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September 23, 2015

Driz Cook, Director
High Trails Outdoor Science School
P.O. Box 2640
Big Bear City, CA 92314
Transmitted via email to mike@dkcarch.com

RE: Paleontological Resource Assessment for the High Trails Outdoor Science School Project, San Bernardino County, California

Dear Mr. Cook:

At the request of DKC Architects, Inc., on behalf of High Trails Outdoor Science School, Applied EarthWorks, Inc. (Æ) performed a paleontological resource assessment for the High Trails Outdoor Science School Project (Project), Community of Angeles Oaks, San Bernardino County, California. The scope of work included a museum records search, a literature and geologic map review, and preparation of this technical memorandum (memo). This memo, which serves as a summary of our findings, was written in accordance with the guidelines set forth by the Society of Vertebrate Paleontology (SVP) (2010) and will satisfy the requirements of the California Environmental Quality Act (CEQA).

Project Description and Background

The Project area is located within the Community of Angeles Oaks, immediately north of the Santa Ana River, along the Converse Creek tributary, approximately 2.5 miles north of State Route (SR) 38 in San Bernardino County. The Project site encompasses approximately 20 acres within Assessor's Parcel Number (APN) 0305-241-14 and is located northwest of the intersection of Patterson Road and Radford Camp Road. Specifically, the Project is located within portions of Township 1 North, Range 1 West, Section 8 on the Big Bear Lake, CA 7.5' U.S. Geological Survey (USGS) Quadrangle (Attachment 1). The Project proposes to construct a new outdoor science school campus, including pre-fabricated steel buildings for student and adult housing facilities, a caretaker residence, a 9,000 square foot central lodge, a parking lot and new driveways, and a new septic system and underground utilities. At this time, depth and extent of ground-disturbing activities have not been defined; however, grading to a maximum depth of approximately 3 feet below ground surface (bgs) and excavation to a maximum depth of 4 to 6 feet bgs for utility installation is expected. This technical memorandum was prepared in support of the application for a Conditional Use Permit, issued by the Land Use Services Department – Planning Division of San Bernardino County, which requires an inventory of existing cultural features (including paleontological resources) for the Project area.

Regulatory Context

Paleontological resources cannot be replaced once they are destroyed. Therefore, paleontological resources are considered nonrenewable scientific resources and are protected under the CEQA. Specifically, in Section V(c) of Appendix G of the CEQA Guidelines, the "Environmental Checklist Form," the question is posed: "Will the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?"

In order to determine the uniqueness of a given paleontological resource, it must first be identified or recovered (i.e., salvaged). Therefore, mitigation of adverse impacts to paleontological resources is mandated by CEQA. In addition, paleontological resources are addressed under the Conservation Element of the County of San Bernardino General Plan (2007). The following policies are set forth under GOAL CO 3 in the Cultural/Paleontological Resources Section (V-C2), which stipulates that San Bernardino County will preserve and promote its historic and prehistoric cultural heritage:

1. In areas of potential but unknown sensitivity, field surveys prior to grading will be required to establish the need for paleontologic monitoring.

2. Projects requiring grading plans that are located in areas of known fossil occurrences, or demonstrated in a field survey to have fossils present, will have all rough grading (cuts greater than 3 feet) monitored by trained paleontologic crews working under the direction of a qualified professional, so that fossils exposed during grading can be recovered and preserved. Fossils include large and small vertebrate fossils, the latter recovered by screen washing of bulk samples.

3. A report of findings with an itemized accession inventory will be prepared as evidence that monitoring has been successfully completed. A preliminary report will be submitted and approved prior to granting of building permits, and a final report will be submitted and approved prior to granting of occupancy permits. The adequacy of paleontologic reports will be determined in consultation with the Curator of Earth Science, San Bernardino County Museum [V-18–V-19].

Paleontological Resource Potential

Absent specific agency guidelines, most professional paleontologists in California adhere to the guidelines set forth by the SVP (2010) to determine the course of paleontological mitigation for a given project. These guidelines establish protocols for the assessment of the paleontological resource potential of underlying geologic units and outline measures to mitigate adverse impacts that could result from project development. Using baseline information gathered during a paleontological resource assessment, the paleontological resource potential of the geologic unit(s) (or members thereof) underlying a Project area can be assigned to one of four categories defined by the SVP (2010). These categories include high, undetermined, low, and no paleontological resource potential.

Methodology

In order to assess whether a particular project area has the potential to contain significant fossil resources at the subsurface, it is necessary to review published geologic mapping to determine the geology and stratigraphy of the area. Geologic units are considered to be “sensitive” for paleontological resources if they are known to contain significant fossils anywhere in their extent. Therefore, a search of pertinent local and regional museum repositories for paleontological localities within and nearby the project area is necessary to determine whether fossil localities have been previously discovered within a particular rock unit. For this Project, because the San Bernardino County Museum is not currently conducting locality record searches, a museum records search was requested at the Los Angeles County Museum of Natural History (LACM) on September 14, 2015.

Resource Context

The Project area is located in the San Bernardino Mountains, within the Transverse Ranges geomorphic province of southern California. A geomorphic province is a region of unique topography and geology that is distinguished from other regions based on its landforms and diastrophic history (Norris and Webb, 1976). The Transverse

Ranges extend 325 miles west-east from Santa Barbara County to San Bernardino County and their geology is dominated by metamorphic and plutonic igneous basement rocks capped by Cenozoic sedimentary and volcanic deposits (Morton and Miller, 2006). The San Bernardino Mountains rise 11,502 feet above mean sea level (amsl) at the highest peak and extend 65 miles from the Cajon Pass and the San Andreas fault in the west, to Twentynine Palms and the Morongo Valley in the east. The San Bernardino Mountains formed 2 to 3 million years ago (Ma) due to uplift of regional structural blocks that are bounded on the north by a system of reverse faults and to the south by the San Andreas fault system (Miller, 1987; Spotila et al., 1998). In general, the mountain range consists of Mesozoic to Cretaceous quartz monzonite and granitic rocks and Precambrian and Paleozoic limestone and quartzite, overlain by Miocene to Pleistocene terrestrial deposits and Quaternary alluvium. Active uplift and erosion in the tectonically active San Bernardino Mountains has produced steep canyons, rugged topography, numerous landslides, and extensive alluvial sedimentation (Morton and Miller, 2006). Interior faulting has resulted in extensive fracturing of the crystalline rocks within the San Bernardino Mountains (Matti and Morton, 2000). Significant faults in the vicinity of the Project include the right-lateral strike-slip San Andreas fault to the west and the Santa Ana thrust fault immediately to the north (Dibblee and Minch, 2008; Meisling and Weldon, 1989).

The geology of the Project area is mapped by Dibblee and Minch (2008) at a scale of 1:62,500 and Morton and Miller (2006) at a scale of 1:100,000. The geological mapping indicates that the Project area is directly underlain by Quaternary alluvium (Qa) and Quaternary older alluvial fan deposits (Qof). At depth, the Quaternary deposits are underlain by the Miocene-Pliocene arkosic Santa Ana Formation and Mesozoic quartz monzonite granitic basement rocks (Dibblee, 1964). Morton and Miller (2006) describe the intrusive igneous rocks as heterogeneous, felsic to intermediate composition, locally moderately recrystallized, and highly weathered. The Quaternary older alluvial fan deposits accumulated during the late Pleistocene as a result of erosion of the uplifting crystalline bedrock and subsequent alluvial deposition. The late Pleistocene alluvium is mapped in the northern Project area and consists of a light-grey to reddish-tan fanglomerate that is composed of poorly sorted, crudely bedded, coarse angular gravel of boulder to pebble size in a coarse arkose matrix. Fine-grained sediments are generally absent or are restricted to local deposits of low-energy silt deposits or overbank mud (Dibblee and Minch, 2008). The Holocene alluvium underlies the majority of the Project area and is composed of unconsolidated, very poorly sorted, weakly to moderately stratified sandy gravel, with granitic and metamorphic pebble- to cobble-sized clasts and lenses of silt derived from sedimentation along the Santa Ana River and tributary drainages. In general, the alluvium is covered by 1–3 feet of sandy loamy soil, with thinner soil development in areas of steeper slopes (Soil Survey Staff, 2003).

Quaternary alluvial, fluvial, and lacustrine deposits of Pleistocene age have proven to yield significant vertebrate fossil localities throughout California (UCMP collections data, 2016), including within the San Bernardino Mountains. Fine-grained Pleistocene terrestrial deposits in the western and northern San Bernardino Mountains have yielded abundant mammal fossils, including specimens of mammoth, bison, camel, horse (Cox et al., 2000). However, the late Pleistocene fanglomerate exposed in the Project area are very coarse, indicative of a high-energy environment that is not conducive to fossil preservation (Bonde, 2015). As a result, the Quaternary older alluvial fan deposits mapped in the Project area have a low paleontological resources potential and low paleontological sensitivity. Similarly, Holocene alluvium, particularly deposits younger than 5,000 years old, are generally too young to contain fossilized material and are considered to have a low paleontological sensitivity in accordance with SVP (2010) guidelines. These Quaternary deposits may overlie potentially sensitive older units, such as the Santa Ana Formation, at moderate depth (Dibblee, 1964); however, the proposed Project-related ground disturbance is minimal and proposed excavation is expected to be shallow.

Records Search Results

The LACM reports that there are no previously recorded vertebrate fossil localities in the Project area or in the immediate vicinity from within the Pleistocene alluvial deposits. However, LACM museum collections identify

one vertebrate locality (LACM 3350) that was recorded east of the Project area, west of Landers, CA, from within somewhat similar, although finer-grained, Pleistocene-age sedimentary deposits. The locality yielded vertebrate fossil specimens of horse, camel, and bison, depth of recovery unreported (McLeod, 2016).

Findings and Recommendations

Based on the literature review and museum records search results, the paleontological sensitivity was determined in accordance with the SVP's (2010) sensitivity scale. The Quaternary alluvium and Quaternary older alluvial fan deposits are determined to have a low paleontological resource potential because they are likely too coarse and too young to contain fossilized material. These Quaternary alluvial deposits may be underlain at moderate depth by older Pleistocene-age deposits that have been known to yield significant paleontological resources throughout the region. However, Project excavation is expected to be shallow and older buried units are unlikely to be impacted by Project development. As a result, the potential for encountering fossil resources during Project-related ground disturbance is low; therefore, impacts to paleontological resources are not anticipated and no further paleontological mitigation is recommended at this time. In the event that a fossil discovery is made during the course of Project development, then in accordance with SVP (2010) guidelines, a qualified professional Paleontologist should be retained in order to examine the find and to determine if further paleontological resources mitigation is warranted.

It has been a pleasure assisting you with this Project. If you have any questions, please do not hesitate to contact me at hclifford@appliedearthworks.com or (626) 578-0119.

Sincerely,

Heather Clifford
Associate Paleontologist

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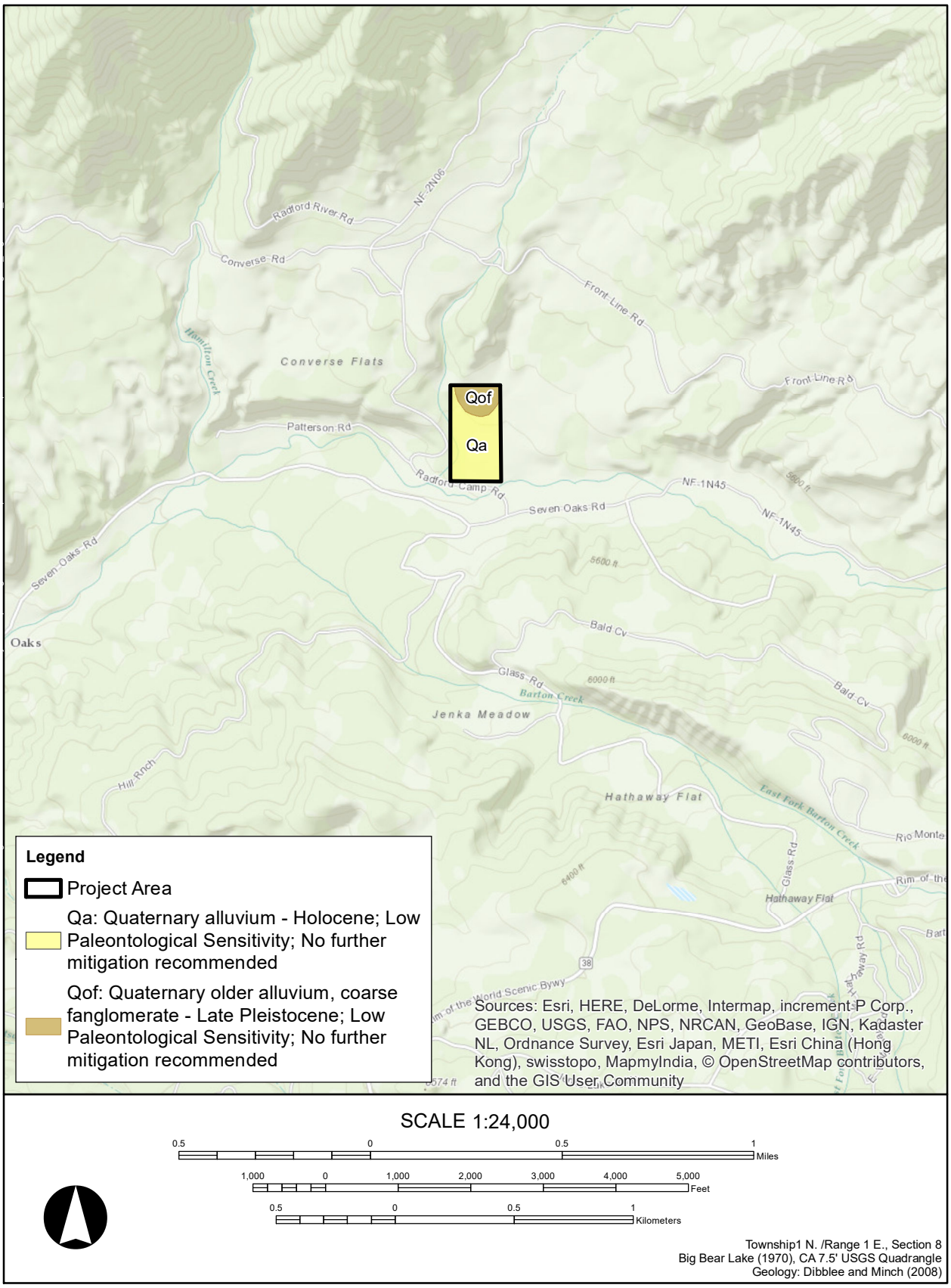

Attachment 1. Geology and Paleontological Sensitivity of the Project Area.