0	-1,987,477
17520	2005	119,342	84,003	80,336	1,790,148	-100,602	0	-1,972,267
17885	2006	119,342	84,030	68,315	1,790,148	-100,602	0	-1,960,274
18250	2007	119,342	84,056	58,796	1,790,148	-100,602	0	-1,950,779

Notes
GHB = general head boundary

Table 4.3 (DR-119)
Residuals and Statistics for the Transient Calibration to Pump Test Drawdown
Beacon Solar Energy Project
Kern County, California

Name	Time (days)	Pumping Well	Easting	Northing	Observed Drawdown (ft)	Computed Drawdown (ft)	Residual (ft)
46	0.5	43	1,342,509	12,804,500	0.15	0.07	0.08
46	1	43	1,342,509	12,804,500	0.30	0.21	0.09
46	2	43	1,342,509	12,804,500	0.57	0.61	-0.04
46	3	43	1,342,509	12,804,500	1.05	1.08	-0.03
50	0.5	43	1,338,386	12,803,743	0.04	0.00	0.04
50	1	43	1,338,386	12,803,743	0.26	0.00	0.26
50	2	43	1,338,386	12,803,743	0.53	0.01	0.52
50	3	43	1,338,386	12,803,743	0.85	0.05	0.80
USGS	0.5	43	1,339,694	12,801,248	3.20	3.04	0.16
USGS	1	43	1,339,694	12,801,248	5.70	5.83	-0.13
USGS	2	43	1,339,694	12,801,248	9.50	9.47	0.03
USGS	3	43	1,339,694	12,801,248	12.37	11.66	0.71
41	0.5	48	1,333,612	12,798,544	1.22	0.26	0.96
41	1	48	1,333,612	12,798,544	1.55	0.67	0.88
41	2	48	1,333,612	12,798,544	1.81	1.39	0.41
41	3	48	1,333,612	12,798,544	1.93	1.95	-0.02
47	0.5	48	1,329,846	12,797,459	1.14	0.42	0.72
47	1	48	1,329,846	12,797,459	1.57	0.86	0.71
47	2	48	1,329,846	12,797,459	2.25	1.46	0.79
47	3	48	1,329,846	12,797,459	2.75	1.88	0.87
49	0.5	48	1,334,463	12,800,146	0.12	0.13	-0.01
49	1	48	1,334,463	12,800,146	0.22	0.39	-0.17
49	2	48	1,334,463	12,800,146	0.31	0.91	-0.60
49	3	48	1,334,463	12,800,146	0.41	1.34	-0.93
44	0.5	63	1,335,918	12,799,848	4.01	3.86	0.15
44	1	63	1,335,918	12,799,848	5.12	4.63	0.49
44	2	63	1,335,918	12,799,848	6.37	5.56	0.81
44	3	63	1,335,918	12,799,848	7.26	6.21	1.05
45B	0.5	63	1,336,096	12,801,531	0.43	0.14	0.29
45B	1	63	1,336,096	12,801,531	0.70	0.32	0.38
45B	2	63	1,336,096	12,801,531	0.86	0.70	0.16
45B	3	63	1,336,096	12,801,531	0.92	1.09	-0.17
49	0.5	63	1,334,463	12,800,146	5.05	4.42	0.63
49	1	63	1,334,463	12,800,146	5.66	5.09	0.57
49	2	63	1,334,463	12,800,146	6.09	5.91	0.18
49	3	63	1,334,463	12,800,146	6.17	6.49	-0.32
Residual Mean							**0.29**
Residual Standard Deviation							**0.45**
Absolute Residual Mean							**0.42**
Minimum Residual							**-0.93**
Maximum Residual							**1.05**
Range in Head							**12.25**
Residual Mean/Range							**2.3%**
Residual Standard Deviation/Range							**3.7%**
Absolute Residual Mean/Range							**3.4%**

Notes

ft = feet
USGS = United States Gological Survey Well

Table DR-122
Well Pumping Used in Model Run from 1958 to 2007
Beacon Solar Energy Project
Kern County, California

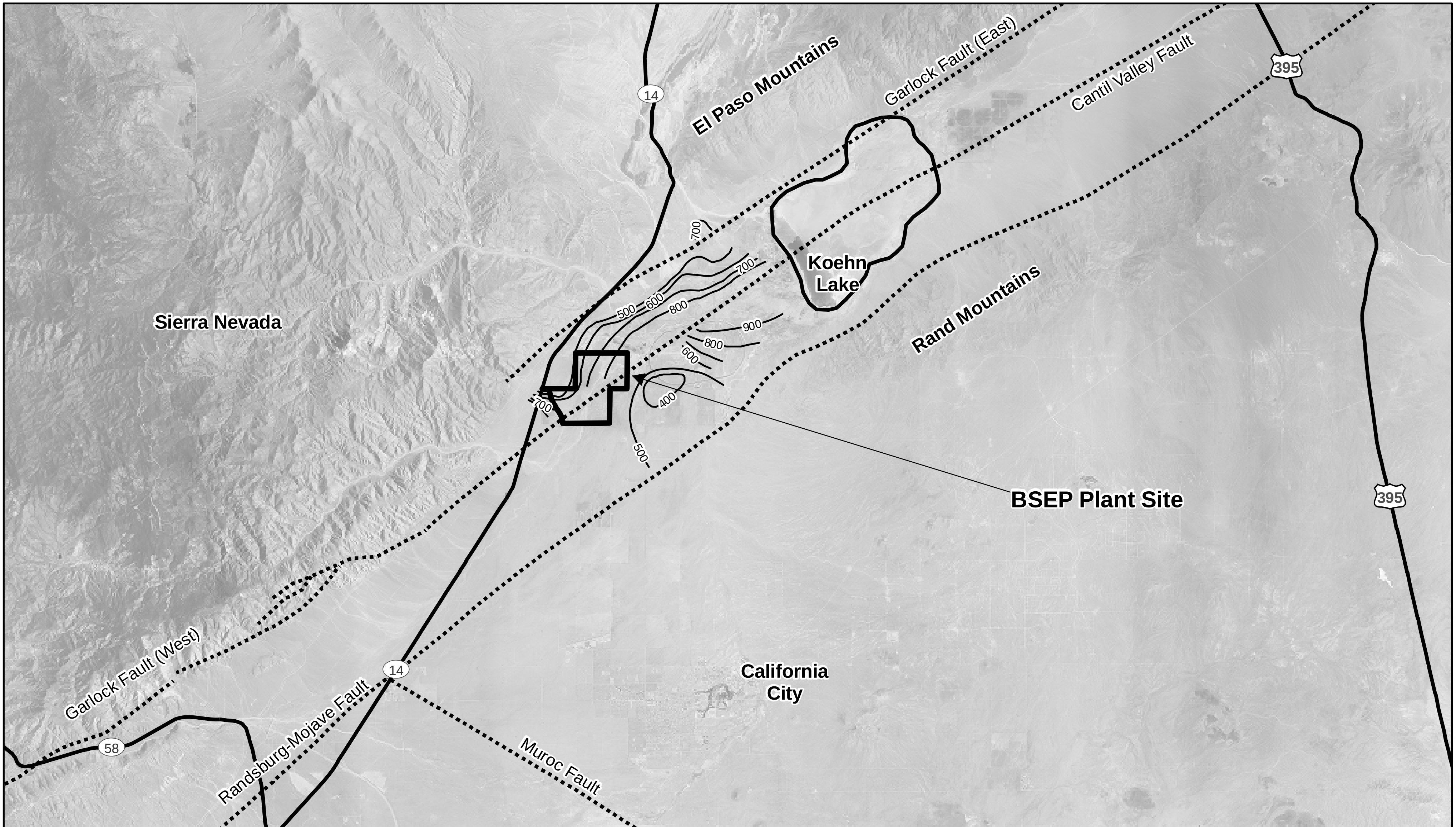
Model Elapsed Time (days)	Year	Well Pumping (ft3/d)	Well Pumping (AF/Yr)	Reference
365	1958	-100,602	843	Estimated
730	1959	-1,174,684	9,843	Koehler, 1977
1095	1960	-2,248,766	18,843	Koehler, 1977
1460	1961	-3,024,492	25,343	Koehler, 1977
1825	1962	-3,382,520	28,343	Koehler, 1977
2190	1963	-2,606,794	21,843	Koehler, 1977
2555	1964	-2,785,808	23,343	Koehler, 1977
2920	1965	-2,487,451	20,843	Koehler, 1977
3285	1966	-2,248,766	18,843	Koehler, 1977
3650	1967	-3,084,164	25,843	Koehler, 1977
4015	1968	-3,919,561	32,843	Koehler, 1977
4380	1969	-4,337,260	36,343	Koehler, 1977
4745	1970	-4,158,246	34,843	Koehler, 1977
5110	1971	-4,158,246	34,843	Koehler, 1977
5475	1972	-4,277,588	35,843	Koehler, 1977
5840	1973	-4,754,958	39,843	Koehler, 1977
6205	1974	-4,874,301	40,843	Koehler, 1977
6570	1975	-5,172,657	43,343	Koehler, 1977
6935	1976	-7,201,478	60,343	Koehler, 1977
7300	1977	-7,261,150	60,843	Estimated
7665	1978	-6,401,884	53,643	Estimated
8030	1979	-6,306,410	52,843	Estimated
8395	1980	-5,346,717	44,801	Estimated
8760	1981	-4,010,082	33,601	Estimated
9125	1982	-3,571,397	29,926	Estimated
9490	1983	-3,571,397	29,926	Estimated
9855	1984	-3,296,076	27,619	Estimated
10220	1985	-2,796,076	23,429	Estimated
10585	1986	-2,500,602	20,953	Estimated
10950	1987	-2,300,602	19,277	Estimated
11315	1988	-2,400,602	20,115	Estimated
11680	1989	-2,500,602	20,953	Estimated
12045	1990	-2,500,602	20,953	Estimated
12410	1991	-2,110,602	17,685	Estimated
12775	1992	-2,100,602	17,601	Estimated
13140	1993	-2,000,602	16,764	Estimated
13505	1994	-2,300,602	19,277	Estimated
13870	1995	-2,100,602	17,601	Estimated
14235	1996	-880,602	7,379	Estimated
14600	1997	-700,602	5,871	Estimated
14965	1998	-1,000,602	8,384	Estimated
15330	1999	-100,602	843	Estimated
15695	2000	-100,602	843	Estimated

Table DR-122
Well Pumping Used in Model Run from 1958 to 2007
Beacon Solar Energy Project
Kern County, California

Model Elapsed Time (days)	Year	Well Pumping (ft3/d)	Well Pumping (AF/Yr)	Reference
16060	2001	-100,602	843	Estimated
16425	2002	-100,602	843	Estimated
16790	2003	-100,602	843	Estimated
17155	2004	-100,602	843	Estimated
17520	2005	-100,602	843	Estimated
17885	2006	-100,602	843	Estimated
18250	2007	-100,602	843	Estimated

Notes
AF/Yr = acre=feet per year
ft^3/d = cubic feet per day
d = days

Figures



Map Location

Legend

- Alluvium_Thickness-feet
- Fault
- BSEP Plant Site Boundary

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 6 8 Miles

1:253,440

N S E W

BSEP

Figure DR-102a
Alluvial Thickness for the
Koehn Sub-Basin

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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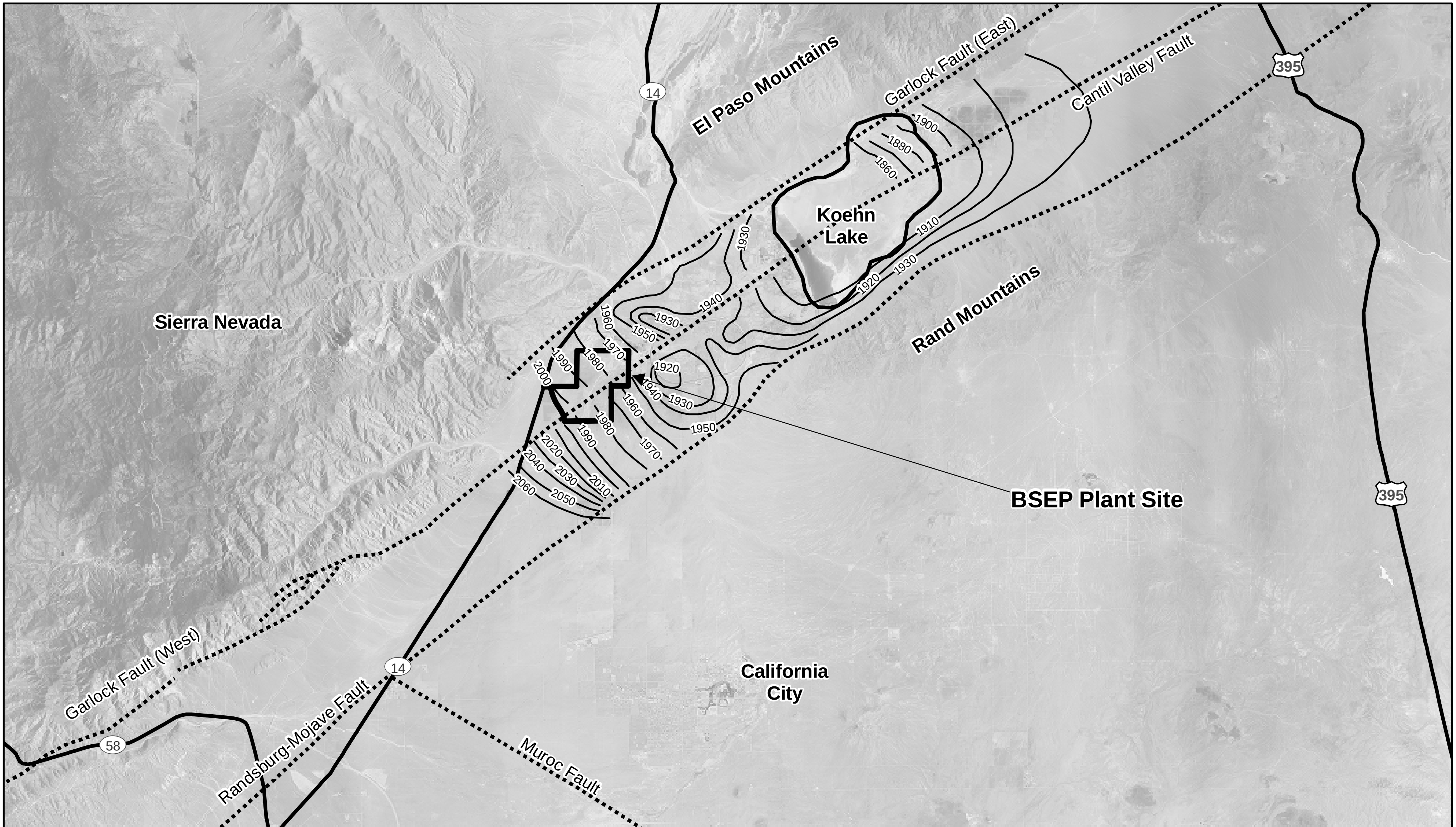

Map Location

Legend

- Groundwater Contour (feet amsl)
- Fault
- BSEP Plant Site Boundary

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 6 8 Miles

1:253,440

N W E S

BSEP

Figure DR-102b
Water Level Contour Map (1958)
Koehn Sub-Basin

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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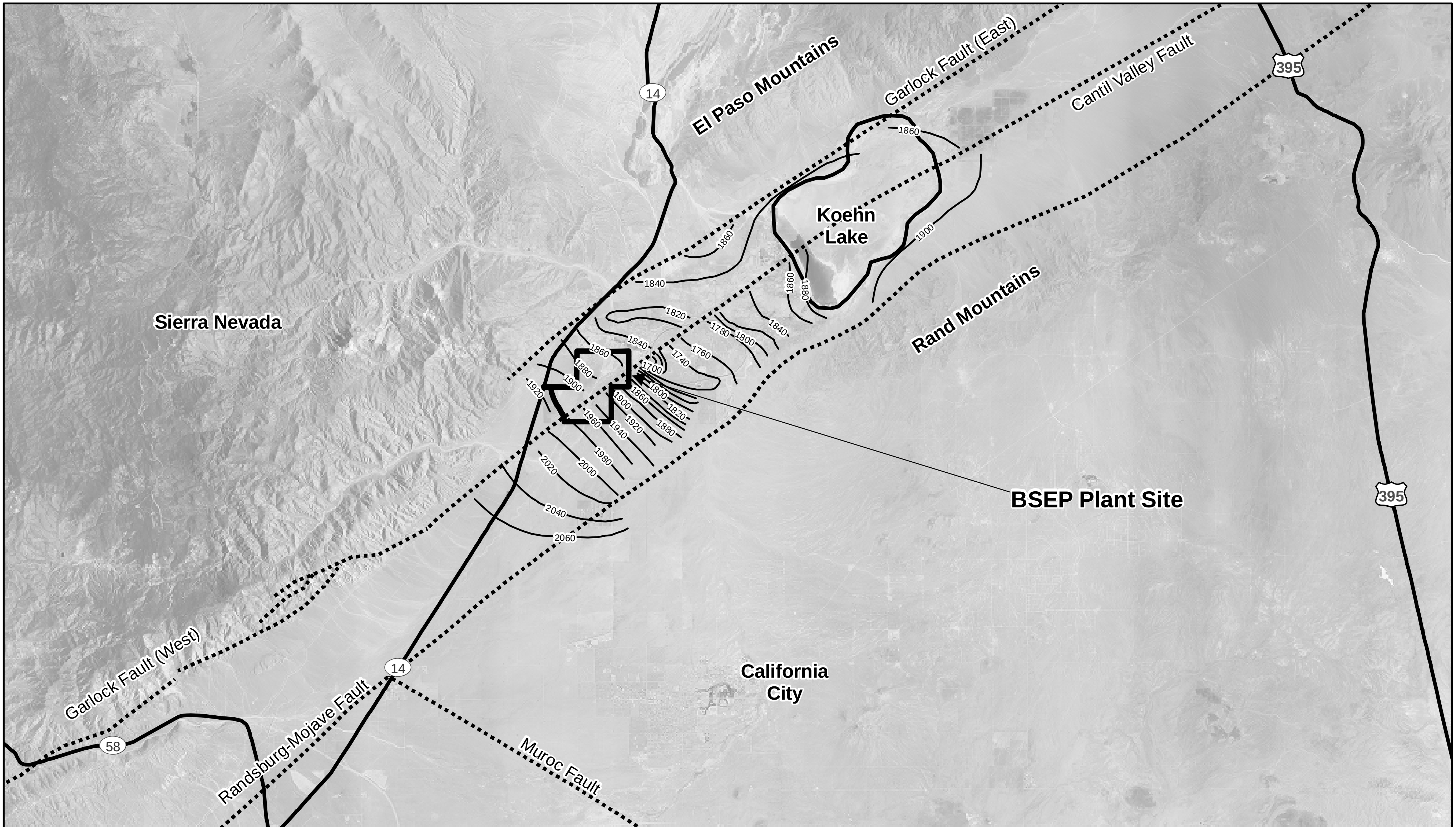

Map Location

Legend

- Groundwater Contour (feet amsl)
- Fault
- BSEP Plant Site Boundary

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 6 8 Miles

1:253,440

N S E W

BSEP

Figure DR-102c
Water Level Contour Map (1976)
Koehn Sub-Basin

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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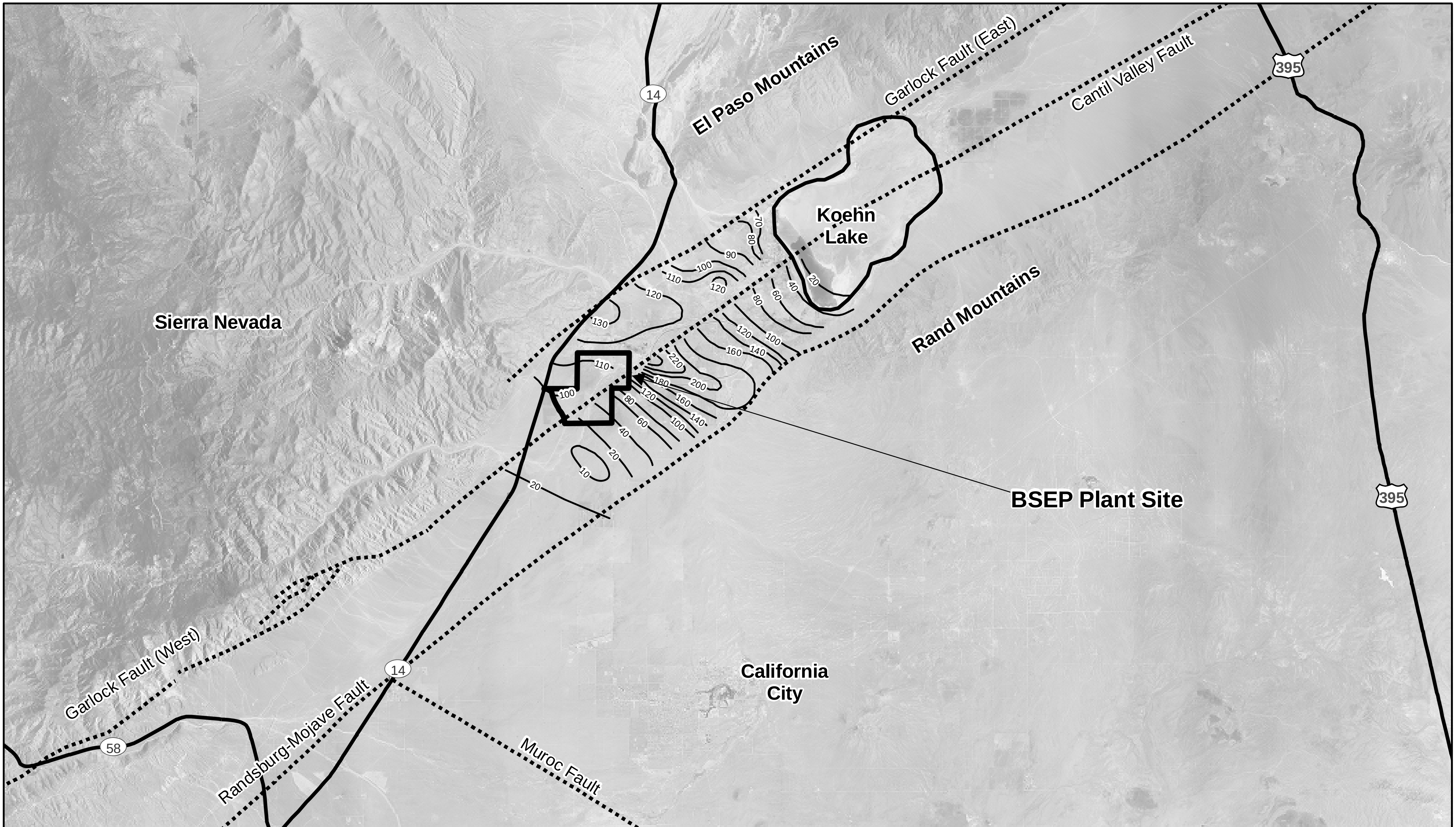

Map Location

Legend

- Drawdown (feet)
- Fault
- BSEP Plant Site Boundary

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 6 8 Miles

1:253,440

N W E S

BSEP

Figure DR-102d
Groundwater Drawdown between 1958 and 1976
Koehn Sub-Basin

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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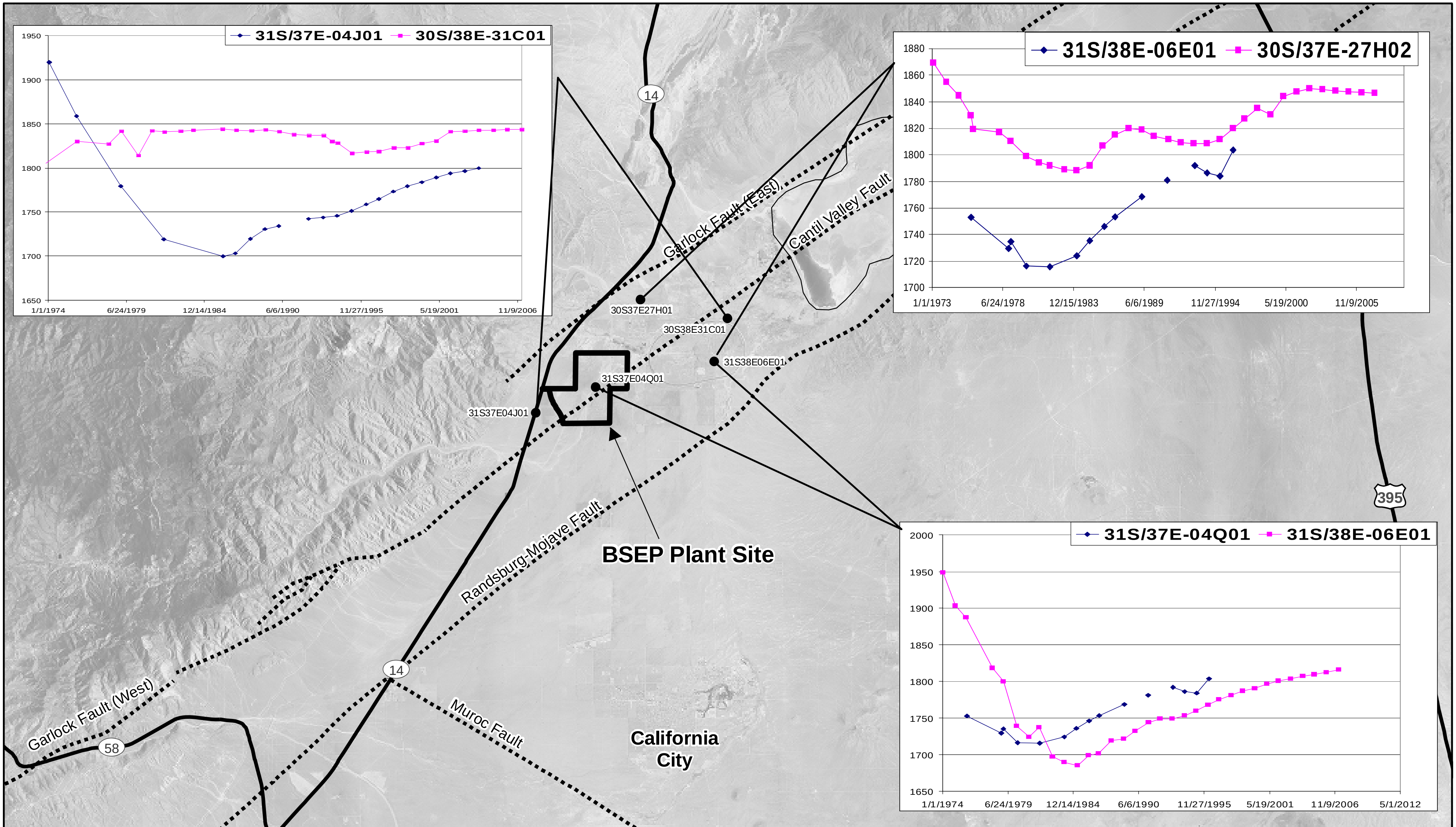

Map Location

Legend

- Fault
- BSEP Plant Site Boundary

Note: Additional hydrographs presented in Appendix J.1

0 2 4 6 8 Miles

1:253,440

N W E S

BSEP

Figure DR-103
Hydrographs of Selected Key Wells within the Koehn Sub-basin

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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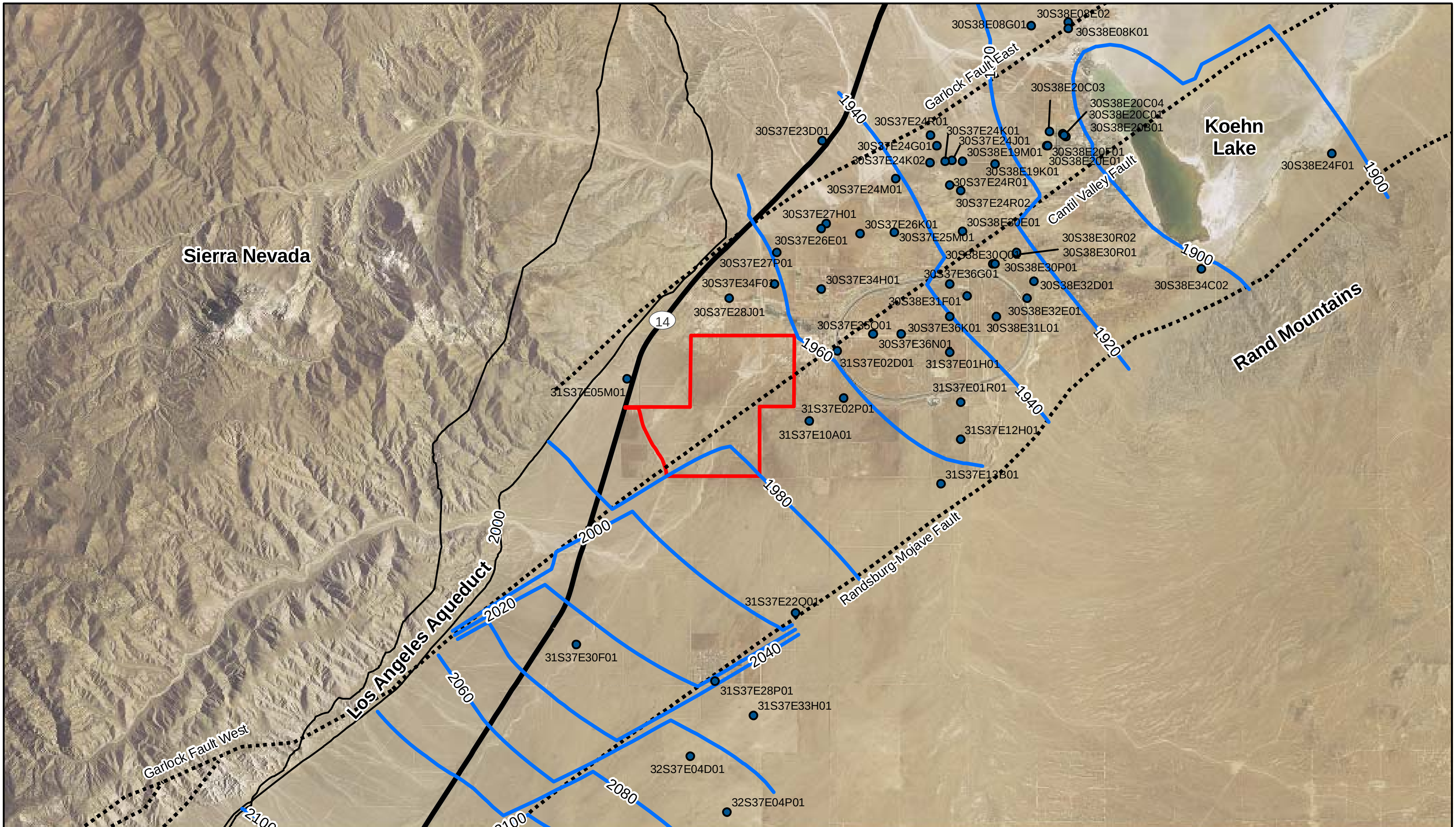

Map Location

Legend

- Model Targets
- Model Predicted Contours (1958)
- Los Angeles Aqueduct
- Fault
- BSEP Plant Site Boundary

Note: Groundwater model presented in Appendix J.2
Fault locations are approximate

0 1 2 3 4 Miles

1:126,720

N W E S

BSEP

Figure DR-106
Model Targets

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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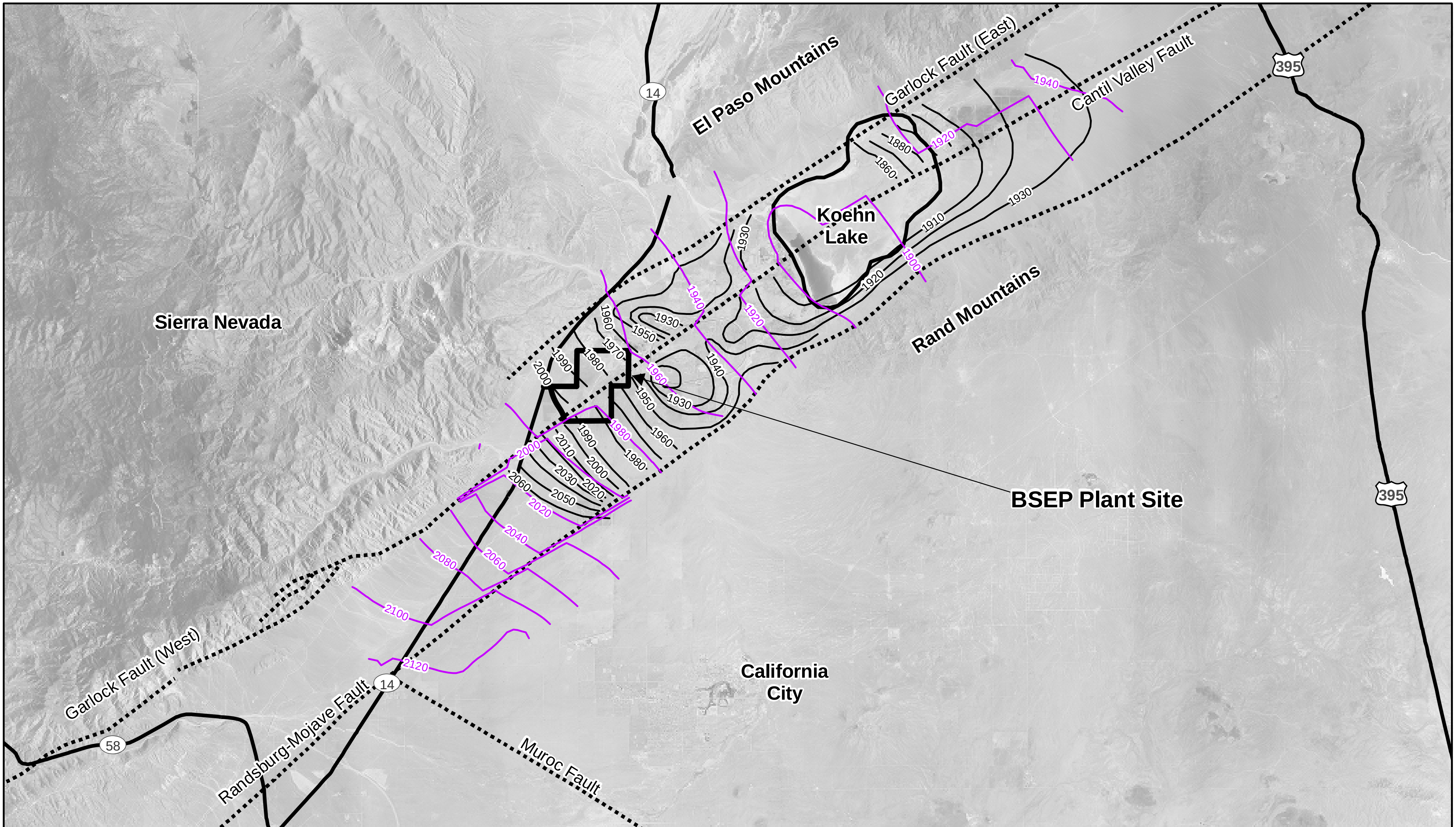

Map Location

Legend

- Predicted 1958 Water Levels
- Groundwater Contour (feet amsl) (Koehler, 1977)
- Fault
- BSEP Plant Site Boundary

N W E S

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 6 8 Miles

1:253,440

BSEP

Figure DR-107
Predicted vs. Observed
Water Levels (1958)

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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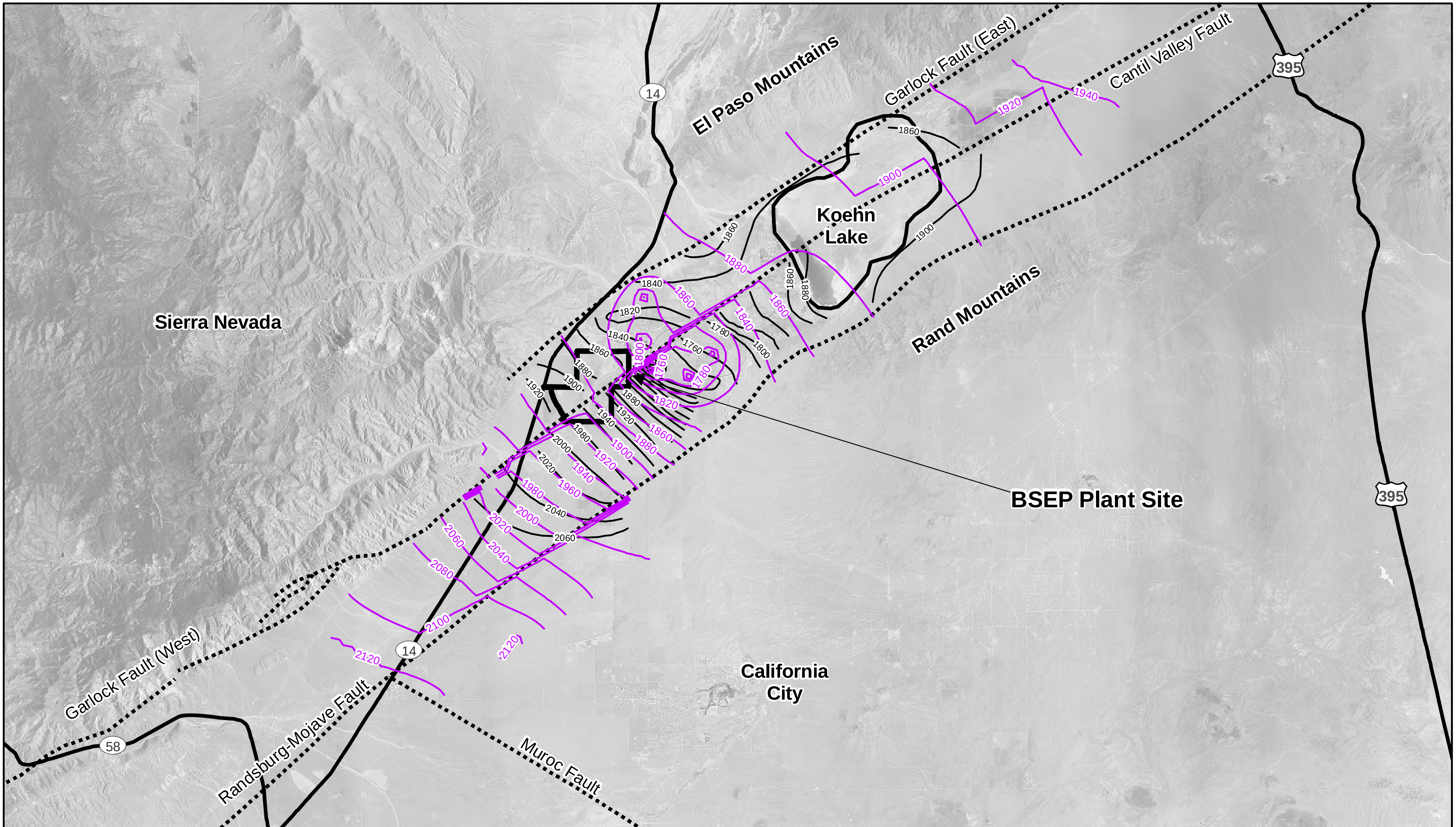

Map Location

Legend

- Predicted 1976 Water Levels
- Groundwater Contour (feet amsl) (Koehler 1976)
- Fault
- BSEP Plant Site Boundary

Note: Fault locations are approximate
Source: Koehler, 1977

0 2 4 6 8 Miles

1:253,440

N W E S

BSEP

Figure DR-108
Predicted vs. Observed
Water Levels (1976)

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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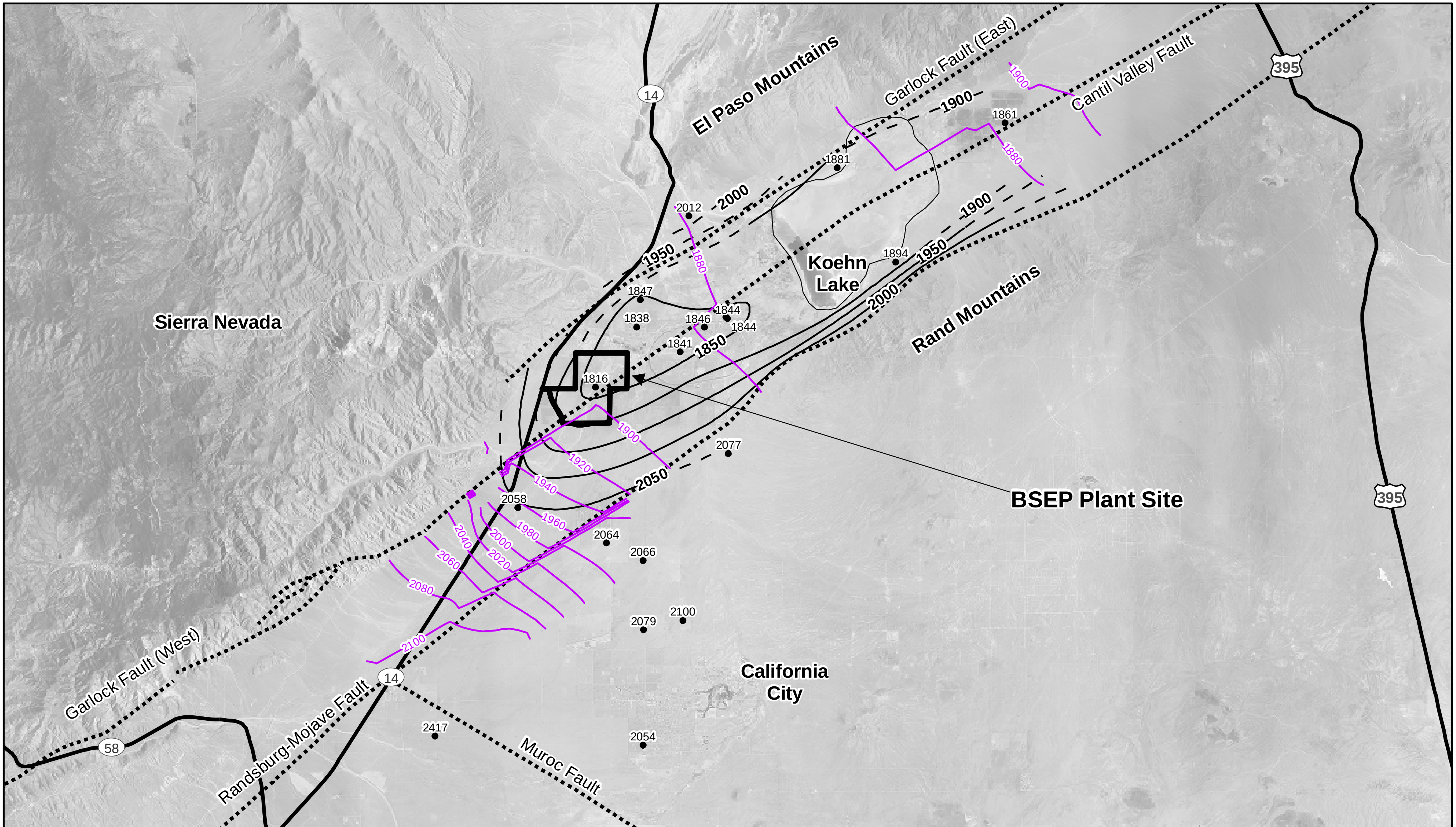

Map Location

Legend

- Wells with Water Level Data (2007)
- Predicted 2007 Water Levels
- Groundwater Contour (feet amsl)
- Dashed where Inferred
- Fault
- BSEP Plant Site Boundary

Note: Fault locations are approximate

0 2 4 6 8 Miles

1:253,440

N W E S

BSEP

Figure DR-109
Predicted vs. Observered
Water Levels (2007)

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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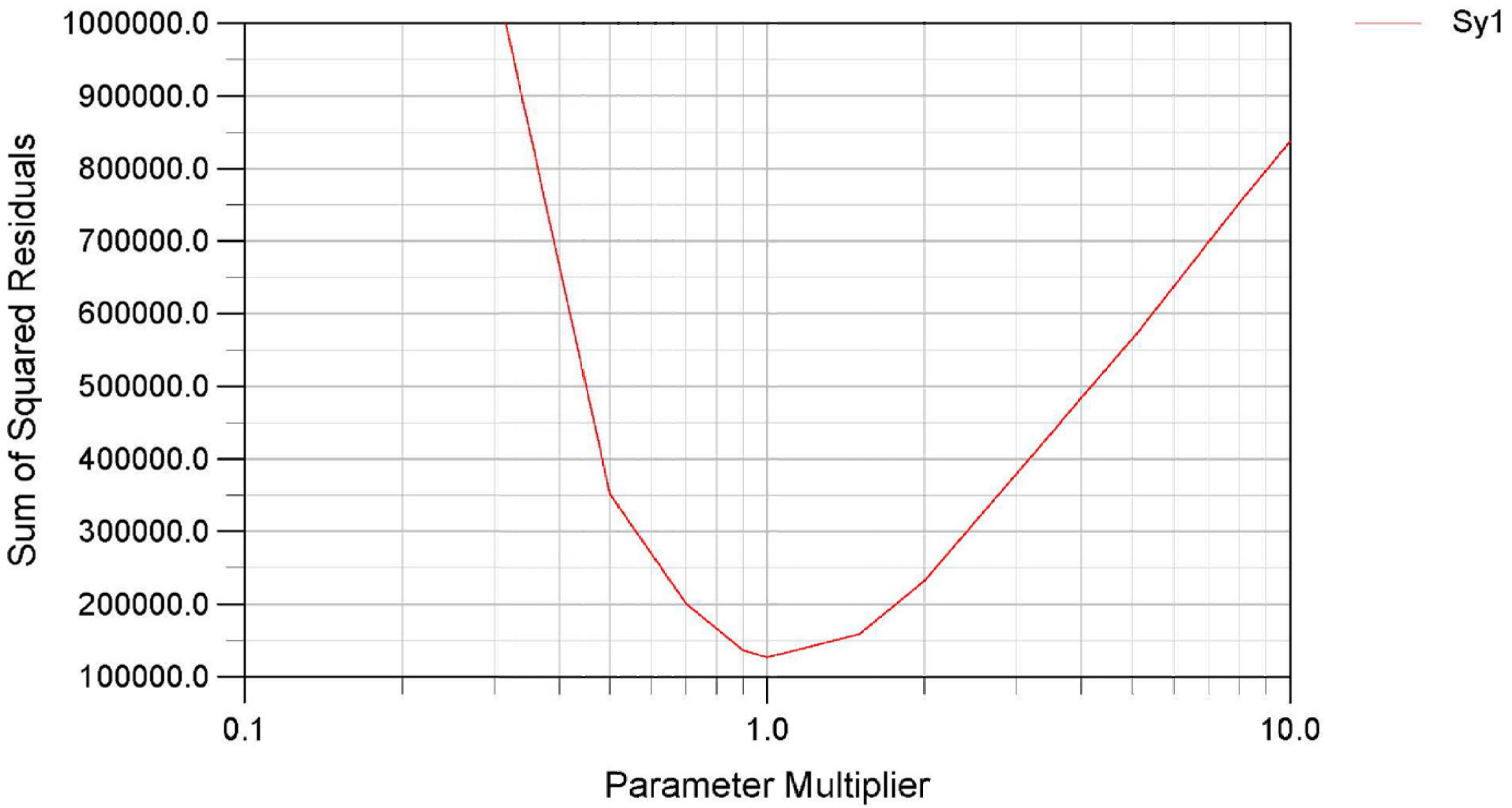

Map Location

BSEP

Figure DR-114a
Specific Yield
Sensitivity Analysis

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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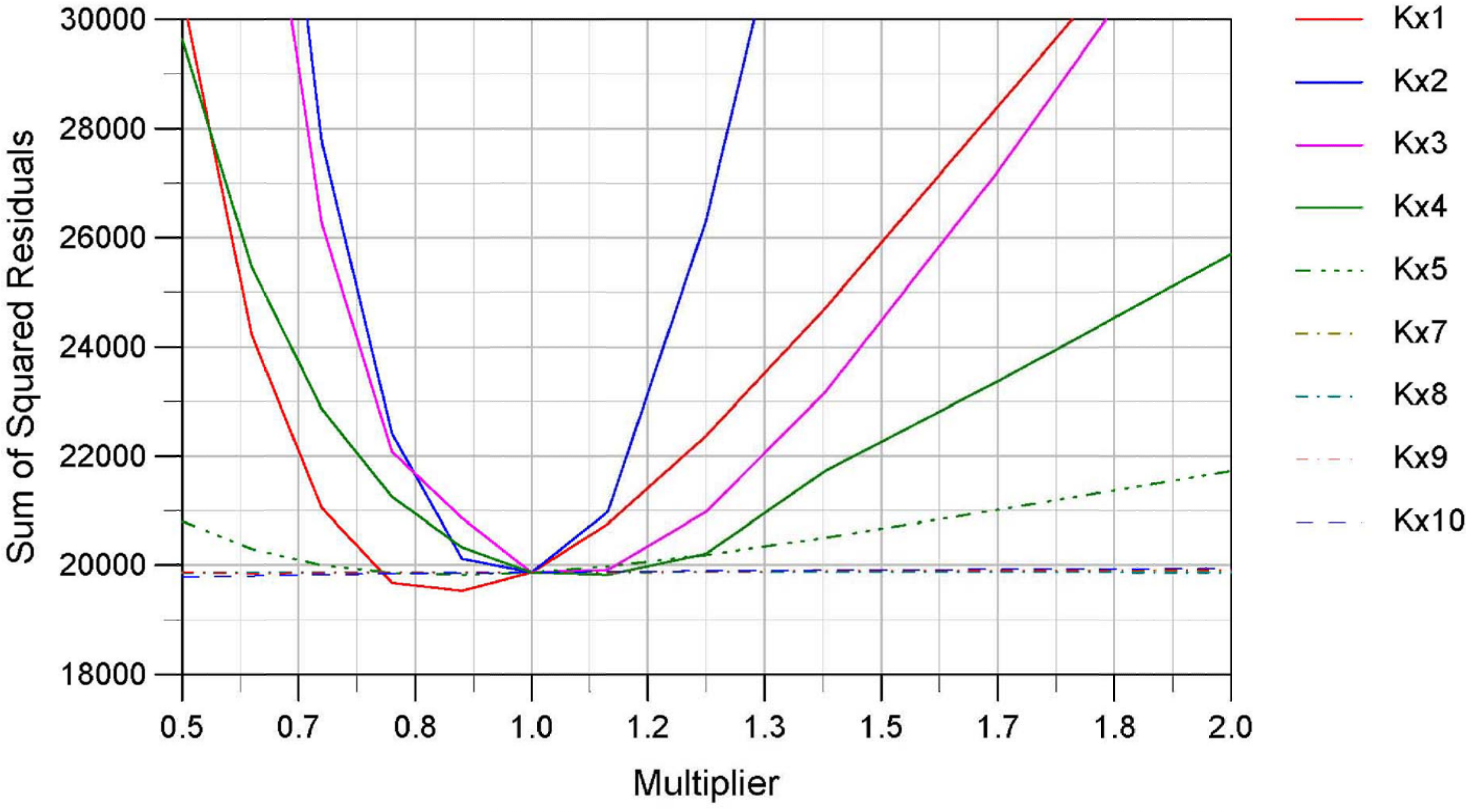

Map Location

BSEP

Figure DR-114b
Hydraulic Conductivity (K)
Sensitivity Analysis

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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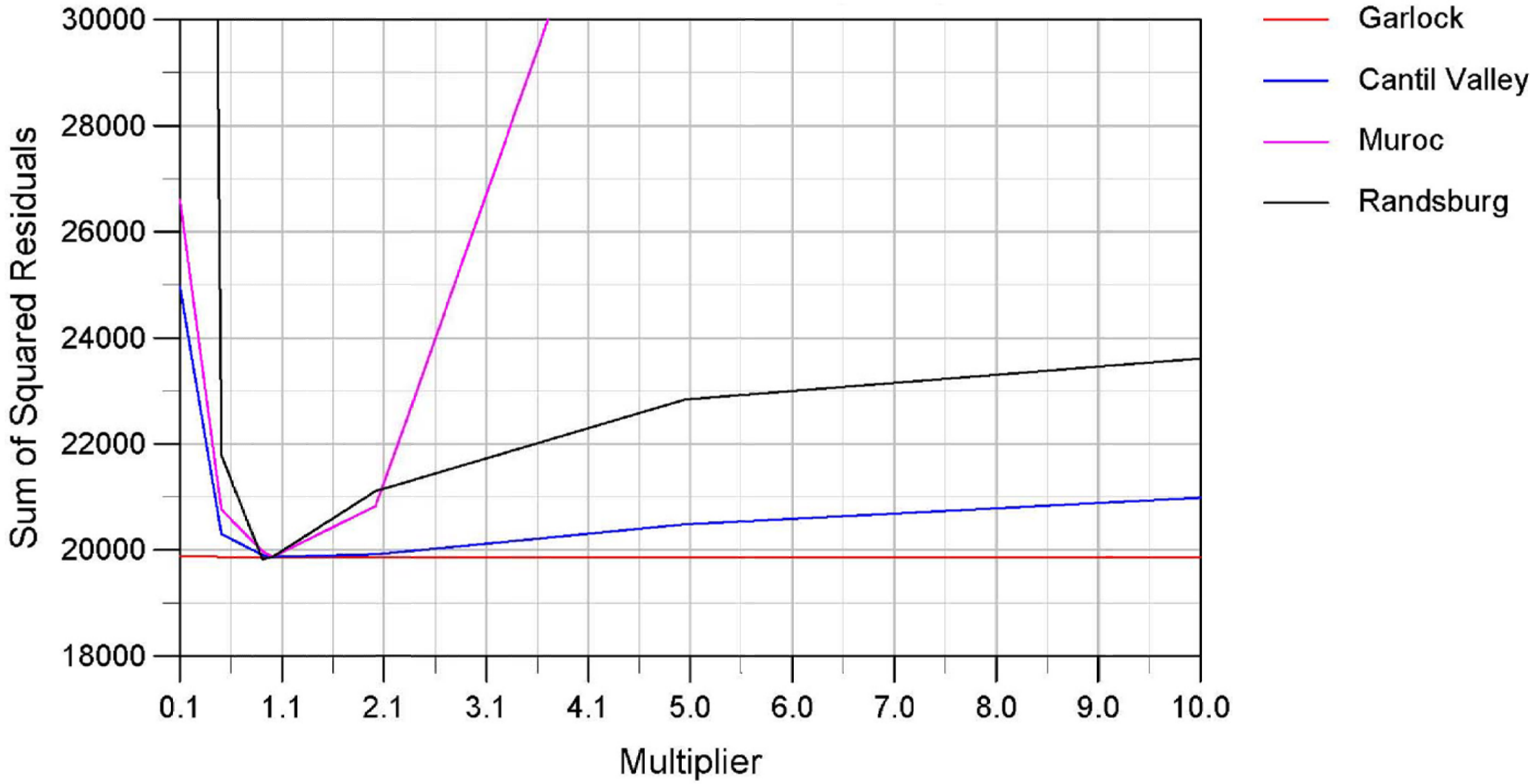

Map Location

BSEP

Figure DR-114c
Fault Conductance
Sensitivity Analysis

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

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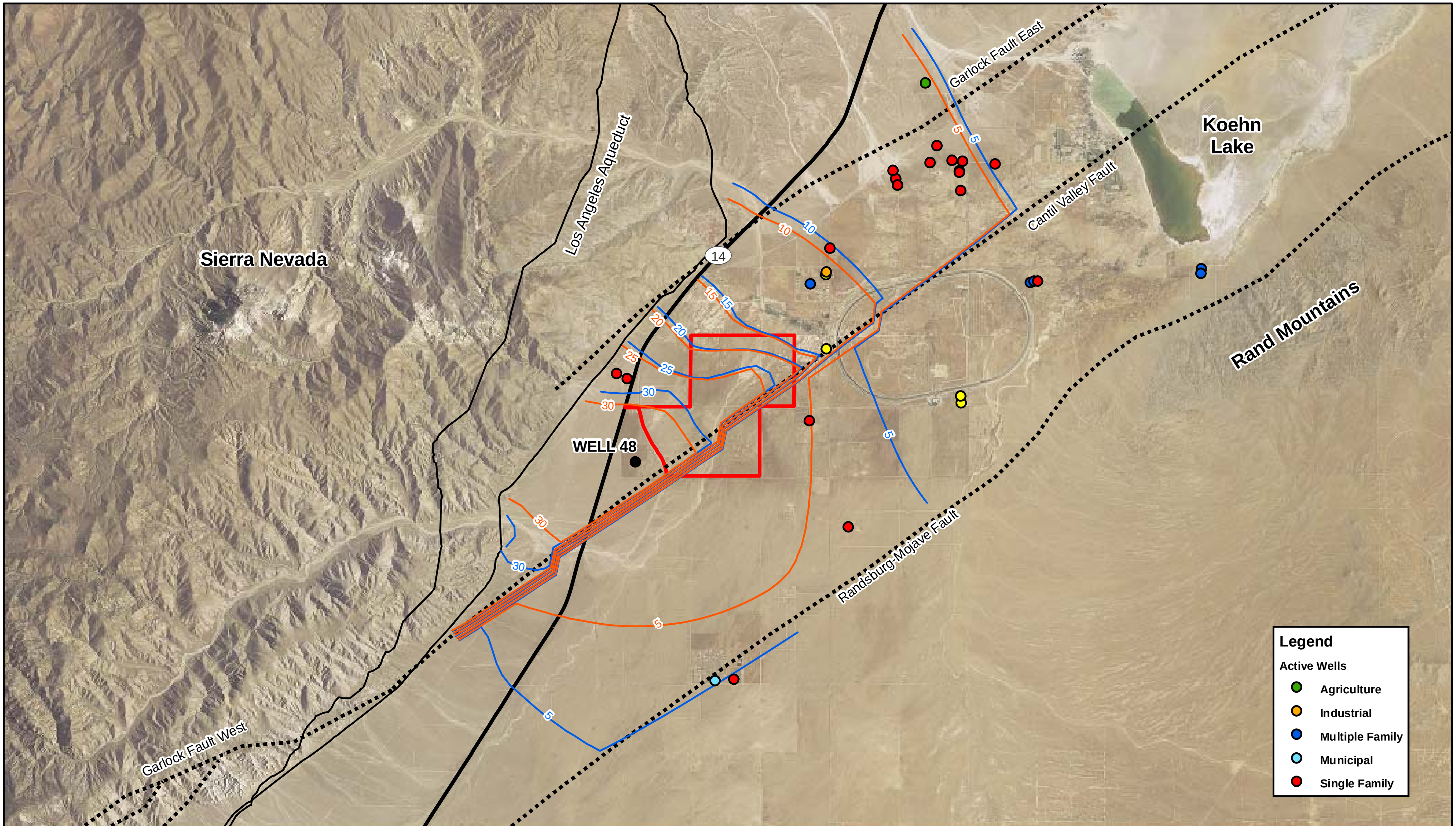


Legend

- Drawdown Contour Predicted from Sensitivity Analysis
- Drawdown Predicted from the Calibrated Model
- Los Angeles Aqueduct
- Fault
- BSEP Plant Site Boundary

Note: Groundwater model presented in Appendix J.2
Fault locations are approximate

0 1 2 3 4 Miles

1:126,720

N W E S

BSEP

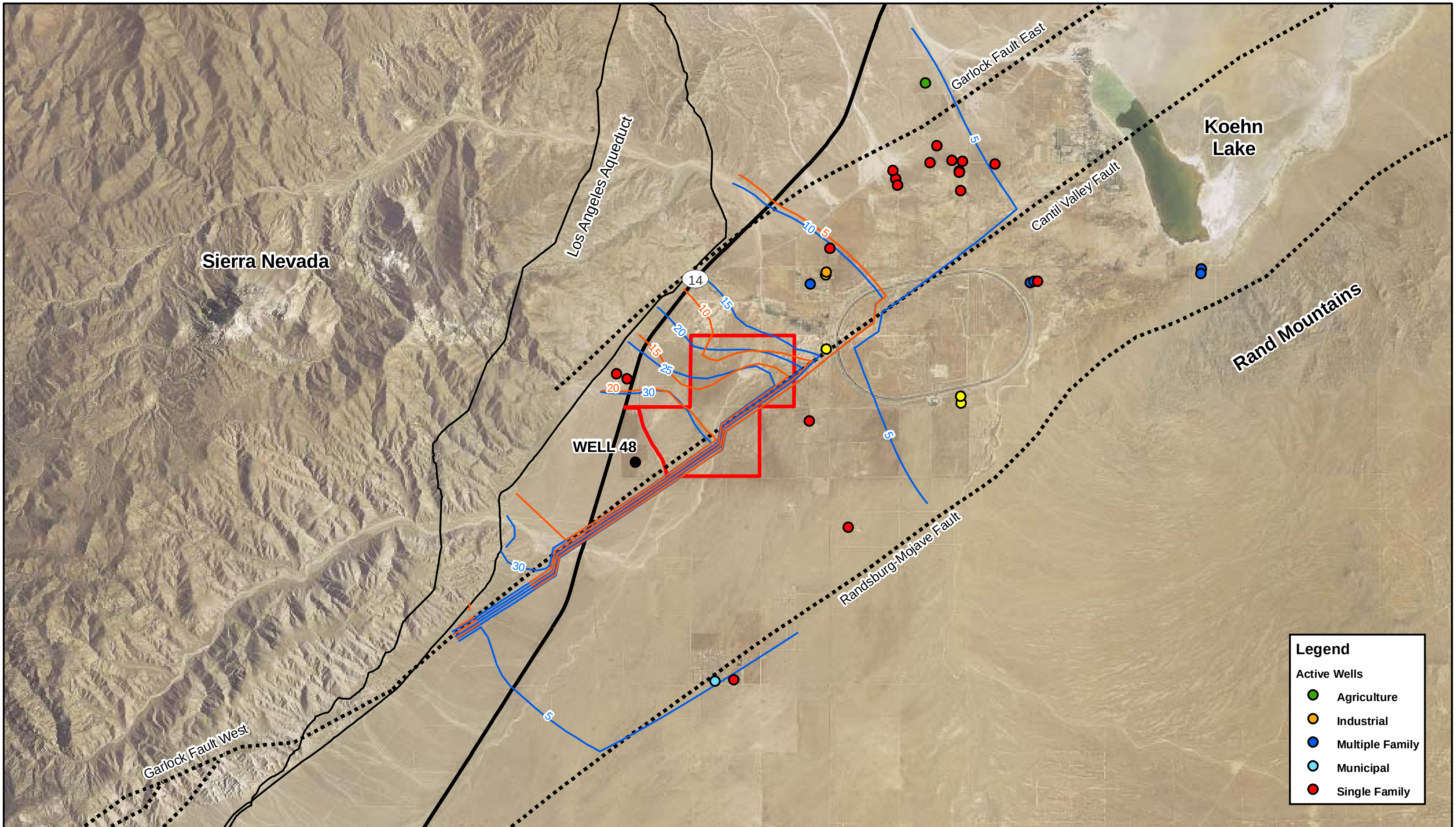
Figure DR-115a
Sensitivity Analysis
Specific Yield 1/2 Modeled Values

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-115a.mxd



Map Location

Legend

- Drawdown Contour Predicted from Sensitivity Analysis
- Drawdown Predicted from the Calibrated Model
- Los Angeles Aqueduct
- Fault
- BSEP Plant Site Boundary

Note: Groundwater model presented in Appendix J.2
Fault locations are approximate

0 1 2 3 4 Miles

1:126,720

N W E S

BSEP

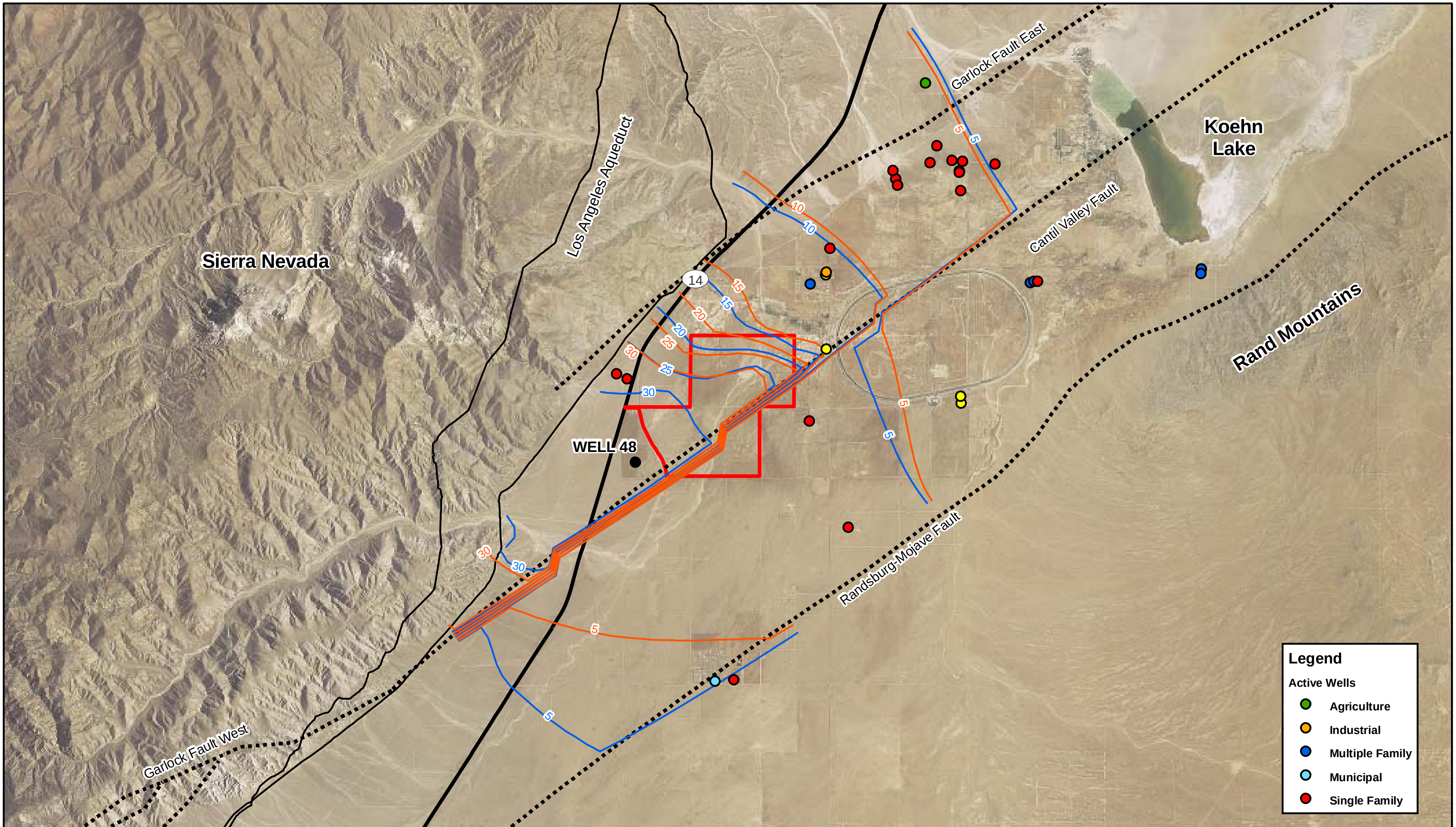
Figure DR-115b
Sensitivity Analysis
Specific Yield 2X Modeled Values

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-115b.mxd



Map Location

Legend

- Drawdown Contour Predicted from Sensitivity Analysis
- Drawdown Predicted from the Calibrated Model
- Los Angeles Aqueduct
- Fault
- BSEP Plant Site Boundary

Note: Groundwater model presented in Appendix J.2
Fault locations are approximate

N W E S

0 1 2 3 4 Miles

1:126,720

BSEP

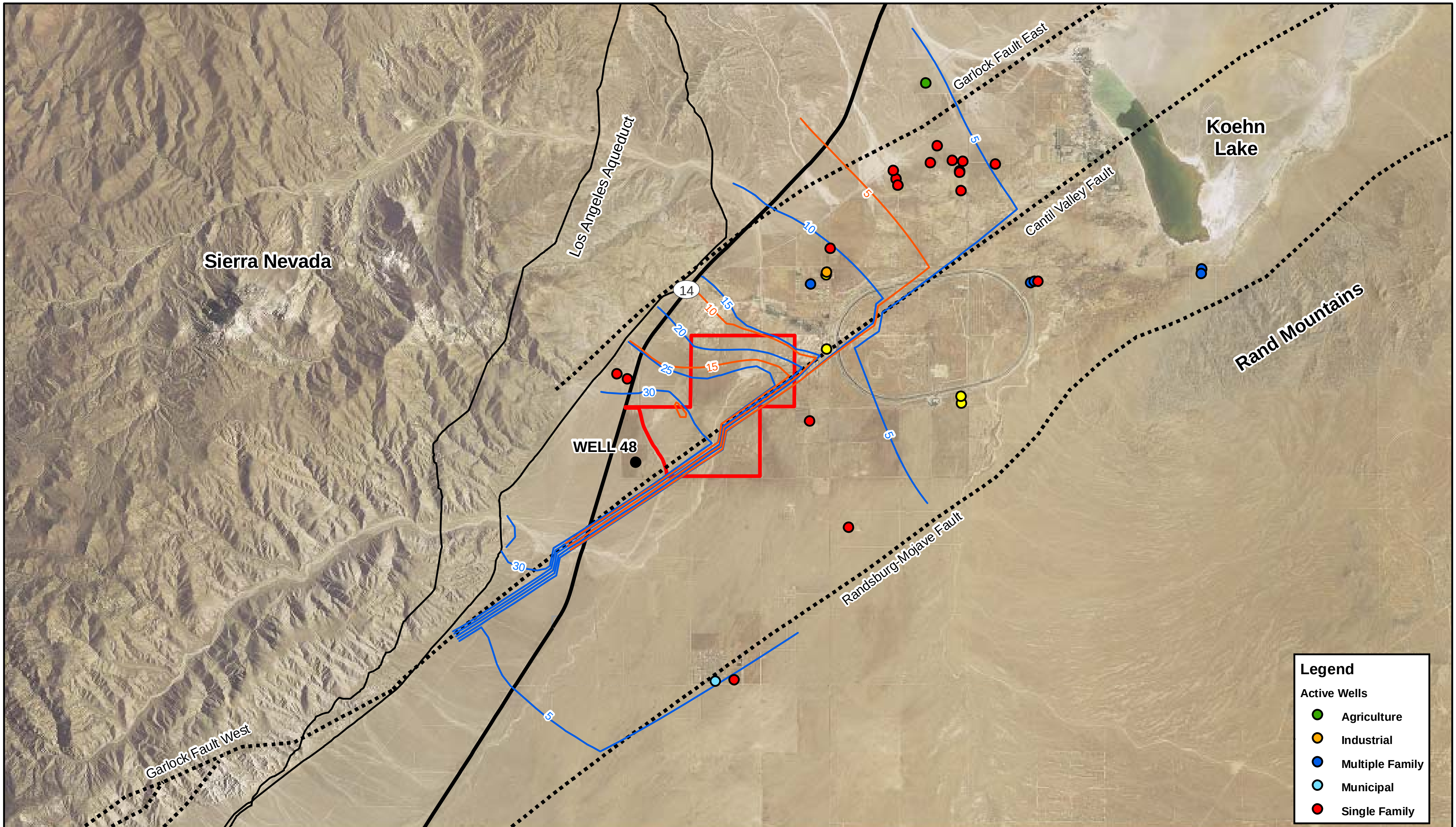
Figure DR-115c
Sensitivity Analysis
Hydraulic Conductivity
1/2 Modeled Values

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-115c.mxd



Map Location

Legend

- Drawdown Contour Predicted from Sensitivity Analysis
- Drawdown Predicted from the Calibrated Model
- Los Angeles Aqueduct
- Fault
- BSEP Plant Site Boundary

Note: Groundwater model presented in Appendix J.2
Fault locations are approximate

0 1 2 3 4 Miles

1:126,720

N W E S

BSEP

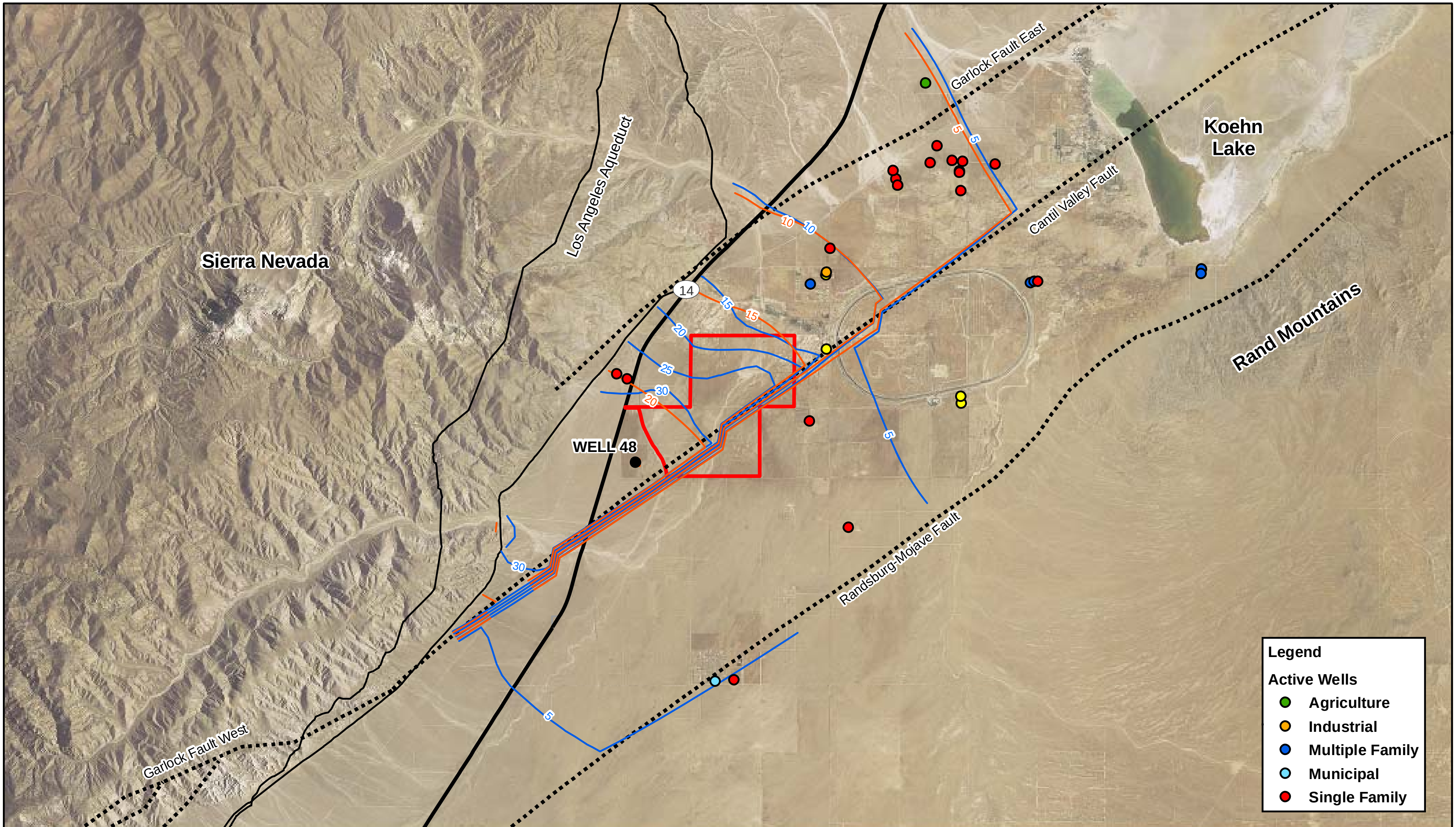
Figure DR-115d
Sensitivity Analysis
Hydraulic Conductivity
2X Modeled Values

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-115d.mxd



Map Location

Legend

- Drawdown Contour Predicted from Sensitivity Analysis
- Drawdown Predicted from the Calibrated Model
- Los Angeles Aqueduct
- Fault
- BSEP Plant Site Boundary

Note: Groundwater model presented in Appendix J.2
Fault locations are approximate

0 1 2 3 4 Miles

1:126,720

N W E S

BSEP

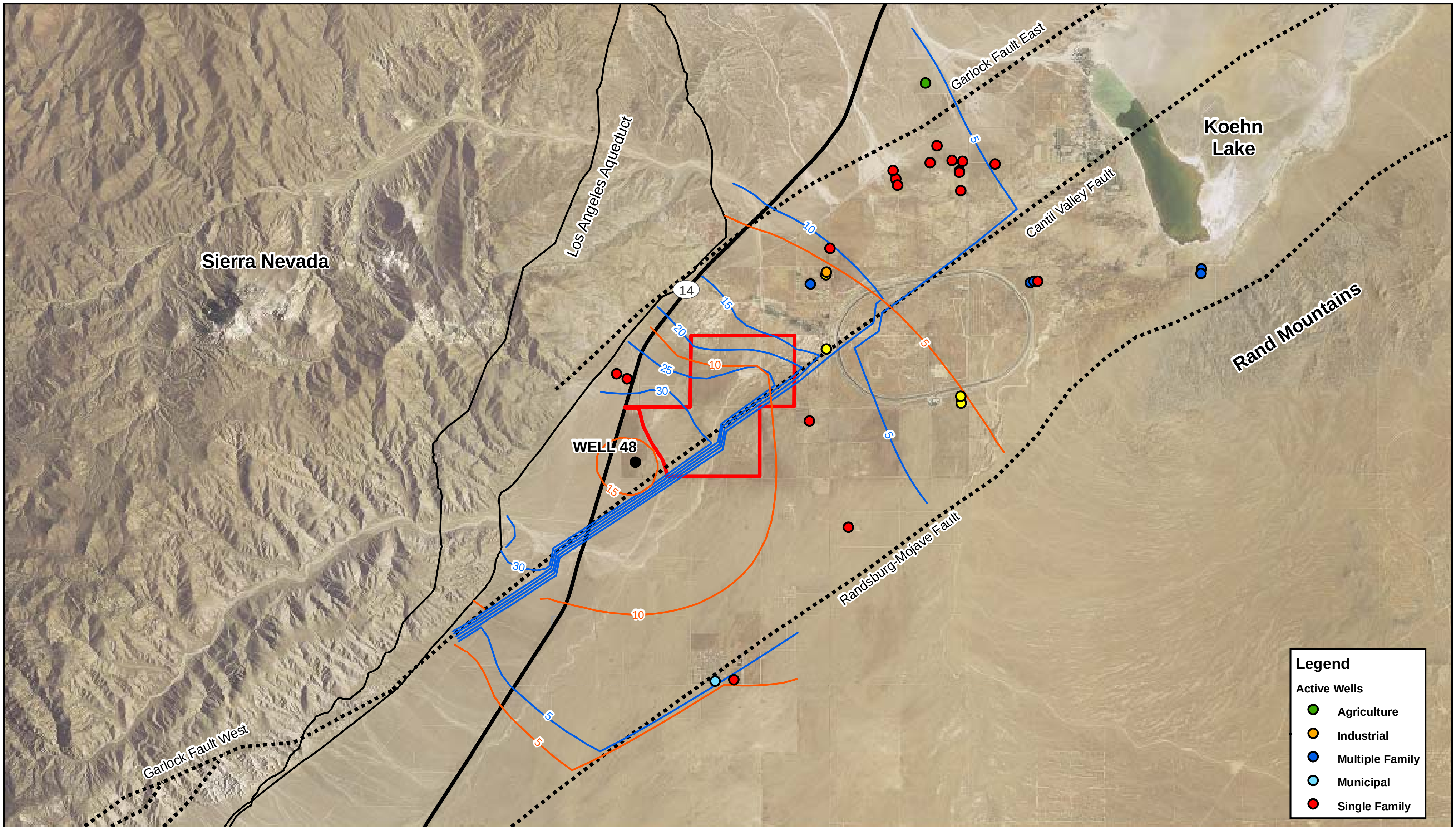
Figure DR-115e
Sensitivity Analysis
Hydraulic Conductivity Zone 2
Removed

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-115e.mxd



Map Location

Legend

- Drawdown Contour Predicted from Sensitivity Analysis
- Drawdown Predicted from the Calibrated Model
- Los Angeles Aqueduct
- Fault
- BSEP Plant Site Boundary

Note: Groundwater model presented in Appendix J.2
Fault locations are approximate

0 1 2 3 4 Miles

1:126,720

N W E S

BSEP

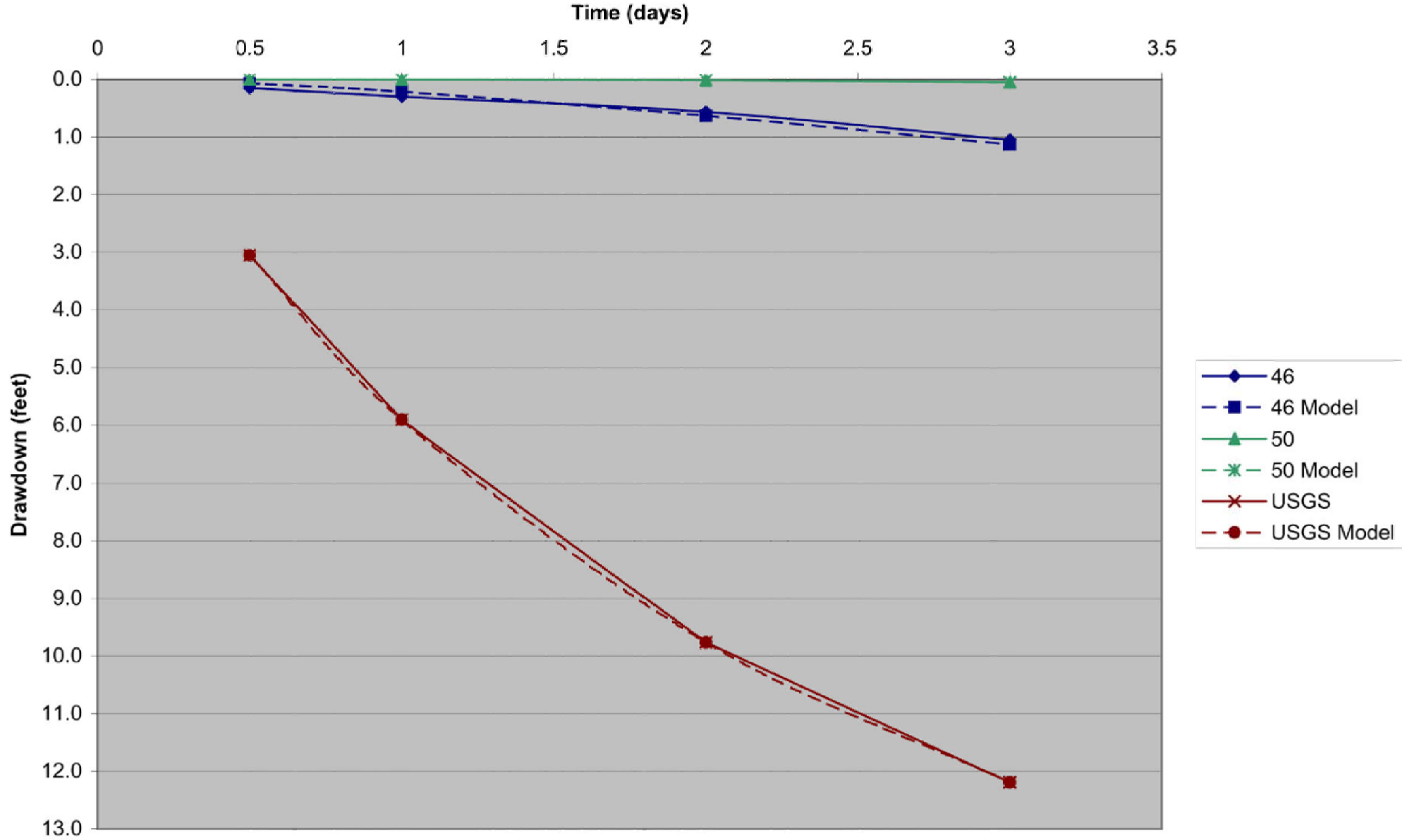
Figure DR-115f
Sensitivity Analysis
Fault Conductance -
Fault Removed

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-115f.mxd



Map Location

BSEP

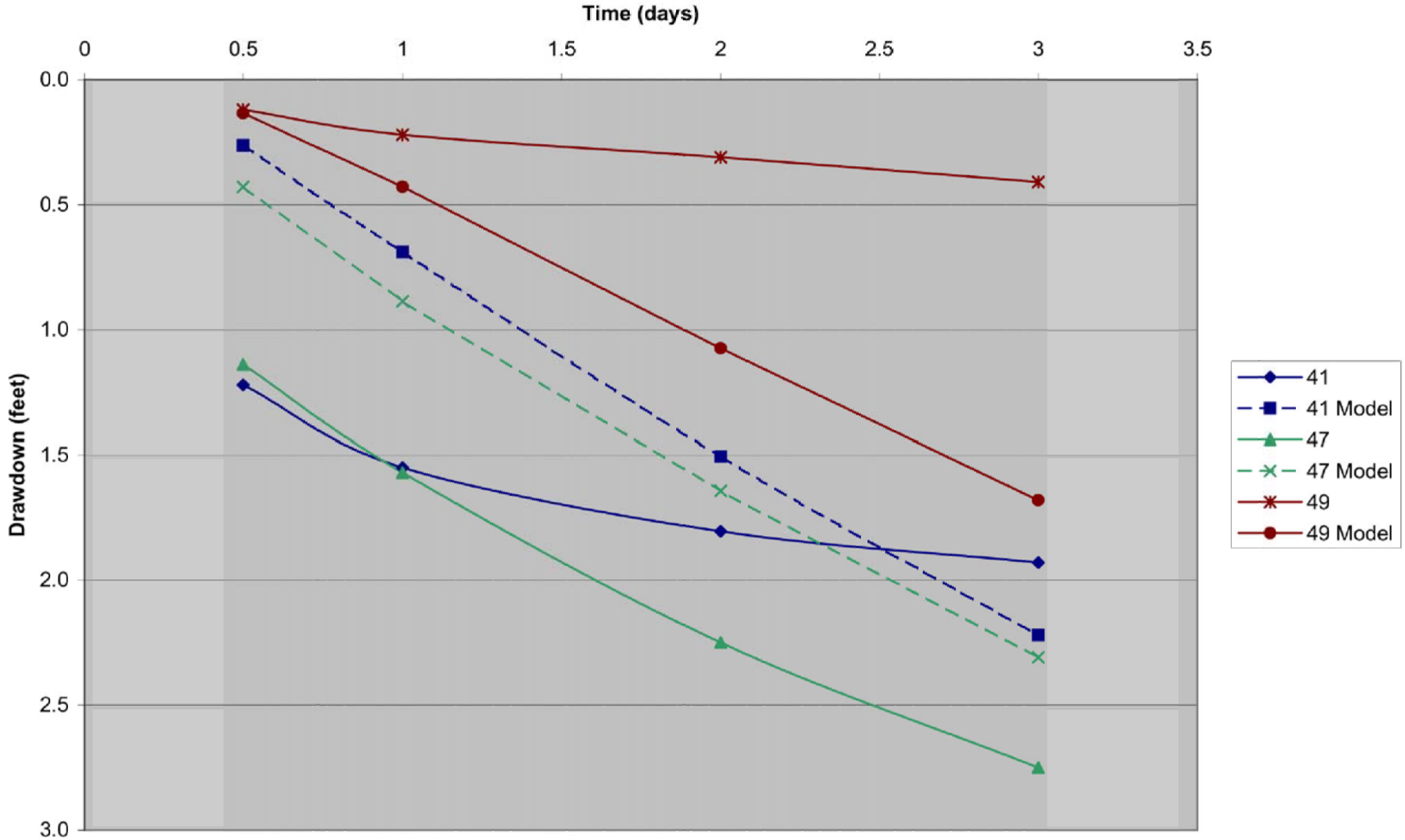
Figure DR-119a
Transient Calibration
Well No. 43

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-119a.mxd



Map Location

BSEP

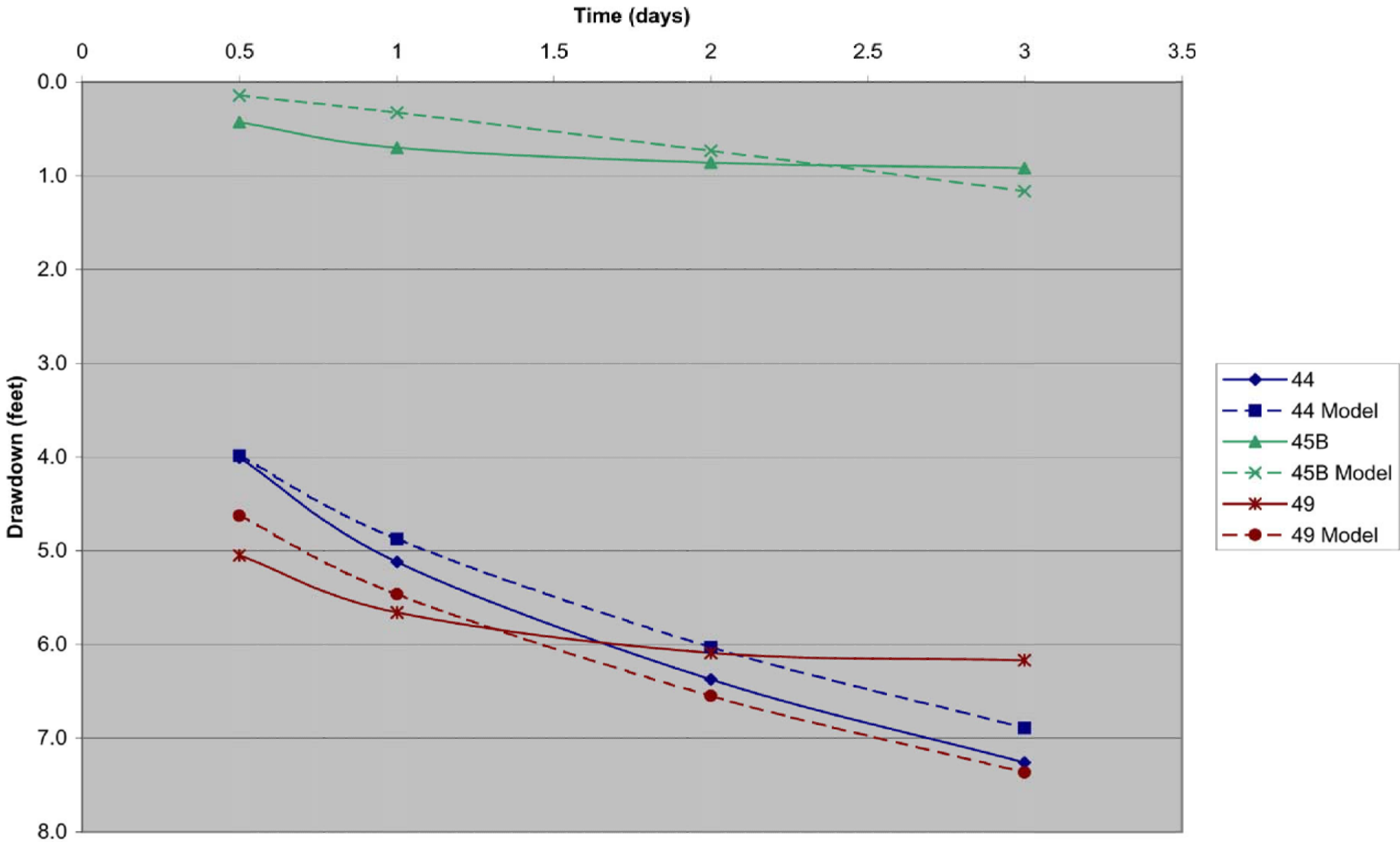
Figure DR-119b
Transient Calibration
Well No. 48

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-119b.mxd



Map Location

BSEP

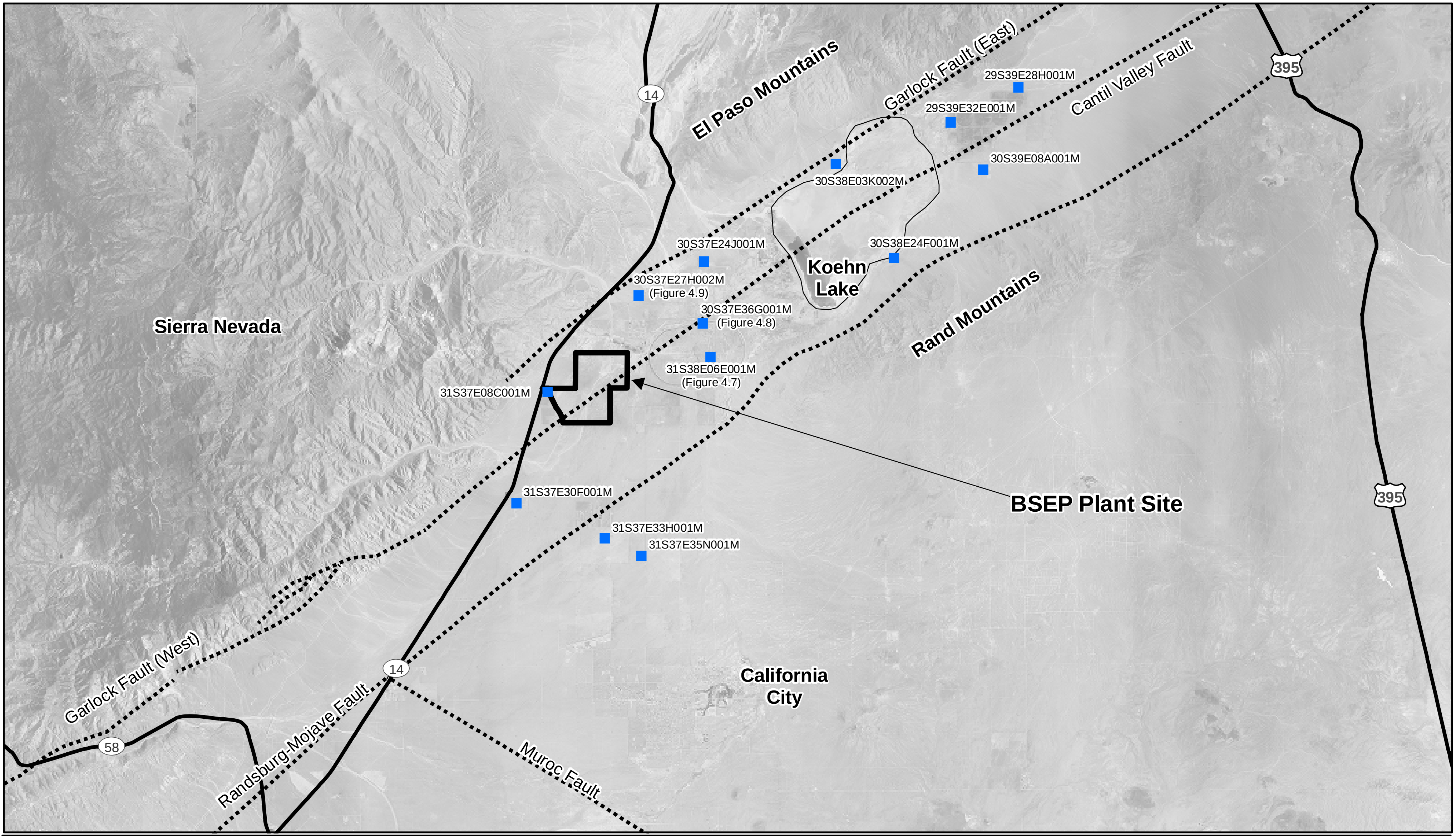
Figure DR-119c
Transient Calibration
Well No. 63

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-119c.mxd



Map Location

Legend

- Model Verification Well Locations
- Fault
- BSEP Plant Site Boundary
- (Figure 4.7) Wells in Original Report

Note: Fault locations are approximate

0 2 4 6 8 Miles

1:253,440

N W E S

BSEP

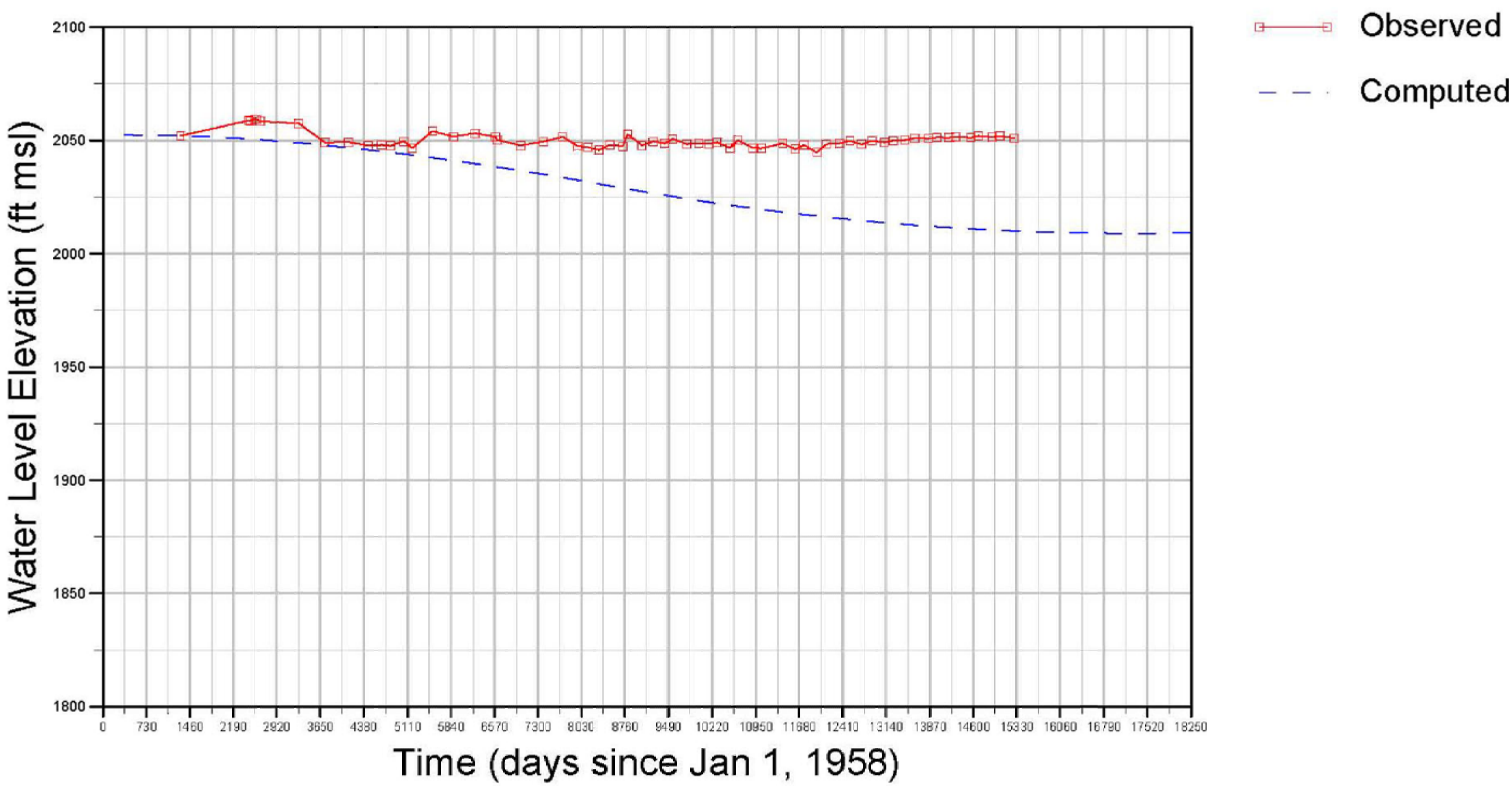
Figure DR-121a
Model Verification
Well Locations

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121a.mxd



Map Location

BSEP

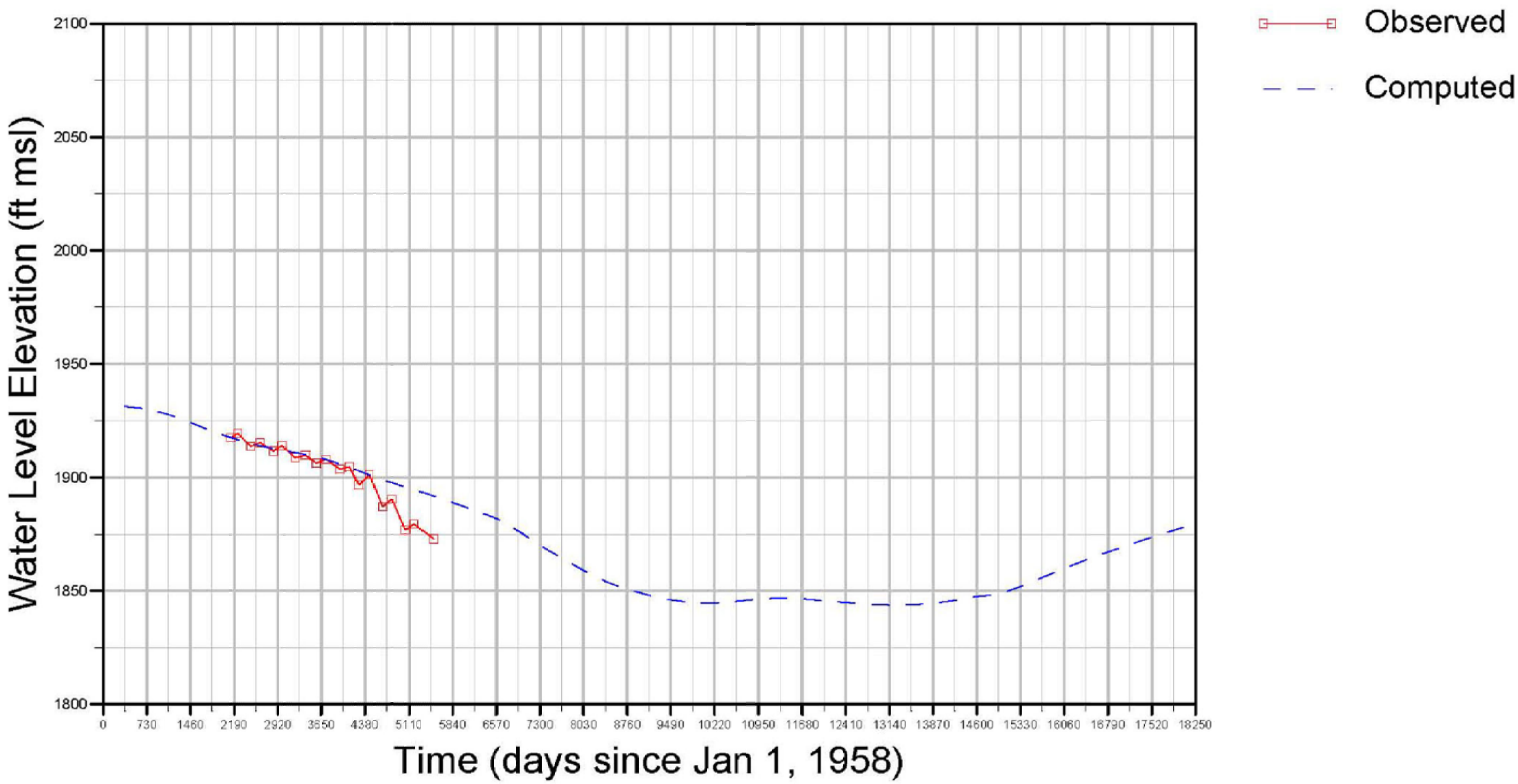
Figure DR-121b
Model Verification
Hydrograph for 31S37E33H001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121b.mxd



Map Location

BSEP

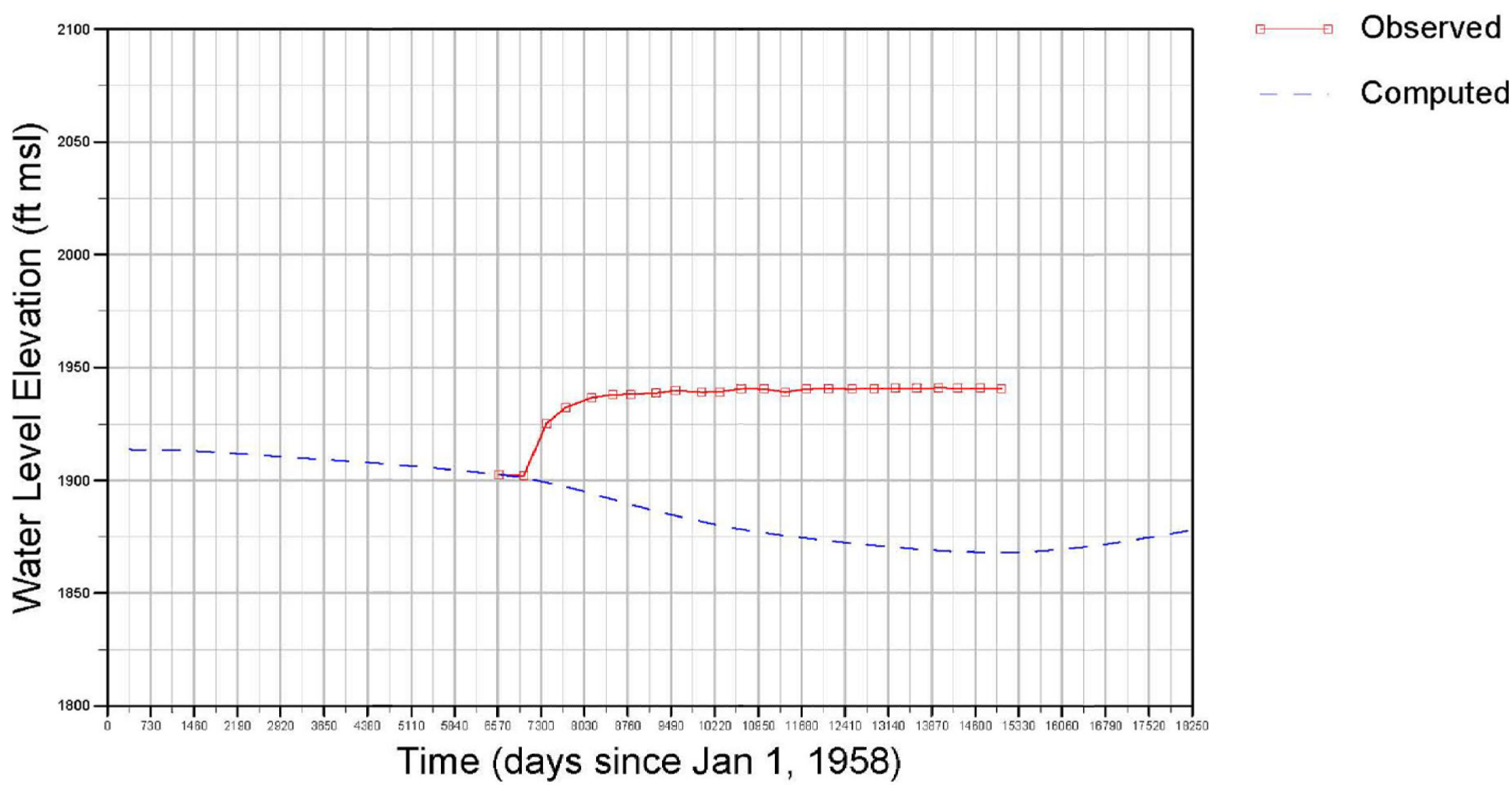
Figure DR-121c
Model Verification
Hydrograph for 30S37E24J001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121C.mxd



Map Location

BSEP

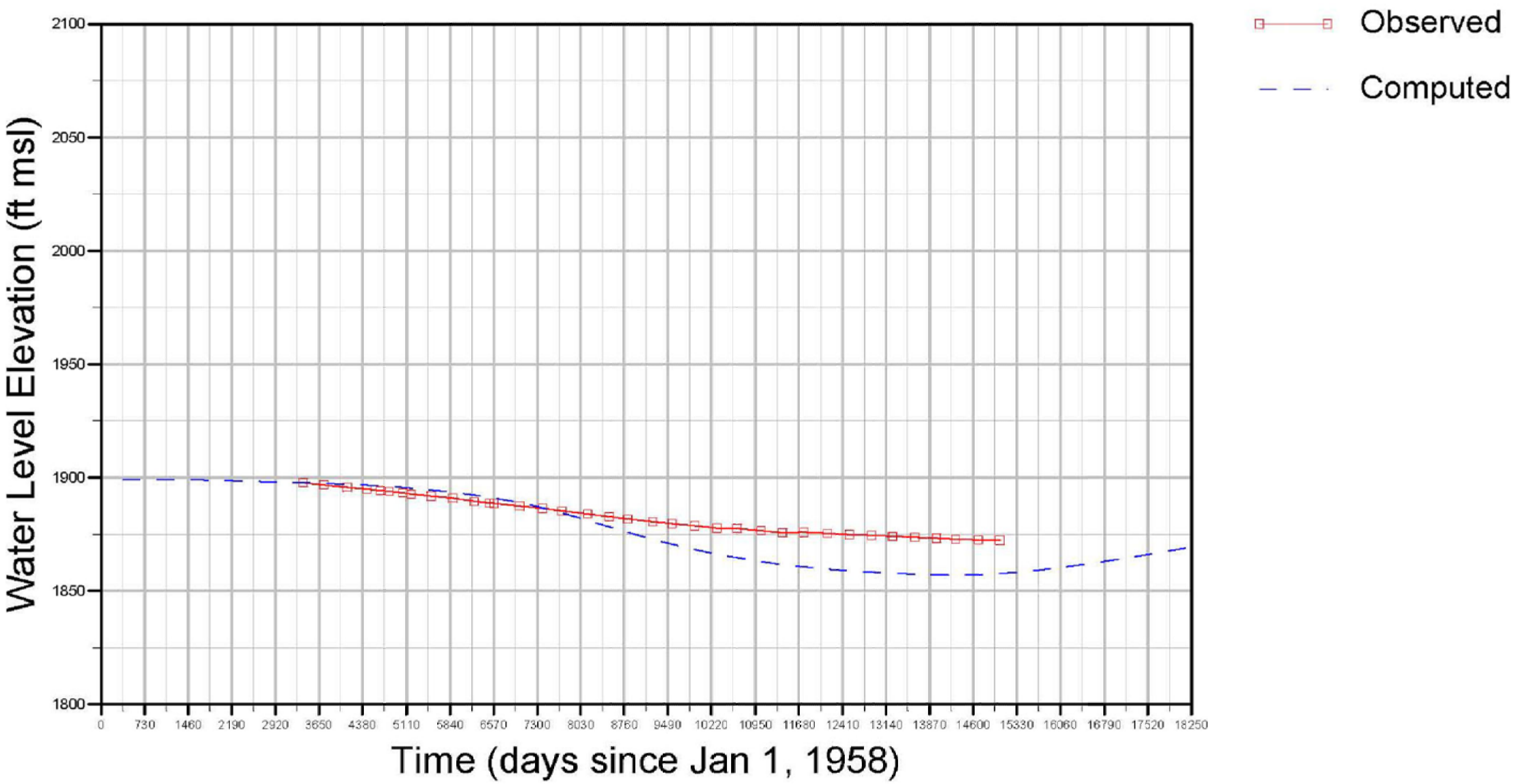
Figure DR-121d
Model Verification
Hydrograph for 30S38E03K002M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121d.mxd



Map Location

BSEP

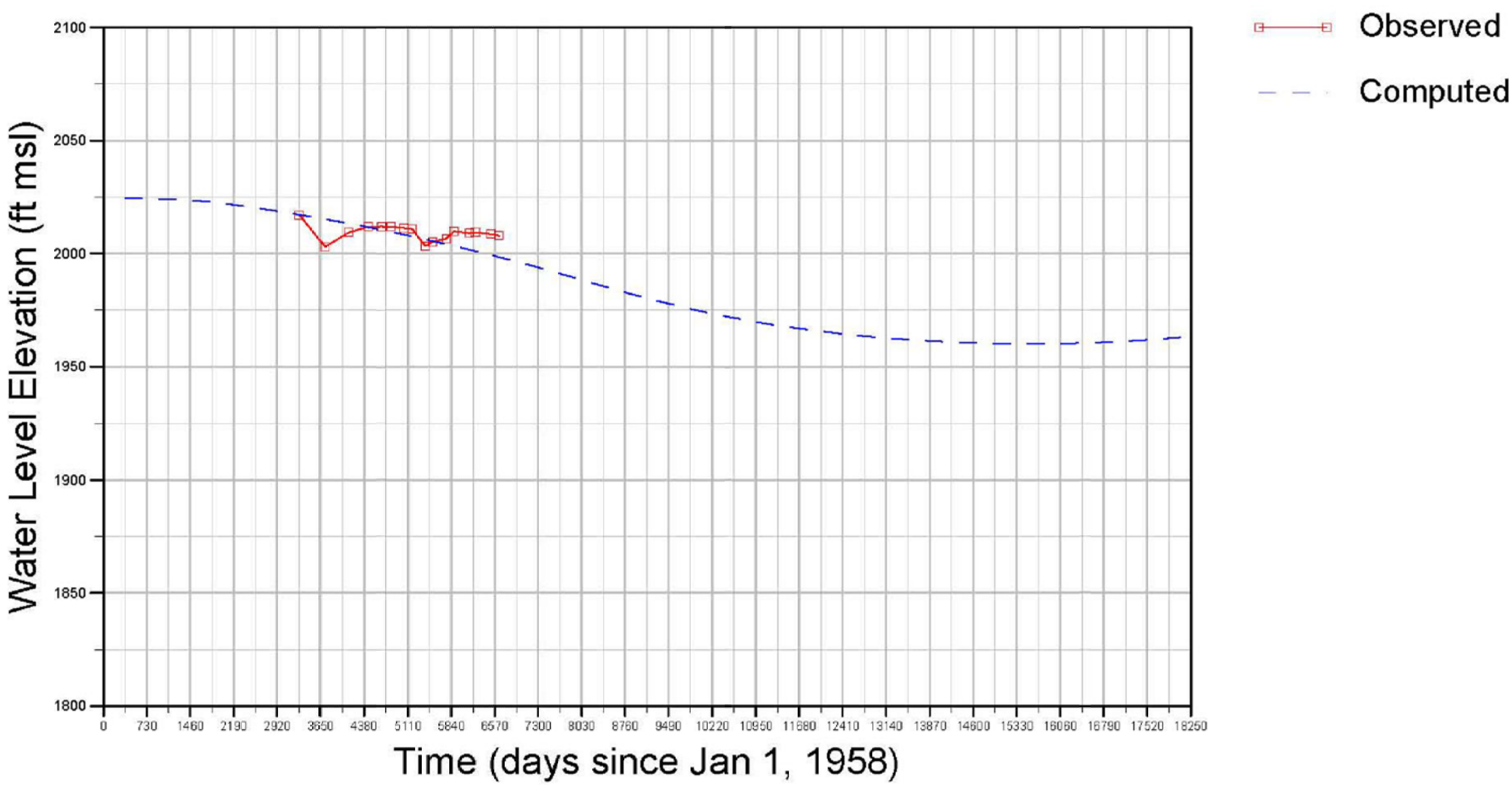
Figure DR-121e
Model Verification
Hydrograph for 30S38E24F001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121e.mxd



Map Location

BSEP

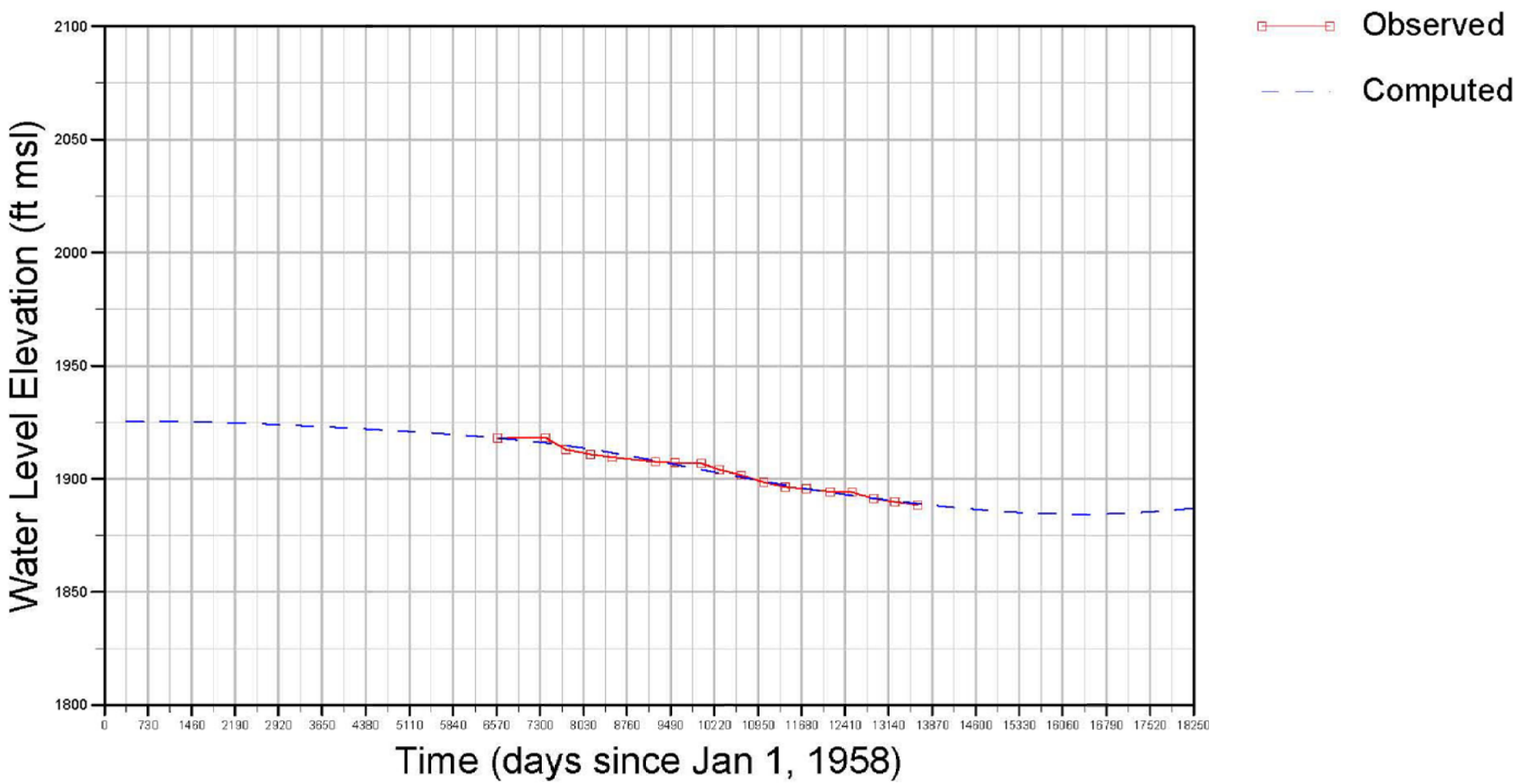
Figure DR-121f
Model Verification
Hydrograph for 31S37E30F001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121f.mxd



BSEP

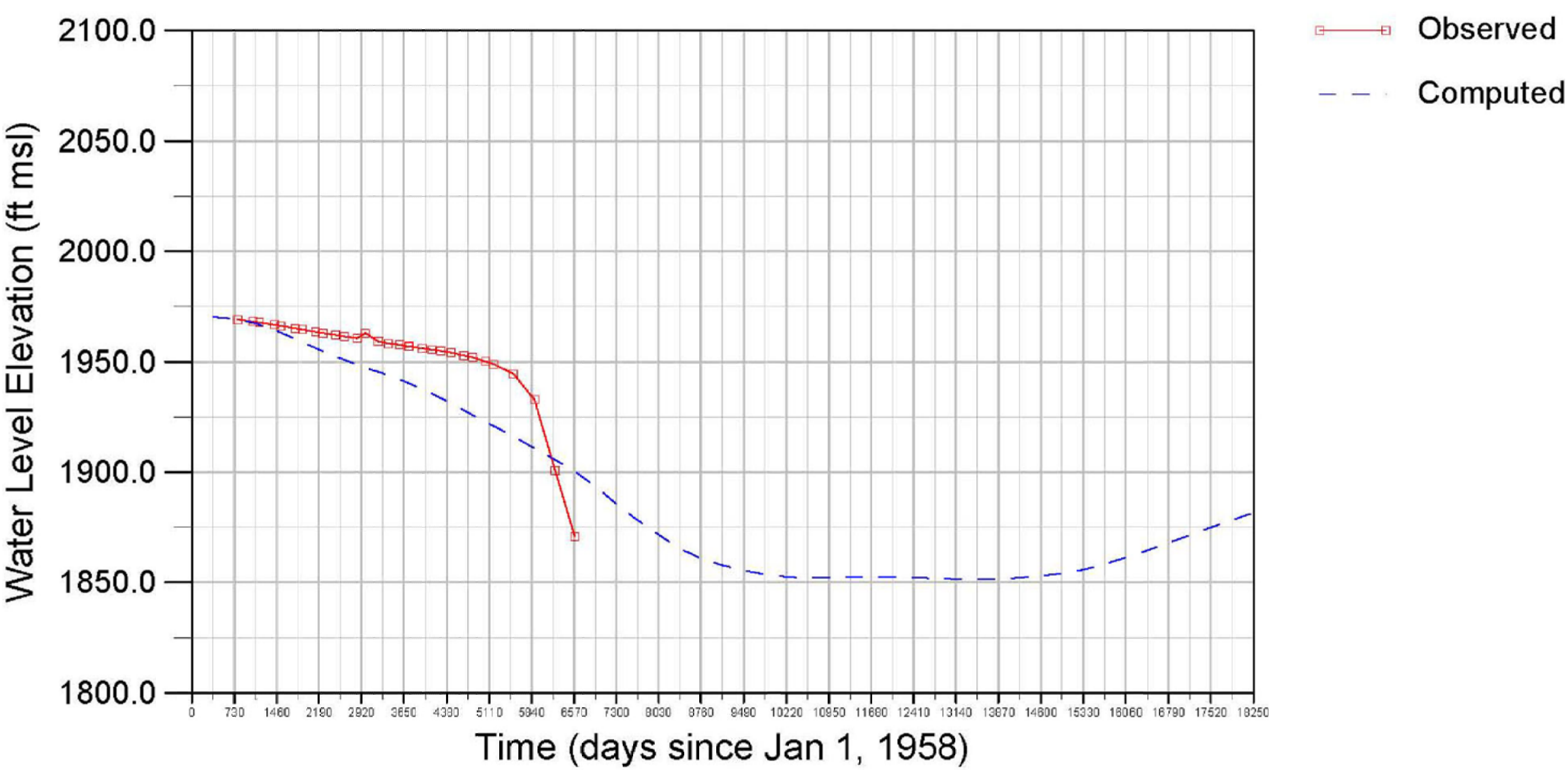
Figure DR-121g
Model Verification
Hydrograph for 29S39E32E001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121g.mxd



Map Location

BSEP

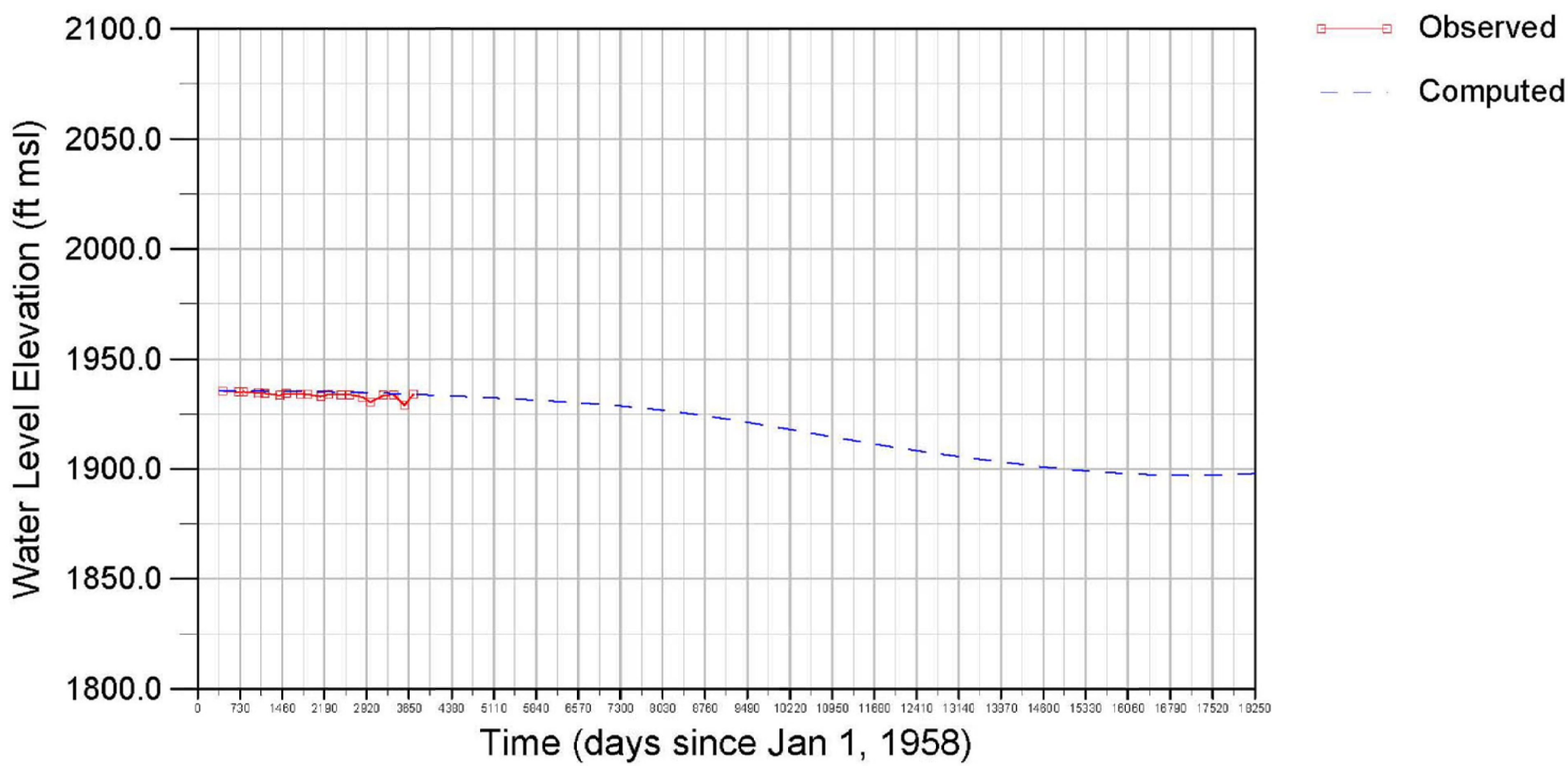
Figure DR-121h
Model Verification
Hydrograph for 31S37E08C001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121h.mxd



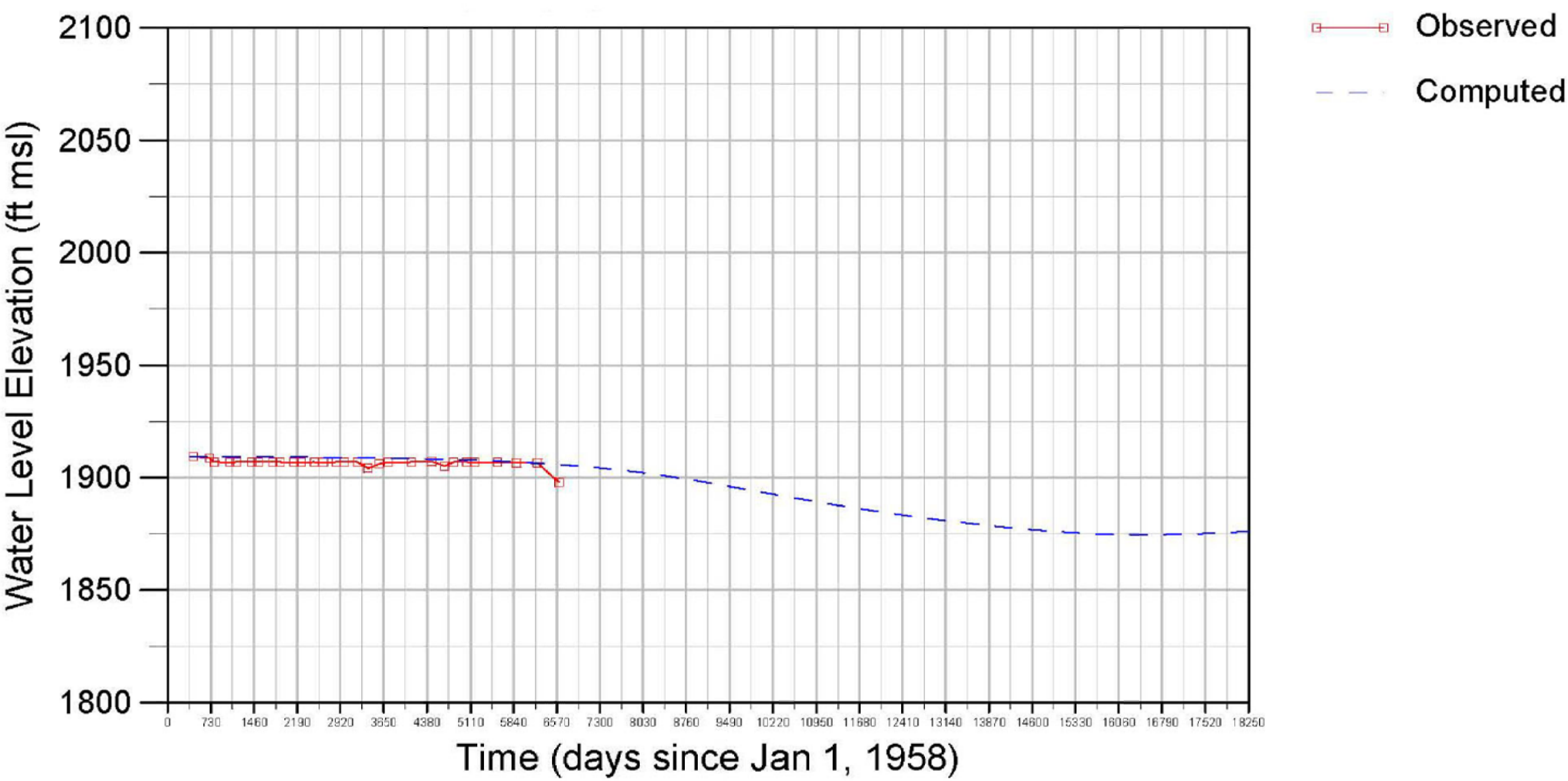
BSEP
Figure DR-121i
Model Verification
Hydrograph for 29S39E28H001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121i.mxd



Map Location

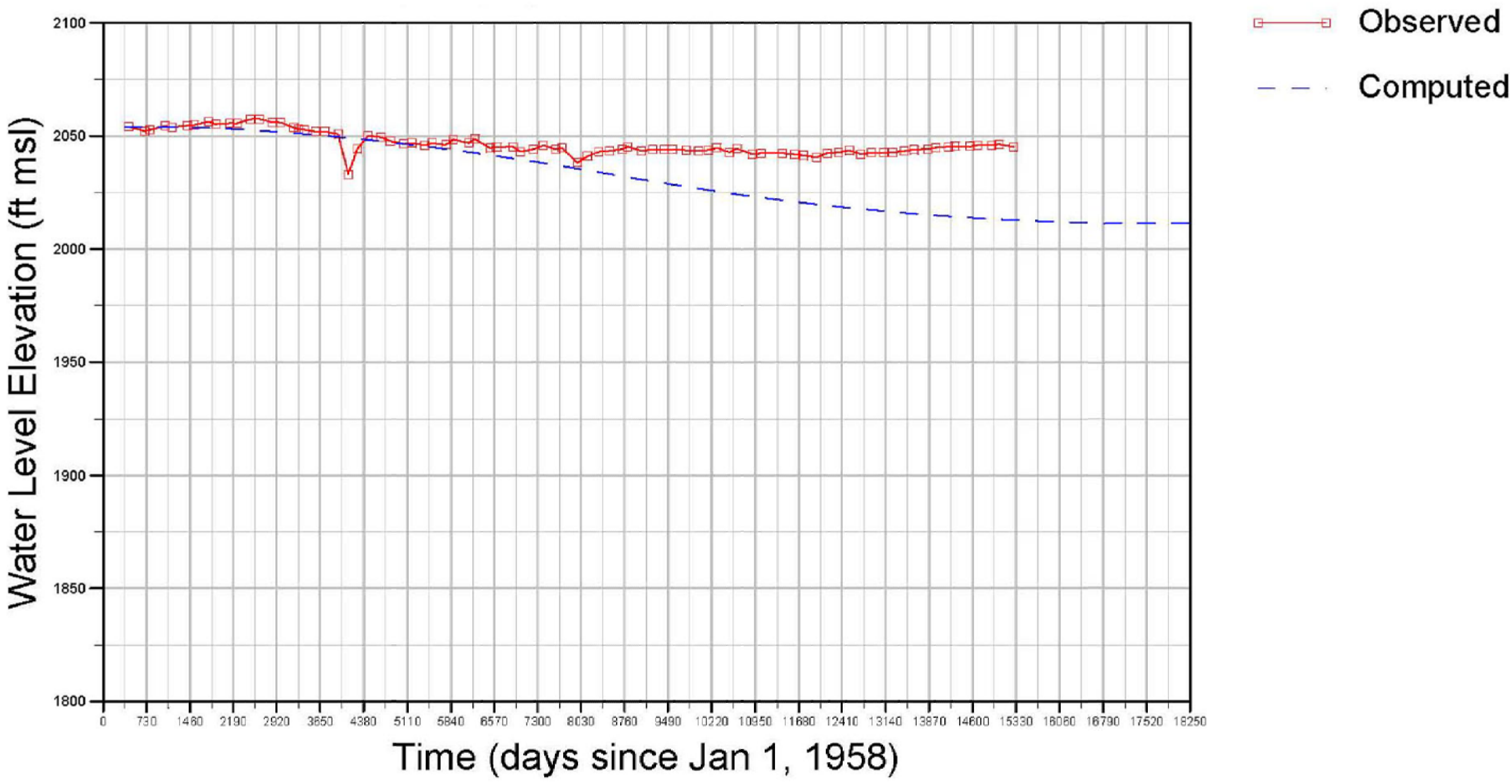
BSEP
Figure DR-121j
Model Verification
Hydrograph for 30S39E08A001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121j.mxd



Map Location

BSEP
Figure DR-121k
Model Verification
Hydrograph for 31S37E35N001M

Beacon Solar

ENSR | AECOM

Project: 10056-014
Date: Oct. 2008

J:\GIS\Projects\10056-Beacon\mxd\Figure DR-121k.mxd