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January 31, 2025

Eliza Laws
Albert A. Webb Associates
3788 McCray Street
Riverside, CA 92506
Transmitted via email to eliza.laws@webbassociates.com

RE: Paleontological Technical Memorandum for the Avenue 50 Improvements Project, Cities of Indio and La Quinta, Riverside County, California

Dear Ms. Laws,

At the request of Albert A. Webb Associates, Applied EarthWorks, Inc. (Æ) completed a paleontological technical memorandum for the Avenue 50 Improvements Project (Project) in the cities of Indio and La Quinta, Riverside County, California. The City of Indio (City) proposes to widen approximately 2.5 miles of Avenue 50 between Jefferson Street and Botella Place in the city of Indio and add an 11-foot-wide parkway and raised median along Avenue 50 in the city of La Quinta.

Æ's scope of work included desktop review of geologic maps, paleontological literature, and museum records searches. This technical memorandum summarizes the findings and was written by staff who meet mitigation paleontology industrywide standards (Murphey et al., 2019) as well as qualification standards of the Society of Vertebrate Paleontology (2010). Although the Project area is within both the cities of Indio and La Quinta, the City of Indio is the lead agency for compliance with the California Environmental Quality Act (CEQA).

PROJECT DESCRIPTION AND BACKGROUND

The majority of the Project area is within the southwestern portion of the city of Indio, although the western third of the Project area, between Jefferson Street and Madison Street, is partially within the northeastern portion of the city of La Quinta in Riverside County. The street centerline of Avenue 50 is the boundary between the two cities, with Indio in the north and La Quinta in the south. Specifically, the Project is mapped within Sections 33, 34, and 35, Township 5 South, Range 7 East, and Sections 2, 3, and 4, Township 6 South, Range 7 East, as depicted on U.S. Geological Survey (USGS) La Quinta and Indio 7.5-minute topographic quadrangle maps.

The Project involves the widening of existing roadway, adding an 11-foot-wide parkway, and constructing a raised median. The Project also may consist of pavement reconstruction and/or rehabilitation; construction of a new curb, gutter, and sidewalk, in addition to repairs; installation of retaining walls; and underground utility improvements. The road segment is to be widened from the existing 30–55 feet in width to 71–78 feet in width in some areas, with parkway and utility improvements within the ultimate street right-of-way of approximately 100-110 feet. The majority of work will be conducted within the existing right-of-way; some areas will require right-of-way acquisition, drainage easements, and temporary construction easements. The maximum depth of ground disturbance during Project construction is not expected to exceed 15 feet below ground surface (bgs).

REGULATORY CONTEXT

This Project is subject to both state laws and local goals and policies. The following section provides an overview of the relevant laws and regulations.

State

At the state level, paleontological resources are protected under CEQA, which requires detailed studies that analyze the environmental effects of a proposed project. If a project is determined to have a potential significant environmental effect, the act requires that alternative plans and mitigation measures be considered. Specifically, Section VII(f) of Appendix G of the CEQA Guidelines, the Environmental Checklist Form, poses the question, "Will the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?" If paleontological resources are identified as being within the proposed project area, the sponsoring agency must take those resources into consideration when evaluating project effects. The level of consideration may vary with the importance of the resource.

Local

There are several policies covering paleontological resources within the County's *General Plan*, *Multipurpose Open Space (OS) Element* (Riverside County Planning Department, 2015:OS-51):

- **OS 19.6:** Whenever existing information indicates that a site proposed for development has high paleontological sensitivity as shown on Figure OS-8, a paleontological resource impact mitigation program (PRIMP) shall be filed with the Riverside County Geologist prior to site grading. The PRIMP shall specify the steps to be taken to mitigate impacts to paleontological resources.

- **OS 19.7:** Whenever existing information indicates that a site proposed for development has low paleontological sensitivity as shown on Figure OS-8, no direct mitigation is required unless a fossil is encountered during site development. Should a fossil be encountered, the Riverside County Geologist shall be notified and a paleontologist shall be retained by the project proponent. The paleontologist shall document the extent and potential significance of the paleontological resources on the site and establish appropriate mitigation measures for further site development.

- **OS 19.8:** Whenever existing information indicates that a site proposed for development has undetermined paleontological sensitivity as shown on Figure OS-8, a report shall be filed with the Riverside County Geologist documenting the extent and potential significance of the paleontological resources on site and identifying mitigation measures for the fossil and for impacts to significant paleontological resources prior to approval of that department.

- **OS 19.9:** Whenever paleontological resources are found, the County Geologist shall direct them to a facility within Riverside County for their curation, including the Western Science Center in the City of Hemet.

In addition to County policies and guidance, the City of Indio's General Plan also includes policies and guidance regarding preservation of paleontological resources. Specifically, the Conservation Element of the *Interim Final Draft General Plan* includes two policies designed to assist with achieving "Goal CE-8: Historic, Archaeological, and Paleontological Resources" (City of Indio, 2019b:8-19):

- **CE-8.1 Site Plan Review.** Ensure adequate site plan review and mitigation measures are implemented for the development of sites with the potential to contain historic, archaeological, and paleontological resources.

- **CE-8.4 Monitoring.** Require monitoring on sites where grading has the potential to impact subsurface cultural and paleontological resources during excavation and construction activities.

PALEONTOLOGICAL RESOURCE POTENTIAL

Most professional paleontologists in California follow the Society of Vertebrate Paleontology (2010) guidelines to determine the course of paleontological mitigation for a given project unless specific city, county, state, or federal guidelines are available. Both the County and the City of Indio have assessed the paleontological sensitivity of geologic units on countywide and citywide scales, respectively, and outline measures to follow in order to mitigate adverse impacts to known or unknown fossil resources during project development (County of Riverside, 2015; City of Indio, 2019a, 2019c).

The County has assigned various paleontological sensitivity to the various geologic units exposed within its boundaries—Low, Undetermined, High A (Ha), and High B (Hb) Potential (County of Riverside, 2015). Geologic units are considered to be "sensitive" for paleontological resources and have a High paleontological resource potential if they are known to contain significant fossils anywhere in their extent, even if outside the Project area. High A (Ha) sensitivity is based on the occurrence of fossils that may be present at the ground surface of the Project area, while High B (Hb) sensitivity is based on the occurrence of fossils at or below 4 feet of depth, which may be impacted during construction activities (County of Riverside, 2015). A coarse-grained paleontological sensitivity map of Riverside County is included in the OS Element, which indicates the sensitivity rankings across the ground surface (County of Riverside, 2015:Figure OS-8, OS-55).

In contrast to the County, the City of Indio includes only three categories for ranking the sensitivity of a geologic unit—High, Undetermined, and Low Potential (City of Indio, 2019a, 2019c). Areas of High paleontological sensitivity throughout the City correlate to the surface mapping of the Mecca Formation, Palm Springs Formation, Canebrake Conglomerate, and Lake Cahuilla beds. Areas of Undetermined Potential within the City correspond to surface exposures of the Ocotillo Conglomerate. All other geologic units in the City are assigned Low Potential.

Although the County does not include specific mitigation measures in their regulatory documents, the City's General Plan Update Final Environmental Impact Report (FEIR) includes Mitigation Measure MM-CR-4, which requires project applicants to conduct a paleontological field survey or construction monitoring in areas ranked High or Undetermined Potential (City of Indio, 2019a).

METHODS

To assess the paleontological sensitivity of geologic units mapped at the ground surface and those likely to occur in the subsurface of the Project area, Æ completed desktop studies. Æ first researched published geologic maps and paleontological literature for the region. Æ then retained the Natural History Museum of Los Angeles County (NHMLAC) and the Western Science Center (WSC) in Hemet, California, to conduct searches of fossil localities recorded in their collections. To augment these results, Æ also conducted searches of the online Paleobiology Database (PBDB) and the University of

California Museum of Paleontology (UCMP). The PBDB lists a large collection of museum records and publications of fossil material, whereas the UCMP is the largest repository of fossils on the West Coast of the U.S. with an older history of collection than several other regional natural history museums.

RESOURCE CONTEXT

The Project area is northwest of the Salton Sea in the Coachella Valley portion of the Colorado Desert geomorphic province[1] (California Geological Survey, 2002). The Colorado Desert is a subregion of the Sonoran Desert (Commission for Environmental Cooperation, 2006). The Sonoran Desert includes areas of southeastern California, southwestern Arizona, and the northern portions of two Mexican states, Baja California Norte and Sonora (Calzia and Wilson, 2012). Much of the Colorado Desert lies within the Salton Trough; a large structural depression that extends from the San Gorgonio Pass in the north to the Gulf of California in the south (Norris and Webb, 1976). The Salton Trough is a graben, bounded by roughly parallel northwest-trending faults, including the San Andreas Fault Zone to the northeast and the San Jacinto fault zone to the southwest.

The Salton Trough formed as a topographic depression from spreading and subsidence associated with the rift system that opened the Gulf of California (Alles, 2011). Rifting initiated in the late Miocene (Dorsey et al., 2007), as shown by magnetostratigraphy and biostratigraphy dating the oldest basin-filling deposits at approximately 8 million years old (Dorsey et al., 2007). Seawater spilled into the trough and undisputed marine sequences began in the Pliocene (Alles, 2011). From the Pliocene to late Pleistocene, an immense volume of sediment eroded from downcutting of the Grand Canyon, resulting in the formation of a massive delta across the seaway by deposition from the ancestral Colorado River. This delta eventually separated the marine waters of the Gulf of California from the brackish and fresh waters of the Salton Trough, evidenced by the transition from marine to terrestrial fossils preserved in sedimentary strata (Dorsey et al., 2007).

From the late Pleistocene to early Holocene, the ancient freshwater Lake Cahuilla periodically occupied the Salton Trough. This lake formed, drained, and reformed several times between approximately 10,000 to 240 years before present (B.P.) due to fluctuations in the course of the Colorado River and the subsequent diversion of the river's mouth from the Gulf of California to the Salton Trough (Norris, 1979; Deméré, 2018). During its last high stand, Lake Cahuilla measured approximately 105 miles long by 35 miles wide and reached a maximum depth of 300 feet.

According to Bedrossian et al. (2012), the surficial geology of the Project area is mapped as early- to middle Holocene young alluvial valley deposits (Qya). Unit Qya includes unconsolidated to slightly consolidated and slightly dissected sandy and gravelly deposits associated with streams and larger river valleys.

The former shoreline of Lake Cahuilla is exposed at the ground surface near the San Andreas Fault Zone approximately 7 miles east-southeast of the Project area, which suggests these surficial deposits correspond to the most recent interval of inundation of the ancient lake (Norris, 1979; Waters, 1983; Dibblee and Minch, 2008; Deméré, 2018). The proximity of the Lake Cahuilla shoreline to the Project area indicates the Lake Cahuilla beds likely also occur at shallow depth beneath the surficial Holocene

[1] A geomorphic province is a region of unique topography and geology that is readily distinguished from other regions based on its landforms and tectonic history (American Geological Institute, 1976).

alluvial deposits or may be interstratified with the deposits in the immediate subsurface and difficult to distinguish, particularly in fresh cuts. For instance, tufa and travertine coatings are occasionally present on silts and clays of the Lake Cahuilla beds.

Trenches excavated by Whistler et al. (1995) indicate the Lake Cahuilla beds are at least 60 feet (18.5 meters) thick in the vicinity of the Project area. As Project-related excavations are expected to be no more than 15 feet below ground surface (bgs), it is unlikely that excavations will extend into underlying geologic units. Therefore, discussion in this section is limited to the Lake Cahuilla beds and Qya, as mapped at the surface.

Holocene deposits, particularly those less than 5,000 years old, are typically too young for the fossilization process to occur (Society of Vertebrate Paleontology, 2010). However, certain factors can speed the mineralization process and result in partial, if not complete fossilization of microbial, plant, and animal remains. The physical and chemical environment of dry playa lakes is particularly suitable for fossil preservation due to their arid and often alkaline conditions that promote abundant carbonate precipitation required for tufa and travertine formation. A diverse assemblage of fossils is known from late Holocene localities within the Lake Cahuilla beds approximately 2 miles southwest of the Project area, southeast of the City of La Quinta (Whistler et al., 1995). These fossiliferous strata are radiocarbon-dated to 1125 ± 80 and 2545 ± 50 years B.P. Fossils include various freshwater diatoms, land plants, sponges, ostracods, mollusks, fish, small terrestrial vertebrates, and traces found in shallow excavations. These Holocene deposits are stratigraphically above Pleistocene and Pliocene deposits; however, the contact depth is unknown and the Lake Cahuilla beds can be up to 300 feet thick in the center of the Salton Trough (Norris and Webb, 1976). The proximity of these fossiliferous beds to the Project area indicates they may be present at shallow depths beneath the surficial alluvial deposits.

RECORDS SEARCH RESULTS

No paleontological localities are previously recorded for the Project area. However, the NHMLAC listed four vertebrate and invertebrate fossil localities within seven miles of the Project area, and the WSC listed one invertebrate locality within their collections within two miles of the Project area. In addition, two other localities are listed in record search results from previous Æ projects within a 10-mile radius. These several localities are in Holocene and Pleistocene deposits like those mapped either at the surface or likely at depth in the Project area. The PBDB and UCMP online databases do not list any fossil localities from Holocene or Pleistocene alluvial deposits within the Project area or a 10-mile radius. Table 1 lists known paleontological resources within a 10-mile radius of the Project area.

Table 1
Fossil Localities Reported within a 10-Mile Radius of the Project Area

Locality No.	Geologic Unit (Date)	Taxa	Depth	Approx. Distance from Project Area
LACM IP 17946[a]	Lake Cahuilla Beds	Invertebrates (unspecified)	Surface	2 miles
Imagine Coachella[b]	Lake Cahuilla Beds	*Chara* (freshwater algae) *Anodonta californiensis* (bivalve) *Pisidium* (bivalve) *Gyraulus parvus* (gastropod) *Physella humerosa* (gastropod) *Planorbella trivolvis* (gastropod) *Pyrgulopsis longinqua* (gastropod) *Tryonia protea* (gastropod) Podocopoidea (ostracod)	Unknown	2 miles
LACM VP 6252-6256; LACM IP 16830, 16831[a]	Lake Cahuilla Beds, lacustrine claystone (Holocene)	*Perognathus* (pocket mouse) *Sylvilagus* (rabbit) *Dipodomys* (kangaroo rat) *Peromyscus longimenbris* (deer mouse) *Neotoma lepida* (pack rat) *Ammospermophilus leucurus* (antelope ground squirrel) *Chionactis occipitalis* (western shovelnose snake) *Pituophis melanoleucus* (gopher snake *Crotalus cerastes* (rattlesnake) *Hypsiglena torquata* (Night snakes) *Sonora semiannulata* (Ground snake) *Phrynosoma platyrhinos* (horned lizard) *Sceloporus magister* (spiny lizard) *Uma inornata* (fringe-toed lizard) *Urosaurus graciosus* (tree lizard) Passeriformes (songbirds) *Xyrauchen texanus* (razorback sucker) *Cyprinodon macularius* (pupfish) *Gila elegans* (western chub) *Anodonta californiensis* (bivalve) *Pisidium casertanum* (bivalve) *Amnicola longinqua* (gastropod) *Ferrissia walkeri* (gastropod) *Gyralus parvus* (gastropod) *Helisoma trivolvis* (gastropod) *Physella ampullacea* (gastropod) *Physella humerosa* (gastropod) *Tryonia protea* (gastropod) *Cypridopsis vidua* (ostracod) *Cypronotus torosa* (ostracod) *Limnocythere ceriotuberosa* (ostracod)	5 feet bgs	3 miles

Table 1 (continued)
Fossil Localities Reported within a 10-Mile Radius of the Project Area

Locality No.	Geologic Unit (Date)	Taxa	Depth	Approx. Distance from Project Area
JC-072313-01[b]	Lake Cahuilla Beds (Holocene)	*Anodonta* (bivalve) *Littorina* (gastropod) *Planorbella* (gastropod) *Pomatiopsis* (gastropod)	Unknown	3 miles
LACM IP 4779[a]	Unknown formation (Pleistocene)	Invertebrates (uncatalogued)	Unknown	5 miles
LACM IP 474[a]	Lake Cahuilla Beds (Holocene)	Invertebrates (unspecified)	Unknown	6 miles
SBCM 5.8.7–5.8.15[c,d]	Lake Cahuilla Beds (Holocene)	*Thomomys* (pocket gopher) *Odocoileus* (deer) Osteichthyes (bony fish) *Anodonta californiensis* (bivalve) *Pisidium* (bivalve) *Fossaria* cf. *parva* (gastropod) *Tryonia protea* (gastropod) *Planorbella tenuis* (gastropod) *Physella concolor* (gastropod) *Physella humerosa* (gastropod)	Unknown	7 miles

a - NHMLAC
b - WSC
c - previous Æ projects
d - San Bernardino County Museum

Multiple localities have been documented within the Lake Cahuilla Beds in the vicinity of the Project area. Imagine Coachella, approximately two miles east of the Project area, and Æ field locality JC-072313-01, approximately three miles southwest of the Project area, include invertebrate fauna of small, freshwater bivalves and gastropods recovered during construction monitoring. Localities LACM VP 6252-6256 and LACM IP 16830-16831 are southwest of the Project area, and on both sides of Madison Street north of Avenue 58. These localities yielded a large number of terrestrial and freshwater vertebrate and invertebrate fauna from a single trench west of Madison Street, although another trench east of Madison Street yielded a similar fauna that was not collected. Depths at which fossils were collected or observed ranged from 1 to 2 meters bgs (Whistler et al., 1995). Whistler et al. (1995) also noted multiple diatom and land plant taxa, although these specimens have not been accessioned into the NHMLAC and are not included in the records search results. SBCM 5.8.7–5.8.15, approximately seven miles northeast of the Project area, yielded a similar vertebrate invertebrate fauna, along with unspecified land plants. Additional Lake Cahuilla Bed localities are documented approximately five miles west (LACM IP 4779) and 2-5 miles south (LACM IP 17946 and LACM IP 474) of the Project. However, the NHMLAC records search did not provide identifications for the taxa recovered from these localities.

FINDINGS AND RECOMMENDATIONS

Æ used the results from the desktop studies to determine the paleontological sensitivity of the Project area. According to the Riverside County Planning Department (2015) paleontological sensitivity map, the entire Project area is mapped as High A. Similarly, the City of Indio (2019c) sensitive paleontological resources map indicates the entire Project area is High Potential. Æ's desktop studies support these assessments. Specifically, the records searches and literature reviews indicate paleontological resources have been collected from Lake Cahuilla beds within 7 miles of the Project area, from depths of 1 to 2 meters bgs. As Lake Cahuilla beds are potentially interstratified with the Holocene young alluvial valley deposits, such resources may also be present at these depths in the Project area. Subsurface soil sampling or artificial exposure by earthmoving activities (e.g., grading or excavating) may help in assessing the subsurface stratigraphy of the Project area and refining the paleontological sensitivity.

Æ recommends that a qualified paleontologist who meets industry standards (Murphey et al., 2019) and/or qualifications standards of the Society of Vertebrate Paleontology prepare a Paleontological Resource Impact Mitigation Program (PRIMP) prior to the start of Project-related ground-disturbing activities. The purpose of the PRIMP is to establish mitigation monitoring procedures and discovery protocols, based on industry-wide best practices (Murphey et al., 2019), for any paleontological resources that may be encountered as a result of earth-disturbing activities during construction of the Project. For instance, Worker's Environmental Awareness Program training should be prepared prior to the start of Project-related ground disturbance and presented in person to all field personnel to describe the types of fossils that may occur and the procedures to follow if any are encountered in the Project area. A PRIMP also will indicate where construction monitoring will be required for the Project and the frequency of required monitoring (i.e., full-time, spot checks, etc.). The collection and processing (e.g., wet- or dry-screening) of sediment samples to analyze for presence/absence of microvertebrates and other small fossils also would be addressed in a PRIMP. In addition to monitoring and sampling procedures, a PRIMP also will provide details about fossil collection, analysis, and preparation for permanent curation at an approved repository, such as the WSC. Lastly, the PRIMP describes the different reporting standards to be used for monitoring with negative findings versus monitoring resulting in fossil discoveries.

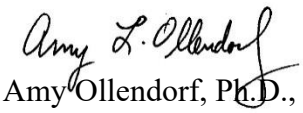
It has been a pleasure assisting you with this Project. If you have any questions, please do not hesitate to contact me at (626) 578-0119 ext. 403.

Sincerely,



Melissa Macias, M.S.
Senior Paleontologist
Applied EarthWorks, Inc.

Edited and Approved By:



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