Appendix E2 Paleontological Resources Assessment Report

Appendices

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SWCA ENVIRONMENTAL CONSULTANTS

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Paleontological Resources Impact Assessment Report for the City of Hope Specific Plan, City of Duarte, Los Angeles County, California

Prepared for:

PlaceWorks

Prepared by:

SWCA Environmental Consultants

April 2016

PALEONTOLOGICAL RESOURCES IMPACT ASSESSMENT REPORT FOR THE CITY OF HOPE SPECIFIC PLAN, CITY OF DUARTE, LOS ANGELES COUNTY, CALIFORNIA

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CONTENTS

FIGURES

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PROJECT SUMMARY

Purpose and Scope

SWCA Environmental Consultants (SWCA) was retained to conduct a paleontological resources study in support of the proposed City of Hope National Medical Center (City of Hope) Specific Plan (project). The assessment was conducted by SWCA at the request of PlaceWorks to provide an analysis of paleontological resources that might be present on or below the surface through a comprehensive museum records and literature review of the project area. The scope of paleontological services included a comprehensive literature review and museum records search, as well as preparation of this technical report of findings that includes project-specific recommended mitigation measures.

Dates of Investigation

The museum records search was performed on February 9, 2016. This technical report was completed in April 2016.

Results of Investigation

According to geologic mapping by Dibblee and Ehrenspeck (1998) and Morton and Miller (2003, 2006), the surficial geology of the project area is composed of young alluvial fan deposits likely overlying older alluvial sediments. Museum collection records maintained by the Natural History Museum of Los Angeles County (LACM) indicate that the nearest fossil locality from a similar geologic setting occurs in Eagle Rock, approximately 15 miles west of the project area, where turkey and mammoth fossils were discovered. The combined results of the literature review and museum records search indicate that the geologic sediments found at the surface of the project area are too young to contain fossils and have a low paleontological sensitivity. However, sediments underlying the project area may preserve scientifically significant vertebrate and/or invertebrate fossils, and are determined to have a high paleontological sensitivity.

Recommendations

SWCA recommends that a qualified paleontologist be retained to design and implement a paleontological monitoring and mitigation program during any project-related ground-disturbing activities that exceed a depth of 10 meters (32.8 feet). All fossils recovered during the paleontological monitoring and mitigation program should be prepared, stabilized, identified, and permanently curated in an approved repository or museum, such as the LACM.

Distribution of Data

Copies of this report will be submitted to PlaceWorks and the City of Duarte. A copy of this report will be retained at SWCA, along with all other records related to the project.

INTRODUCTION

This report presents the results of the paleontological resource impact assessment completed for the City of Hope project. This study was performed to evaluate the paleontological sensitivity of the project area and vicinity, to assess potential project-related impacts on paleontological resources, and to provide recommendations for project-specific mitigation measures. This study was conducted in accordance with the professional guidelines established by the Society of Vertebrate Paleontology (SVP) (2010) and guidelines set forth by the California Environmental Quality Act (CEQA).

DEFINITION AND SIGNIFICANCE OF PALEONTOLOGICAL RESOURCES

Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or un-mineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only the fossils themselves, but also the physical characteristics of the fossils' associated sedimentary matrix.

The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered nonrenewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced (Murphey and Daitch 2007). Fossils are important scientific and educational resources and can be used to

- study the phylogenetic relationships amongst extinct organisms, as well as their relationships to modern groups;
- elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- reconstruct ancient environments, climate change, and paleoecological relationships;
- provide a measure of relative geologic dating, which forms the basis for biochronology and biostratigraphy, and is an independent and corroborating line of evidence for isotopic dating;
- study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- study patterns and processes of evolution, extinction, and speciation; and
- identify past and potential future human-caused effects to global environments and climates (Murphey and Daitch 2007).

REGULATORY FRAMEWORK

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under state laws and regulations. This study satisfies project requirements in accordance with CEQA (13 Public Resources Code [PRC] 2100 et seq.) and PRC Section 5097.5 (Stats. 1965, c. 1136, p. 2792). This analysis also complies with guidelines and significance criteria specified by the SVP (2010).

State of California Local Authorities

Guidelines for the Implementation of CEQA, as amended March 29, 1999 (Title 14, Chapter 3, California Code of Regulations 15000 et seq.), define procedures, types of activities, persons, and public agencies required to comply with CEQA, and include as one of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section XIV, Part a) the following: "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?"

Other state requirements for paleontological resource management are included in the PRC Division 5, Chapter 1.7, Section 5097.5, and Division 20, Chapter 3, Section 30244. These statutes prohibit the removal of any paleontological site or feature from public lands without permission of the jurisdictional agency, define the removal of paleontological sites or features as a misdemeanor, and require reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, and district) lands.

RESOURCE ASSESSMENT GUIDELINES

The loss of any identifiable fossil that could yield information important to prehistory, or that embodies the distinctive characteristics of a type of organism, environment, period of time, or geographic region, would be a significant environmental impact. Direct impacts on paleontological resources primarily concern the potential destruction of nonrenewable paleontological resources and the loss of information associated with these resources. This includes the unauthorized collection of fossil remains. If potentially fossiliferous bedrock or surficial sediments are disturbed, the disturbance could result in the destruction of paleontological resources and subsequent loss of information (a significant impact). At the project-specific level, direct impacts can be mitigated to below a significant level through the implementation of paleontological mitigation.

The CEQA threshold of significance for a significant impact to paleontological resources is reached when a project is determined to "directly or indirectly destroy a significant paleontological resource or unique geologic feature" (Appendix G, State CEQA Guidelines). In general, for project areas that are underlain by paleontologically sensitive geologic units, the greater the amount of ground disturbance, the higher the potential for significant impacts to paleontological resources. For project areas that are directly underlain by geologic units with no paleontological sensitivity, there is no potential for impacts on paleontological resources unless sensitive geologic units that underlie the non-sensitive unit are also affected.

Professional Standards

The SVP has established standard guidelines that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation (1995, 2010). Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological laws, ordinances, regulations, and standards accept and use the professional standards set forth by the SVP.

As defined by the SVP (2010:11), significant paleontological resources are defined as

> fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years).

Based on the significance definitions of the SVP (2010), all identifiable vertebrate fossils are considered to have significant scientific value. This position is adhered to because vertebrate fossils are relatively uncommon, and only rarely will a fossil locality yield a statistically significant number of specimens of the same genus. Therefore, every vertebrate fossil found has the potential to provide significant new information about the taxon it represents, its paleoenvironment, and/or its distribution. Furthermore, all geologic units in which vertebrate fossils have previously been found are considered to have high sensitivity. Identifiable plant and invertebrate fossils are considered significant if found in association with vertebrate fossils or if defined as significant by project paleontologists, specialists, or local government agencies.

A geologic unit known to contain significant fossils is considered to be sensitive to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either disturb or destroy fossil remains directly or indirectly. This definition of sensitivity differs fundamentally from the definition for archaeological resources as follows:

> It is extremely important to distinguish between archaeological and paleontological (fossil) resource sites when defining the sensitivity of rock units. The boundaries of archaeological sites define the areal extent of the resource. Paleontological sites, however, indicate that the containing sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontological potential in each case. (SVP 1995)

Many archaeological sites contain features that are visually detectable on the surface. In contrast, fossils are often contained within surficial sediments or bedrock, and are therefore not observable or detectable unless exposed by erosion or human activity.

In summary, paleontologists cannot know either the quality or quantity of fossils prior to natural erosion or human-caused exposure. As a result, even in the absence of fossils on the surface, it is necessary to assess the sensitivity of rock units based on their known potential to produce significant fossils elsewhere within the same geologic unit (both within and outside the study area), a similar geologic unit, or based on whether the unit in question was deposited in a type of environment that is known to be favorable for fossil preservation. Monitoring by experienced paleontologists greatly increases the probability that fossils will be discovered during ground-disturbing activities and that, if these remains are significant, successful mitigation and salvage efforts may be undertaken in order to prevent adverse impacts to these resources.

Paleontological Sensitivity

Paleontological sensitivity is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, past history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its "Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources," the SVP (2010:1–2) defines four categories of paleontological sensitivity (potential) for rock units: high, low, undetermined, and no potential:

High Potential. "Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e.g., ashes or tephras), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.). Paleontological potential consists of both a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential."

Low Potential. "Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e.g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils."

Undetermined Potential. "Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy."

No Potential. "Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection or impact mitigation measures relative to paleontological resources" (SVP 2010:1–2).

PROJECT LOCATION AND DESCRIPTION

The project is in the cities of Duarte and Irwindale in the southwestern portion of Section 31 of Township 1 North, Range 10 West of the Azusa 7.5-minute U.S. Geological Survey Quadrangle (Figure 1). The project area is bounded to the north by Duarte Road; to the west by Cinco Robles Drive, the Duarte Flood Control Channel, and Buena Vista Street; and to the east and south by the Santa Fe Flood Control Basin. The project site is primarily located in the City of Duarte (approximately 89.5 acres), with a small portion of the eastern and southern project area located in the City of Irwindale (approximately 26.5 acres). In accord with CEQA Guidelines Section 15050, the City of Duarte has been designated as the lead agency for environmental reporting. The City of Hope proposes a 20-year enhancement and development of their campus. This development would include enhancements to existing buildings involved in outpatient and inpatient care as well as research, office, industrial, warehouse, and hospitality uses. New parking structures, surface parking lots, internal roadways, and pedestrian and open space improvements are also included in the plan.

Project Personnel

SWCA project manager Steven Treffers, M.H.P., provided oversight on this project. SWCA Lead Paleontologist Alyssa Bell, Ph.D. requested the museum records search and authored this report. Geographic Information Systems (GIS) Specialist Jeremy Huey produced the figures, and Technical Editor Peter Von der Porten edited and formatted this report. SWCA principal investigator paleontologist Russell Shapiro, Ph.D., reviewed this report.

Figure 1. Locality map for the City of Hope Project.

METHODS

Analysis of Existing Data Methods

The project area was the subject of thorough background research and analysis. The research included geologic map and literature reviews, as well as previous locality data searches. The purpose of the review was to evaluate the paleontological sensitivity of the project area by identifying known fossil resources within the project area and nearby in the same geologic formations. In addition, SWCA conducted a paleontological records search with the LACM. The purpose of the museum records search was to 1) determine whether any previously recorded fossil localities occur in the project area; 2) assess the potential for disturbance of these localities during construction; and 3) evaluate the paleontological sensitivity of the project area.

RESULTS

Literature Search Results

Geologic Setting

California is naturally divided into the following 12 geomorphic provinces, each distinguished from one another by having unique topographic features and geologic formations: 1) the Sierra Nevada, 2) the Klamath Mountains, 3) the Cascade Range, 4) the Modoc Plateau, 5) the Basin and Range, 6) the Mojave Desert, 7) the Colorado Desert, 8) the Peninsular Ranges, 9) the Transverse Ranges, 10) the Coast Ranges, 11) the Great Valley, and 12) the Offshore area (Norris and Webb 1976). The project site is located in the southernmost part of the Transverse Ranges, very near to the boundary with the Peninsular Ranges geomorphic province. The Transverse Ranges run east–west between the Peninsular Ranges to the south and the Coast Ranges and Mojave Desert to the north.

Locally, the project is within the northern portion of the Los Angeles Basin in the San Gabriel Mountain Assemblage (Morton and Miller 2006). The San Gabriel Mountain Assemblage is a complex mosaic of faults disrupting basement rocks of Proterozoic and Paleozoic metamorphic and igneous rocks, the late Triassic Mount Lowe Intrusive Suite (218 million years old [Ma]), the late Cretaceous-Paleocene Pelona Schist (99.6–55.8 Ma), and the Oligocene (33.9–23.03 Ma) granodiorite of Telegraph Peak (Nourse 2002). Tertiary sediments belonging to the Topanga Group (18–12 Ma; Campbell et al. 2009) and the Puente Formation (ca. 15–12 Ma; Critelli et al. 1995) overlie the basement igneous and metamorphic rocks. These rocks form a thick sequence of marine sandstones, siltstones, shales, and conglomerates (Morton and Miller 2006). The project area is located just south of where the San Gabriel Mountains end in the Los Angeles Basin, an area that has seen large amounts of sediment deposited from the mountains since the early Pleistocene (ca. 2.6–0.7 Ma; Yerkes et al. 1965). Because of steep gradients in the mountains and the high degree of faulting, landslide deposits are common throughout the assemblage (Morton and Miller 2006). The Los Angeles Basin is a massive, complex structural depression that formed during episodes of crustal extension and faulting during the Miocene (23–5 Ma); this stretching exposed the Mesozoic Catalina Schist on the basin floor, upon which 5,500 meters (16,400 feet) of sediment was unconformably stacked (Norris and Webb 1976). Most of the basin-filling material was deposited during the last 4 million years and is largely composed of marine sediments topped off by a relatively thin terrestrial sequence (Norris and Webb 1976). During the Pliocene (5.3–3.6 Ma), the basin sat at its deepest: over 1,219 meters (4,000 feet) below sea level (Natland 1957). By the Holocene, with global sea level drop and continued uplift of the region, the Los Angeles Basin had assumed its modern elevation and appearance (Woodring et al. 1946).

The project area is just south of the Sierra Madre fault zone, which forms the southern boundary of the San Gabriel Mountains and is an active reverse thrust fault system today. This fault, combined with the Cucamonga Fault, is primarily responsible for uplift of the San Gabriel Mountains (Crook et al. 1987). Around Azusa, which is just to the east of the project area, the Sierra Madre Fault has uplifted basement Cretaceous rocks over the younger Tertiary sedimentary sequence, a vertical displacement of over 3,000 meters (10,000 feet; Morton and Miller 2006).

Project Geology and Paleontology

The geology in the vicinity of the project area has been mapped by Dibblee and Ehrenspeck (1998) at a scale of 1:24,000 and by Morton and Miller (2003, 2006) at a scale of 1:100,000. Additionally, detailed geologic reporting of the project region has been published by Yerkes et al. (1965) and Crook et al. (1987). A map of the surficial geology in and around the project area is shown in Figure 2. The project area is covered with young alluvial fan deposits (Qyf_4) that date from the late Holocene. These deposits consist of unconsolidated to slightly consolidated silt, sand, and coarse-grained sand in the northwestern corner of the project area, with larger clasts in the remainder of the project area (Dibblee and Ehrenspek 1998). While the thickness of these deposits has not been established in the project area, in Monrovia, just west of the project area, they are approximately 30 meters (100 feet) thick (Crook et al. 1987). Because of the young age of these sediments, their paleontological sensitivity is low (Figure 3).

Much less is known about the subsurface geology in the vicinity of the project area; however, the subsurface geology of the oil-rich central Los Angeles Basin has been studied extensively (Crook et al. 1987; Yerkes et al. 1965). The middle Miocene volcanic and marine sedimentary sequence crops out sporadically along the southern front of the San Gabriel Mountains, mainly along the Sierra Madre Fault Zone, and is likely present in the subsurface as well (Crooke et al. 1987). The Pliocene sequence of marine and terrestrial sediments is thickest in the central basin (up to 4,300 meters [14,000 feet]) and thins along the margins, including the vicinity of the project area, where it is likely present in the subsurface (Yerkes et al. 1965). The lower Pleistocene marine silt, sandstone, and gravel sequence ranges widely from 550 meters (1,800 feet) thick in the south-central basin to 90 meters (300 feet) in the Puente Hills and is possibly present in the subsurface of the project area (Yerkes et al. 1965). These sediments are particularly rich in marine invertebrate fossils, such as mollusks. The upper Pleistocene is widely exposed in the Los Angeles Basin, with marine terrace deposits, terrestrial sedimentary lenses, a variety of marine deposits that can range from 6 to 1219 meters (20 to 4,000 feet) thick (Yerkes et al. 1965). Near the project area, in Monrovia, these sediments are over 30 meters (100 feet) thick (Crook et al. 1987). These sediments preserve an array of fossils, most commonly marine mollusks, but mammals are also well-known. Along the southern face of the San Gabriel Mountains, in the vicinity of the project area, upper Pleistocene alluvial fans are common and can be hundreds of meters thick (Crook et al. 1987). These sediments have a high paleontological sensitivity. Because these Pleistocene sediments are the result of the same erosional processes at work today, it is difficult to differentiate the older, potentially fossiliferous deposits from the modern alluvial deposits at the surface.

Records Search Results

A summary of the data provided by the LACM (McLeod 2016) indicates that there are no known fossil localities within the project area. The nearest fossil locality that is known to the LACM occurs approximately 24 kilometers (15 miles) west of the project area in Eagle Rock. Two significant fossils are known from this locality, a turkey (*Parapavo californicus*; Miller 1942) and a nearly complete mammoth (*Mammuthus*; Roth 1984). These fossils occurred in geologic deposits similar to those present in the subsurface of the project area—Pleistocene alluvium—at depths of approximately 5 meters (15 feet) below the surface.

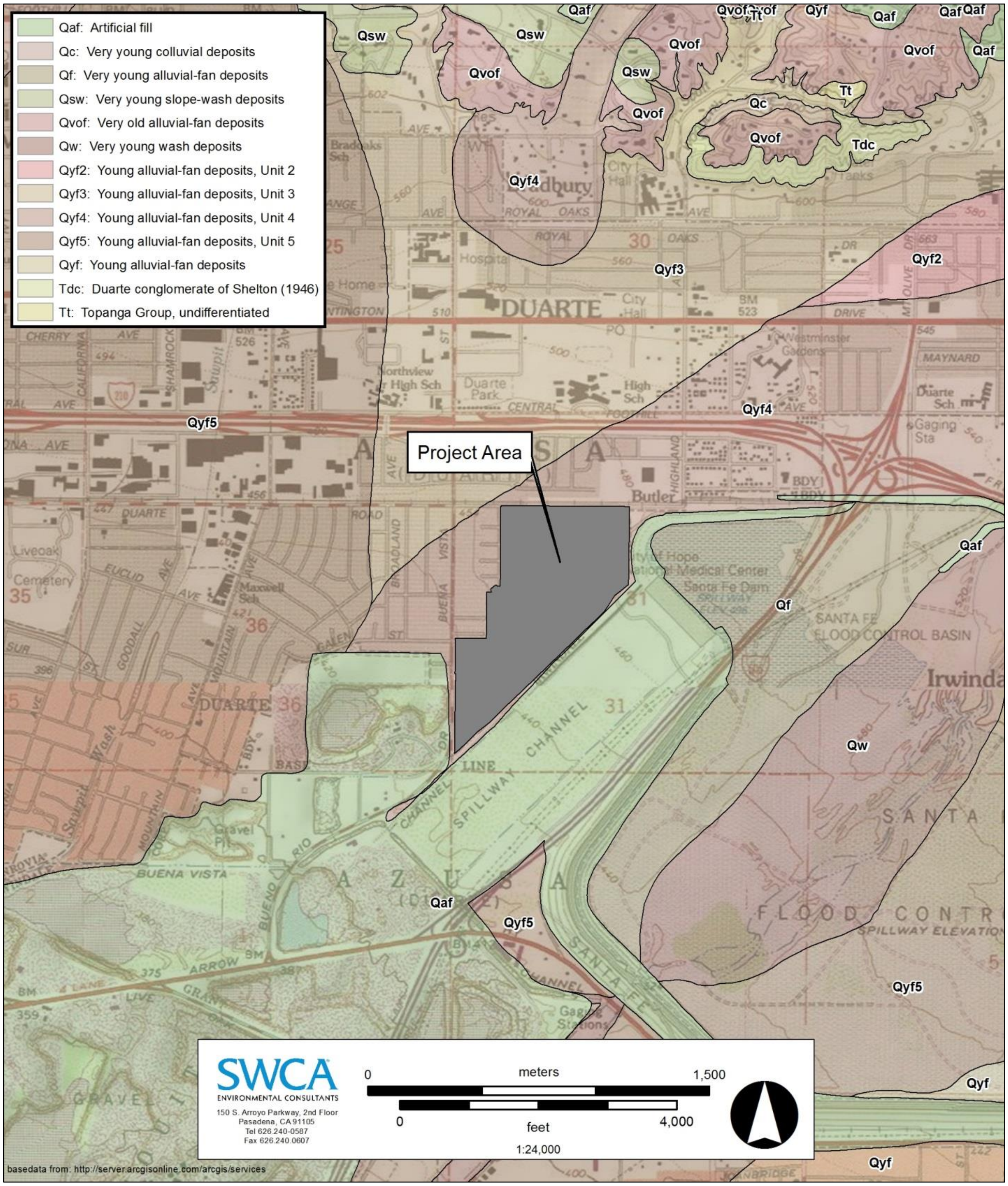

Figure 2. Geologic map of the City of Hope Project area and vicinity, adapted from Dibblee and Ehrenspeck (1998).

CONCLUSIONS

A map of the paleontological sensitivity of the surficial geology in and around the project area is shown in Figure 3. Construction activities including surficial and/or shallow excavations within the surficial young alluvial fan deposits, or in areas of previous disturbance, are unlikely to result in adverse impacts to significant paleontological resources. The surficial sediments are too young to preserve paleontological resources and therefore have low paleontological sensitivity. However, the older Quaternary sediments that are likely present in the subsurface (and which are therefore not visible on the surficial geologic map) are of an age to preserve fossils. As indicated by the records search of the LACM, these sediments have preserved significant vertebrate fossils elsewhere in the region (McLeod 2016) and have high paleontological sensitivity. Therefore, construction activities requiring excavations to a depth below the thickness of the younger alluvial sediments may have an adverse impact to paleontological resources unless proper mitigation measures are implemented. The destruction of fossils as a result of human-caused ground disturbance has a significant cumulative impact because it makes biological records of ancient life permanently unavailable for study by scientists. Implementation of proper mitigation measures can, however, reduce the impacts to the paleontological resources to below the level of significance.

RECOMMENDED MITIGATION MEASURES

In order to demonstrate CEQA compliance, a response is required to the following question in the Environmental Checklist, based on the results of the paleontological analysis: “Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?” With the implementation of the following recommendations, the City of Hope project will not directly or indirectly destroy unique paleontological resources or sites or unique geologic features. The intent of the recommendations is to ensure that potential adverse impacts to paleontological resources as a result of project implementation are reduced to a less-than-significant level.

The following mitigation measures have been developed in accordance with the SVP (2010) standards and meet the paleontological requirements of CEQA. These mitigation measures have been used throughout California and have been demonstrated to be successful in protecting paleontological resources while allowing timely completion of construction.

A. All project-related ground disturbances that could potentially affect previously undisturbed older Quaternary deposits in the subsurface of the project area will be monitored by a qualified paleontological monitor on a full-time basis, as these geologic units are determined to have a high paleontological sensitivity. Because the exact depth at which these deposits may be encountered is unknown, it is recommended that a trained paleontological monitor be present for any excavations over 3 meters (10 feet) in depth to ensure that underlying sensitive sediments are not being impacted. This monitoring will include inspection of exposed sedimentary units during active excavations within sensitive geologic sediments. The monitor will have authority to temporarily divert activity away from exposed fossils to professionally and efficiently recover the fossil specimens and collect associated data. The project paleontologist will prepare monthly progress reports to be filed with the client and the City of Duarte (if requested).

C. Qualified paleontological monitors will use field data forms to record pertinent geologic data, will measure stratigraphic sections (if applicable), and collect appropriate sediment samples from any fossil localities.

D. Recovered fossils will be prepared to the point of curation, identified by qualified experts, listed in a database to facilitate analysis, and deposited in a designated paleontological curation facility.

The most likely repository is the LACM. A repository will be identified and a curatorial arrangement will be signed prior to collection of the fossils.

E. If signficant fossils are recovered, a Qualified Paleontologist will prepare a final monitoring and mitigation report to be filed with PlaceWorks, the City of Duarte, and the repository.

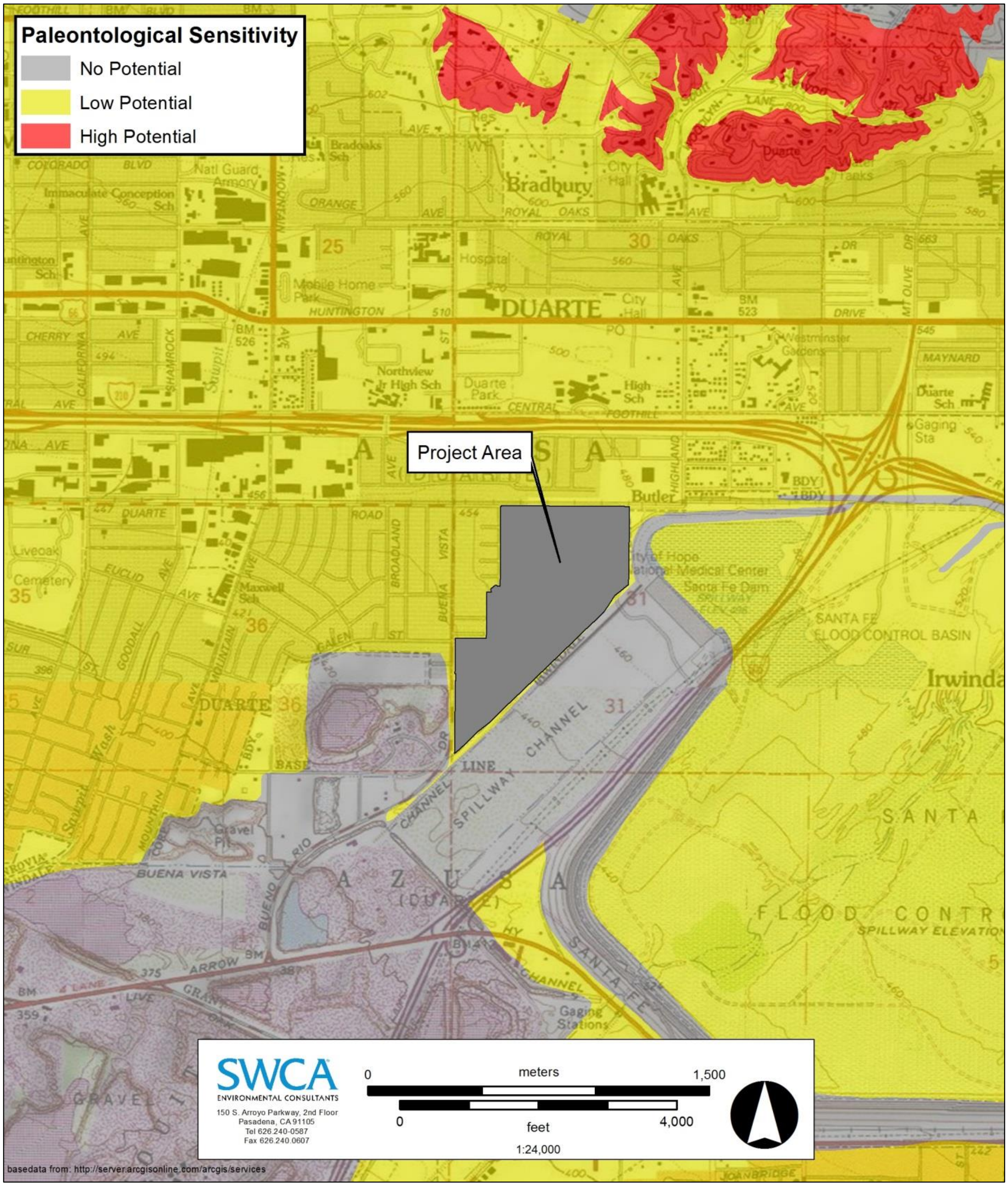

Figure 3. Paleontological sensitivity map for the City of Hope Project area and vicinity.

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