

June 14, 2024

Karibia Baillargeon, Project Manager
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Transmitted via email to kbaillargeon@kleinfelder.com

RE: Paleontological Resource Revalidation Memorandum for the Madison Avenue Improvement Project, City of Murrieta, Riverside County, California

Dear Ms. Baillargeon,

This letter report, prepared by Applied EarthWorks, Inc. (Æ) on behalf of Kleinfelder, is a paleontological resource revalidation memorandum for the Madison Avenue Improvement Project (Project) in the city of Murrieta, Riverside County, California. The Project area covers an approximately 1.1-mile-long (5,900 linear feet) segment of Madison Avenue (from the intersection at Guava Street to the terminus of Sandalwood Circle). Specifically, the Project is within Township 7 South, Range 3 West, as shown on the U.S. Geological Survey (USGS) Temecula Land Grant, Murrieta, California, 7.5-minute topographic quadrangle map. Development plans associated with the proposed Project include paved roadways, streetlights, sidewalks, utilities, and storm water drainage facilities. In order to avoid or minimize landscape effects outside of the existing 88-foot-wide right-of-way (ROW), the Project will follow the existing roadway along most of its length. The anticipated maximum depth of disturbance is 41 feet below ground surface (bgs).

Æ completed a Paleontological Resource Assessment (PRA) for the Project in September 2018 (Shi, 2018). In that PRA, Æ reviewed relevant literature and geologic maps, as well as collections records maintained by the Natural History Museum of Los Angeles County and the University of California Museum of Paleontology's online database. Subsequent to the PRA, the Project was placed on hold for nearly three years. The city of Murrieta (City) has reclassified the Project, which now requires revalidation for compliance with the California Environmental Quality Act (CEQA). The City is the lead agency responsible for compliance with CEQA.

REGULATORY CONTEXT

This Project is subject to both state laws and local goals and policies. Æ's 2018 paleo report for the Project used the City of Murrieta General Plan 2035 (City of Murrieta, 2011:5.9–5.19). However, this revalidation memo uses the updated General Plan (City of Murrieta, 2022) and Supplemental Environmental Impact Report (City of Murrieta, 2020). The only difference between the 2011 and 2022 general plans with respect to paleontological resources is that paleontology is now incorporated into Section 5.5, Geology and Soils, whereas the previous General Plan included paleontology in Section 5.9, Cultural Resources. There are no changes to the mitigation measures regarding paleontology (City of Murrieta, 2020:5.5). Because extensive information about the geologic setting and paleontological sensitivity of the PA is provided in Shi (2018), this revalidation memorandum focuses exclusively on new information collected by Æ in 2024 through a combination of desktop and field methods.



METHODS

Since the PRA was written more than five years ago, Æ completed updated desktop studies and a pedestrian survey to ensure there have been no changes to the suggested paleontological sensitivity rankings of geologic units mapped at the ground surface and those likely to occur in the subsurface of the Project area. The 2018 PRA listed two sedimentary geologic units mapped within the Project area and likely to be present in the subsurface: the middle to late Pleistocene Pauba Formation and the late Pleistocene to Holocene Young alluvial channel deposits.

For the revalidation memorandum, Æ first reexamined published geologic maps and searched for newly published or other recently completed 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 updated searches of fossil localities recorded in their collections. To augment these results, Æ re-reviewed previous record searches for nearby projects in case others had been completed during the intervening years. Æ also conducted new 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.

FIELD SURVEY

Æ completed a reconnaissance-level paleontological field survey as part of the 2018 PRA, although much of the project area was obscured by dense vegetation. In addition, some areas were not surveyed due to utility installations and road maintenance occurring during the scheduled survey. Therefore, Æ completed a spot-check survey of the Project area for this memo. Æ paleontological field technician Andrew Vasquez conducted a paleontological field survey on February 28, 2024. Vasquez's pedestrian reconnaissance was limited by dense vegetation throughout the unpaved portions of the Project area. Therefore, he was only able to complete the survey from within the existing road ROW.

Starting at the west end of Madison Avenue and moving eastward within the ROW, Vasquez noted cultivated fields designated for staging, which were covered by vegetation, including buckwheat. The visibility of the open field areas was low from the roadway due to inclined topography and vegetation cover. The remainder of the Project area included developed paved and dirt roadways. No paleontological resources were identified during the field survey; the current findings are consistent with those noted in the previous PRA (Shi, 2018).

RECORDS SEARCH RESULTS

The combined 2018 and 2024 records searches list no paleontological localities within the Project area. However, the NHMLAC listed nine vertebrate and invertebrate fossil localities within 6 miles of the Project area, and the WSC listed two groupings of vertebrate localities within 4 miles of the Project area. In addition, nine other localities are listed in record search results from previous Æ projects within a 10-mile radius. Two additional localities are listed in the PBDB database within a 10-mile radius. Table 1 is a comprehensive list of all known paleontological resources within a 10-mile radius of the Project area. The UCMP online database does not list any fossil localities from Pleistocene alluvial deposits or the Pauba Formation within 10 miles of the Project area.



Table 1
Fossil Localities Reported within a 10-mile Radius of the Project Area, by Distance

Locality No. or Name	Geologic Unit (Date)	Taxa	Depth	Approx. Distance from Project Area
LACM VP 7941 ^a	Pauba Formation	Proboscidea (elephant) <i>Equus</i> sp. (horse)	5–10 feet bgs	0.5–mile
LACM VP 5447 ^a	Pauba Formation	<i>Equus</i> sp. (horse)	Unknown	1 mile
Principe and Associates ^b (14 localities, including Copper Canyon ^c)	Unknown formation (Pleistocene)	<i>Megalonyx wheatleyi</i> (ground sloth) <i>Equus</i> sp. (horse) <i>Equus bautistensis</i> (horse) <i>Tapirus merriami</i> (tapir) <i>Camelops</i> sp. (camel) <i>Antilocapra</i> sp. (pronghorn) <i>Bison</i> sp. (bison) <i>Mammut</i> sp. (mastodon) <i>Mammut pacificus</i> (pacific mastodon) <i>Mammuthus imperator</i> (North American mammoth) Rodentia (rodent) Colubridae (snake) Reptilia (reptile) Lissamphibia (amphibians) Unidentified vertebrates		1–4 miles
LACM VP 5891–5892 ^a	Pauba Formation	Equidae (horse)	Unknown	1.5 miles
Harveston I and II ^b (27 localities)	Unknown formation (Pleistocene)	<i>Paramylodon harlani</i> (ground sloth) <i>Camelops hesternus</i> (camel) <i>Camelops</i> sp. (camel) <i>Bison</i> sp. (bison) <i>Equus scotti</i> (horse) <i>Equus bautistensis</i> (horse) <i>Equus conversidens</i> (horse) <i>Equus</i> sp. (horse) <i>Mammuthus</i> sp. (mammoth) <i>Lepus</i> sp. (rabbit) <i>Thomomys</i> sp. (pocket gopher) Rodentia (rodent)	Unknown	1.5–3 miles
LACM VP 5464 ^a	Pauba Formation	<i>Bison</i> sp. (bison)	Unknown	3 miles
LACM IP 11938 ^a	Pauba Formation	Nonmarine mollusks	Unknown	5 miles
LACM VP 5904 ^d	Pauba Formation	<i>Thomomys</i> sp. (pocket gopher) Leporidae (rabbit)	Unknown	5 miles
LACM VP 5893 ^d	Pauba Formation	<i>Equus</i> sp. (horse)	Unknown	5 miles
LACM VP 6967 and 7456 ^a	Unknown formation (Pleistocene)	<i>Hyla</i> sp. (tree frog) <i>Anniella</i> sp. (lizard) <i>Thamnophis</i> sp. (garter snake) <i>Thomomys</i> sp. (pocket gopher) <i>Peromyscus</i> sp. (pocket mouse)	Unknown	6 miles



Table 1 (continued)
Fossil Localities Reported within a 10-mile Radius of the Project Area, by Distance

Locality No. or Name	Geologic Unit (Date)	Taxa	Depth	Approx. Distance from Project Area
LACM VP5789 ^a	Pauba Formation	<i>Mammuthus</i> sp. (mammoth) Equidae (horse) Unidentified vertebrates and invertebrates	Unknown	6 miles
SBCM 5.6.628, 5.6.857, 5.6.859 ^d	Unknown formation (Pleistocene)	Unspecified invertebrates Actinopterygii (fish) Reptilia (reptile) Leporidae (rabbit) Rodentia (rodent)	Unknown	7 miles
SBCM 5.6.890 ^d	Pauba Formation	Unspecified	Unknown	7 miles
LACM VP 8008 ^d	Unknown formation (Pleistocene)	<i>Mammuthus</i> sp. (mammoth)	Unknown	8 miles
LACM VP 7261 ^d	Unknown formation (Pleistocene)	<i>Mammuthus</i> sp. (mammoth) <i>Bison</i> sp. (bison) Proboscidea (elephant) Ungulata (ungulate)	Unknown	9 miles
SBCM 05.006.399 ^{c, d}	Sandstone and conglomerate of the Wildomar Area: Sandstone Unit (Pleistocene)	<i>Aiolornis incredibilis</i> (vulture)	Unknown	9 miles



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

Locality No. or Name	Geologic Unit (Date)	Taxa	Depth	Approx. Distance from Project Area
Summerly Project (70 localities) ^d	Unknown formation (Pleistocene)	<i>Gasterosteus aculeatus</i> (three-spined stickleback) <i>Rana</i> sp. (small frog) <i>Hyla</i> sp. (tree frog) Lissamphibia (salamander) Colubridae (snake) Inguanidae (lizard) <i>Anas</i> sp. (duck) <i>Branta</i> sp. (goose) Passeriformes (song bird) Soricidae (shrew) <i>Sylvilagus</i> , cf. <i>S. bachmani</i> (brush rabbit) <i>Ammospermophilus</i> sp. (antelope ground squirrel) <i>Thomomys bottae</i> (Bottae pocket gopher) <i>Dipodomys</i> sp. (desert kangaroo rat) <i>Reithrodontomys megalotis</i> (western harvest mouse) <i>Peromyscus maniculatus</i> (deer mouse) <i>Neotoma fuscipes</i> (dusky-footed wood rat) <i>Microtus californicus</i> (California meadow mouse) <i>Erethizon</i> sp. (porcupine) <i>Mustela</i> sp. (weasel) <i>Mammuthus columbi</i> (Columbian mammoth) <i>Camelops hesperus</i> (camel) <i>Odocoileus hemionus</i> (black-tailed deer) <i>Bison</i> sp. (bison) <i>Capromeryx minor</i> (dwarf pronghorn) Antilocapridae (antelope)	Unknown	9 miles

a - NHMLAC

b - WSC

c - PBDB

d - Previous *Æ* projects

Multiple localities have been documented within the Pauba Formation and unspecified Pleistocene sediments in the vicinity of the Project area. Nearest to the Project area, LACM 7941, approximately 0.5-mile southeast along Madison Avenue, includes specimens of elephant and horse recovered from 5 to 10 feet deep. Approximately 1 mile to the southeast, horse fragments were recovered during development at locality LACM 5447. Almost 1.5 miles due east of the Project area is locality



LACM 5891–5892, with several specimens identified as horse. Three miles southeast of the Project area, LACM 5464 yielded bison material at an unspecified depth.

The WSC records include two groups of paleontological localities. However, they have not yet been assigned locality numbers. This report refers to these groups by the names listed in the records search. The Principe and Associates Projects recorded fourteen localities between 1 and 4 miles from the Project area. These projects yielded many identifiable vertebrate taxa (e.g., giant ground sloth, North American mammoth, mastodon, horse, tapir). Likewise, Harveston I and II are two projects with localities 1.5–3 miles from the Project area. The Harveston projects recorded 27 localities and yielded a similar fauna to the Principe localities, with the addition of small mammals, such as rabbit and pocket gopher.

LACM 5893 and 5904 are 5 miles southeast of the Project area and yielded horse and small mammal (rodent and rabbit) specimens, respectively. LACM 5789, 6967 and 7456, 6 miles southeast of the project area, contain a diverse assortment of amphibians, reptiles, and large (mammoth and horse) and small (pocket gopher and pocket mice) mammal fossils. LACM IP 11938, an invertebrate locality containing nonmarine mollusks from the Pauba Formation, has been documented on the north side of Pauba Valley, approximately 5 miles southeast of the Project area. Farther to the southeast, localities SBCM 5.6.628, 5.6.857, and 5.6.859 preserve a diverse assortment of bony fish, reptile, rabbit, and rodent material. SBCM 5.6.890 is 7 miles due east of the Project area and contains unspecified fossils. LACM 8008 is 8 miles northeast and contains mammoth materials. LACM VP 7261 and SBCM 05.006.399 are 9 miles northeast of the Project area. The former preserves elephant, bison, and other ungulate fossils; the latter contains vulture remains.

Lastly, the Summerly Project is 9 miles northwest of the Project area and represents 70 fossil-bearing localities. Those localities preserved a wide range of vertebrate taxa, including amphibians, reptiles, birds, small mammals (rodents and rabbits), as well as megafauna (e.g., bison, camel, mammoth).

FINDINGS AND RECOMMENDATIONS

Æ used the results from the desktop studies and field survey to determine the paleontological sensitivity of the Project area. The density of paleontological localities within the vicinity indicate a high likelihood of paleontological resources present within the Project area, especially within the Pauba Formation. According to the Riverside County Planning Department (2015) paleontological sensitivity map and as described in Shi (2018), the entire Project area is mapped as High A (Ha), which means geologic units containing paleontological resources have been mapped at the ground surface within the Project area. Æ's field surveys were unable to support or refute the Ha ranking because of dense vegetation and paved roads throughout the Project area. Upon future subsurface sampling (e.g., geotechnical investigation) or exposure by construction-related earthmoving activities (e.g., grading or excavating), the paleontological sensitivity of the Project area potentially could be reassigned to the Riverside County Planning Department (2015) High B ranking, which is based on the occurrence of fossils more than 4 feet below the surface.

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 (e.g, 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.
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Applied EarthWorks, Inc.

Edited and Approved By:

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