Beacon Solar Project – Geoarchaeological Trenching Plan

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21 January 2009

Preliminary landform mapping of the Beacon Solar Project study area revealed the presence of five relatively distinct landforms and associated geomorphic surfaces (See *Preliminary Map Sheet*). The project area surface and near-surface deposits are comprised entirely of Holocene-age landforms. Informal designations are present in the following table and on the *Map Sheet*. These reflect specific segments of the Holocene alluvial fan (Hf) with general chronological ordering. Although the absolute ages of the landforms remain unknown, depositional sequence and cross-cutting relationships suggest that the Hf1 landform is older than Hf2 and Hf3, respectively. The subscripts are simple identifiers highlighting features associated with Pine Tree Wash distributaries (d) and post-faulting (p) deposits.

Landform Groups and Features: Intersection of Pine Tree Wash and Cantil Valley Fault

Hf3p - Pine Tree Wash post-faulting channel and fan.
[Trench Locations 4a and 4b].

Hf3 - Active slope wash fan: Pine Tree Canyon fan.
[Trench Location 1].

Hf2 - Distal fan intersection: Pine Tree/Jawbone distal deposits.
[Trench Locations 5a and 5b].

Hf1d - Uplifted fan: Pine Tree Wash abandoned distributaries.
[Trench Location 2].

Hf1 - Uplifted fan: Axial valley fan and wash deposits.
[Trench Location 3].

The landforms are divided or capped by two distinct landform features, the Cantil Valley Fault scarp and the young distal fan of Pine Tree Wash. These features influence local depositional regimes and understanding their role in landform development will aid in the assessment of the potential for buried cultural resources. Apple et al. (2008) have documented the presence of archaeological components buried in and partially exposed on the Hf2 landform. Radiocarbon assays on cultural features in the upper meter of the stratigraphic profile all date to the last 1,000 years.

During the course of preliminary mapping, the author visited CA-KER-3939 to investigate the contexts of the early Holocene dates reported by Gardner et al. (2002). The deeply buried cultural hearths and ash-rich strata are situated in deeply incised channels at the proximal segment (adjacent to the mountain front) of the valley alluvium. Although part of the regional alluvial system, the landscape of deeply buried archaeology at CA-KER-3939 is very different from that of the Beacon project area. The CA-KER-3939 is situated in the active portion of the fan where pulses of deep incision are separated by longer periods of colluvial and alluvial deposition. Left-lateral faulting along the Garlock Fault also contributes to geomorphic responses along the proximal fan. This does not necessarily reduce the potential for buried resources in the project area which is primarily a depositional set of landforms, but draws attention to local variability in geomorphic regimes.

General Landform Setting and Proposed Trench Plan

The primary goal of geoarchaeological trenching is to determine, if possible, the depth of the Holocene-age landforms which have the potential to contain archaeological resources. The upper profile of the entire project area is entirely comprised of Holocene-age deposits, and, in most cases, the energy regimes of project area landforms are appropriate for preservation of intact artifact and feature associations. Erosive events such as sheet floods and channel incisions may have scoured now-buried surfaces producing unconformities in the local stratigraphy and archaeological record. Erosion of one landform produces deposition in downstream portions of the system. Periods of landform stability may be represented by soil or weathering profiles that can help constrain the temporal variability of landform events. In this manner, the complex geomorphic system of the Pine Tree Canyon alluvial fan and axial washes of Fremont Valley plays an important role in structuring the archaeological record. Identification of the chronology and structure of these events can provide a better understanding of the potential for locating buried archaeological resources in the project area. The necessities of cultural resources monitoring may be resolved where Pleistocene-age landforms are identified.

The Cantil Valley fault bisects the project area and has been a major influence on the shifting erosional and depositional regimes of Pine Tree Wash. Sub-surface ages separated by the fault may vary significantly. Although capped by Holocene-age deposits, the near-surface landforms above (south) the fault are older than the young fan deposits below (north) the fault. Landforms above the fault (Hf1 and Hf1d) are derived from the axial system of Fremont Valley and older distributary channels of Pine Tree Wash. Profiles along the axial wash, which has captured the modern course of Pine Tree Wash, contain clear stratigraphic breaks (sheet flow and overbank flood events) along with one prominent soil/weathering profile almost 2 meters below the modern surface. This has been sampled for radiocarbon dating (results should be available early in the trenching program). Landforms below the fault (Hf3p and Hf3) are younger than those above the fault as these areas have been zones of deposition since the time of major tectonic off-set. Slip rates for faults along the Garlock swarm have been estimated (Gardner et al. 2002; McGill 1994), but these have not been applied to the Cantil Valley fault specifically (I will continue to research these slip-rates). However, if the Garlock estimates (mostly left-lateral displacement) are correct, then some of the vertical offset of this fault may pre-date the Pleistocene-Holocene boundary. Therefore, the potential to encounter stratigraphic markers of that boundary is greater on the Hf1 and Hf1d landforms. The second goal of the trenching program is to characterize the chronology of landforms above and below the prominent fault line of the Cantil Valley fault.

The landform comprised of "lakebed sediments" (Hf2) in the north and northeast portion of the study area are actually distal fan deposits formed at the intersection of the Pine Tree Wash and Jawbone (Cottonwood Creek) fans. Comprised of silt and clay, with occasional sand and gravel lenses, these deposits are texturally similar to lacustrine sediments, but have been deposited as a result of very low-energy regimes near the terminus of the fans. Shore zones of Koehn Lake (the basin sump of Fremont Valley drainage) are several kilometers east of the project area. In the project area, distal fan deposits are Holocene in age (surface deposits may be modern) and may have been deposited as local ponding impounded by floods that temporarily blocked drainage to the lake basin. The fan intersections, along with local faulting, may also produce spring locations where vegetation and surface waters impede sediment movement forming distal fan deposits. Although not a true lacustrine landform, resource characteristics might occasionally match littoral/paludal environments and would have been cyclically attractive to prehistoric people. The third goal of the trenching progam is to temporally characterize the development of this distal fan intersection.

Based on preliminary mapping, seven trench locations have been selected to meet the goals outlined above. Trench locations are generalized as box plots on the accompanying *Map Sheet.* Each landform will be investigated by mechanical excavation of a minimum of three trenches; the Hf3d and Hf2 landforms will have multiple trench locations with at least two trenches each (i.e., these two landforms will have a minimum of four trenches each). A minimum of seventeen trenches will be studied. Specific trenches will be placed to emphasize landform features such as distributary channels or spring discharge points. Trenches may be shifted to avoid facilities associated with recent agricultural development (e.g., irrigation piping and power poles). Unless clear stratigraphic indications of Pleistocene deposits are encountered, trenches will be excavated to a depth of 20 feet (exceeding 20 feet requires professionally engineered shoring/safety plans). At each Trench Location, one of the trenches will be documented as completely as possible to identify and illustrate litho- and chrono-stratigraphic units. All trenches will be sampled for archaeological deposits as outlined in the project scope of work.

Summary information and specific goals for each proposed Trench Location is provided below.

Characterizing Holocene Deposition and Archaeological Sensitivity [Trench Locations]:

1: Trenches will allow characterization of the structure and depth of recent fan deposition on down-drop side of Cantil Valley Fault. It may be possible to locate a Pleistocene-age surface in this area that pre-dates recent movement along the fault; however, this surface may be very deep (i.e., > 2 meters) in this area. Sand and gravel rills are common on this down-dropped, active surface of modern Pine Tree Canyon fan.

Three trenches will extend from the toe of fault into the central area of the landform; these will likely run perpendicular to the fault.

2: Trenches provide characterization of morphology, depth, and chronology of pre-fault, Pine Tree Wash distributaries on uplifted fan. These distributaries pre-date the down-cut position occupied by the wash since most recent faulting episodes. Because of tectonic uplift, it may be possible to locate the Pleistocene-age surface at relatively shallow depth (i.e., upper 2 or 3 meters of the profile). Inverted topography due to differential erosion (exacerbated by agricultural activities) is apparent in this area; that is, gravel channels are topographically higher than deflated fan and channel margins. Modern coppice dunes and agricultural debris are common. Three trenches will bisect remnant distributary features.

3: Trenches will allow characterization of structure and depth of axial valley deposits. The Hf1 surface is the oldest surface in the project area, but upper deposits are likely middle to late Holocene in age. As on other uplifted landforms, there is potential here for locating a Pleistocene surface at relatively shallow depth. The pre-agricultural surface is similar to extensive axial valley landform of Fremont Valley. Modern coppice dunes are common; prior to agricultural modification this surface would have been a relatively stable creosote plain with local coppice and slopewash accumulation. Three trenches will be placed in berm and swale topography of older fan.

4a/4b: Trenches will allow characterization of fan structure and exploration of depth of local proximal segment of recent fan deposition where Pine Tree Wash leaves the confinement at Cantil Valley Fault scarp. This landform drapes onto down-dropped segment of Pine Tree Canyon fan. Pine Tree Wash extends onto fine-grained deposits of the distal fan intersection. This deposit has potential to cap landforms known to contain surface and buried archaeological sites. Two trenches (4a) will be placed at the initial deposition point adjacent to the Cantil Valley Fault and perpendicular to wash direction. Two additional trenches (4b) will be placed perpendicular to the Cantil Valley Fault at the margin of Pine Tree Wash depositional fan.

5a/5b: Trenches will allow characterization of depositional sequence and exploration of the depth of fine-grained sediment along intersection zone between the Pine Tree Canyon and Jawbone Canyon fans. Buried archaeological sites have been documented in and on this landform (Apple et al. 2008). Often mischaracterized as lake deposits, distal fan segments in this region may be comprised of inter-bedded, fine-grained silts and clays similar to those found in terminal lake basins, such as Koehn Lake to the northeast. Although local ponding due to flood and/or spring discharge is common, there is no evidence of Holocene lake stands in the project area. Two trenches (5a) will be placed in the vicinity of archaeological resources at EDAW Sites 11 and 12. Two additional trenches (5b) will be placed in the broad area of the Hf2 landform near its intersection with distal deposits of the Jawbone Canyon fan.

Completion of the trenching plan should allow assessment of project impacts to sensitive landforms in the project area. Trench Locations 1, 2, 4a, 5a, and 5b will allow assessment of solar array footings and other facilities on Hf3, Hf1d, Hf3p, and Hf2 landforms. Trench Locations 3, 4b, 5a, and 5b will provide indications of resource potential on Hf1, Hf3p, and Hf2 landforms where the drainage alignment is proposed. Trench 4a will provide an indication of resource sensitivity in the vicinity of the power facility in the central portion of the project area.

References Cited

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