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Paleontological Resources Technical Report

Goodman Logistics Center
City of Fullerton, Orange County, California

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Executive Summary

This technical report provides an assessment of paleontological resources at the proposed Goodman Logistics Center project (Project) site in the City of Fullerton, Orange County, California. The purpose of this report is to identify and summarize paleontological resources that occur within the vicinity of the Project site, identify Project elements (if any) that may negatively impact paleontological resources, and provide, if necessary, recommendations to reduce any potential negative impacts to less than significant levels. The report includes the results of institutional records searches conducted at the Natural History Museum of Los Angeles County (LACM) and the San Diego Natural History Museum (SDNHM).

The approximately 73.1-gross-acre Project site consists of two existing parcels at 2001 East Orangethorpe Avenue (APN 073-120-31 and 073-120-33). The Project Applicant has engaged in negotiations for the acquisition of an off-site, approximately 0.7-acre property located at 2301 East Orangethorpe Avenue (APN 073-120-09). This report addresses the on- and off-site areas. The Project site is a roughly rectangular city block bordered to the south by East Orangethorpe Avenue, to the west by South Acacia Avenue, to the north by Kimberly Avenue, and to the east by South State College Boulevard, to the exclusion of several small parcels located at the northwestern corner of East Orangethorpe Avenue and South State College Boulevard (APN 073-120-17, 073-120-20, 073-120-27, and 073-120-30). As proposed, the Project would involve subdivision of the site into four parcels, demolition of existing structures, and construction of four new buildings totaling up to 1,609,384 square feet (assuming acquisition of the additional parcel) for warehousing and distribution, with one building located on each parcel. On- and off-site improvements will include construction of surface parking areas and vehicle drive aisles, as well as landscaping, storm water storage, utility infrastructure, lighting, signage, and surface improvements to all four adjacent streets.

Published geologic mapping for the Project site indicates the site is underlain by Quaternary young alluvial fan deposits (Qyf). The alluvial fan deposits are considered to be late Pleistocene to Holocene in age (less than approximately 129,000 years old) at the surface, but such deposits typically transition downward in the subsurface into older, early to middle Pleistocene-age alluvial deposits.

There are two documented LACM fossil localities from similar Quaternary alluvial deposits located approximately 2.4 to 3.8 miles southeast of the Project site, which produced fossil remains of sheep (*Ovis* sp.) and horse (*Equus* sp.). The SDNHM, meanwhile, has five documented fossil localities that were discovered in presumably Pleistocene-age alluvial deposits during construction of the Gardenwalk commercial development in Anaheim, located approximately 4.7 miles south-southwest of the Project site. These localities produced a small assemblage of pulmonate snails, freshwater mussels, and rodents (the pocket gopher *Thomomys bottae* and pocket mouse *Perognathus* sp.).

A low to high paleontological potential is assigned to the Quaternary young alluvial fan deposits underlying the entire Project site, with the depth of transition between low potential Holocene-age alluvial deposits and high potential Pleistocene-age alluvial deposits estimated to occur at approximately 8 feet below existing ground surface (bgs). Based on a review of the proposed construction elements, impacts to paleontological resources are not likely to occur during the surficial phase of mass grading (e.g., grading for slab-on-grade building foundations, parking lots, and driveways). However, earthwork related to installation of deep utilities and construction of storm water drains that extend deeper than 8 feet bgs have the potential to directly impact paleontological resources.

Because construction of the proposed Project has the potential to impact paleontological resources during deeper phases of earthwork within Quaternary young alluvial fan deposits, implementation of a paleontological mitigation program centered around paleontological monitoring of this deeper earthwork is recommended (outlined in Mitigation Measures 1–7). Implementation of the paleontological mitigation program will reduce any Project-related impacts to paleontological resources to a level that is less than significant.

Contents

1.0 Introduction

1.1 Project Description

This technical report provides an assessment of paleontological resources for the proposed Goodman Logistics Center project (Project) site, City of Fullerton, Orange County, California (Figure 1). The 73.1-gross-acre Project site consists of two existing parcels at 2001 East Orangethorpe Avenue (APN 073-120-31 and 073-120-33), and one off-site parcel located at 2301 East Orangethorpe Avenue (APN 073-120-09). The Project Applicant has engaged in negotiations for the acquisition of the approximately 0.7-acre property at 2301 East Orangethorpe Avenue. This report addresses the on- and off-site areas. The Project site is a roughly rectangular city block bordered to the south by East Orangethorpe Avenue, to the west by South Acacia Avenue, to the north by Kimberly Avenue, and to the east by South State College Boulevard, to the exclusion of several small parcels located at the northwestern corner of East Orangethorpe Avenue and South State College Boulevard (APN 073-120-17, 073-120-20, 073-120-27, and 073-120-30). As proposed, the Project would involve subdivision of the site into four parcels, demolition of existing structures, and construction of four new buildings totaling up to 1,609,384 square feet for warehousing and distribution, with one building located on each parcel. On- and off-site improvements will include construction of surface parking areas and vehicle drive aisles, as well as landscaping, storm water storage, utility infrastructure, lighting, signage, and surface improvements to all four adjacent streets.

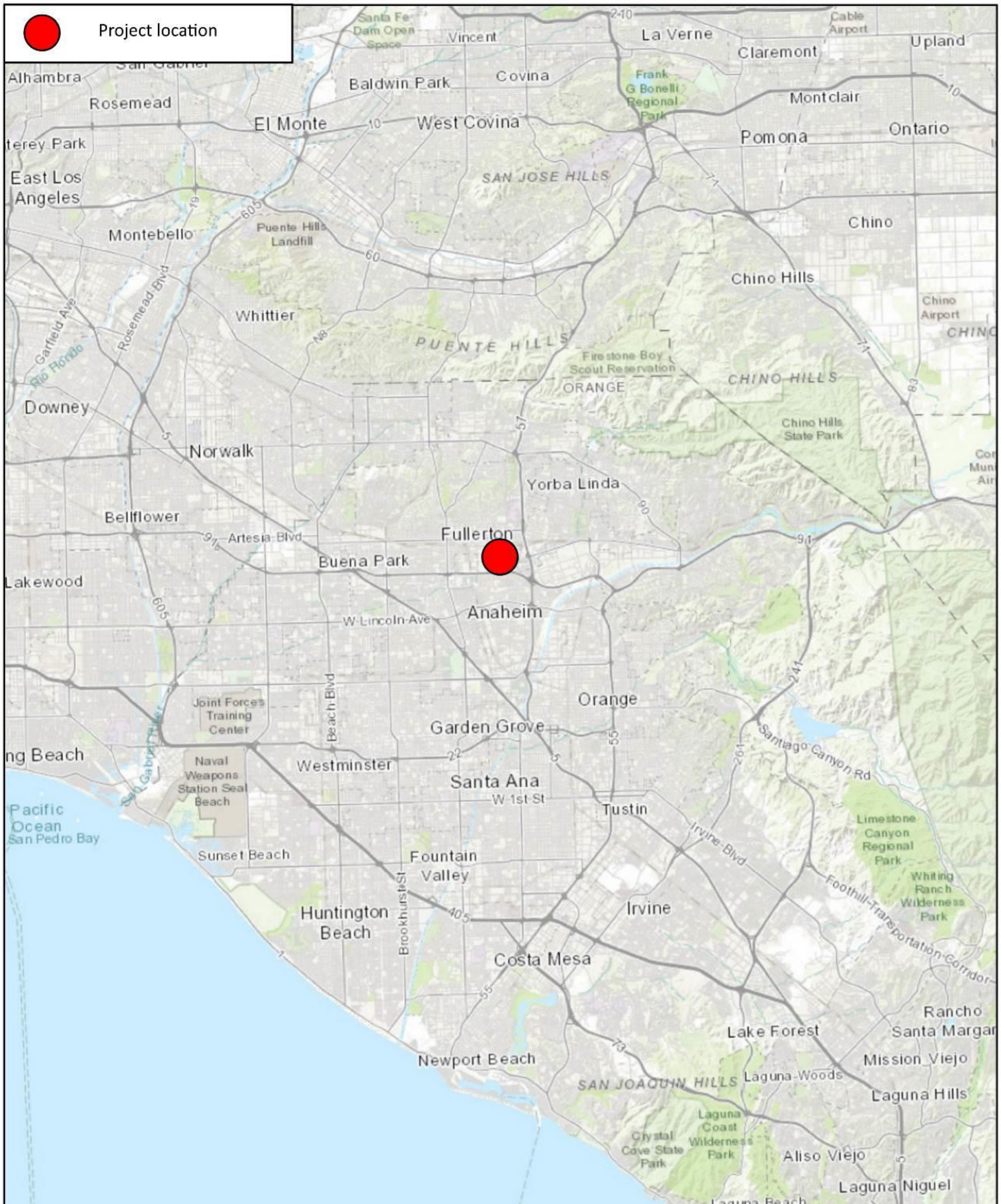
1.2 Scope of Work

This report was produced in support of an Enviromental Impact Report (EIR) required by the City of Fullerton for the proposed Project. It addresses potential impacts to paleontological resources that may occur during construction of the proposed Project by summarizing existing paleontological resource data at the Project site, discussing the significance of these resources, examining potential Project-related impacts to paleontological resources, and, if necessary, suggesting mitigation measures to reduce impacts to paleontological resources to less than significant levels. The report includes the results of a literature review of relevant geological and paleontological reports and institutional records searches of the paleontological collections at the Natural History Museum of Los Angeles County (LACM) and the San Diego Natural History Museum (SDNHM). This report was prepared by Katie M. McComas and Thomas A. Deméré of the Department of PaleoServices, SDNHM.

1.3 Definition of Paleontological Resources

As defined here, paleontological resources (i.e., fossils) are the buried remains and/or traces of prehistoric organisms (i.e., animals, plants, and microbes). Body fossils such as bones, teeth, shells, leaves, and wood, as well as trace fossils such as tracks, trails, burrows, and footprints, are found in the geologic units/formations within which they were originally buried. The primary factor determining whether an object is a fossil or not is not how the organic remain or trace is preserved (e.g., "petrified"), but rather the age of the organic remain or trace. Although typically it is assumed that fossils must be older than ~11,700 years (i.e., the generally accepted end of the last glacial period of the Pleistocene Epoch), organic remains older than recorded human history and/or older than middle Holocene (about 5,000 radiocarbon years) can also be considered to represent fossils (SVP, 2010).

Fossils are considered important scientific and educational resources because they serve as direct and indirect evidence of prehistoric life and are used to understand the history of life on Earth, the nature of past environments and climates, the membership and structure of ancient ecosystems, and the pattern and process of organic evolution and extinction. In addition, fossils are considered to be non-renewable resources because typically the organisms they represent no longer exist. Thus, once destroyed, a particular fossil can never be replaced.



Sources: World Topographic Map, Esri et al., 2020

PaleoServices	FIGURE 1	**Overview Map** Goodman Logistics Center City of Fullerton, Orange County, California	0 — 7.5 scale in miles

Finally, paleontological resources can be thought of as including not only the actual fossil remains and traces, but also the fossil collecting localities and the geologic units containing those localities. The locality includes both the geographic and stratigraphic context of fossils—the place on the earth and stratum (deposited during a particular time in earth's history) from which the fossils were collected. Localities themselves may persist for decades, in the case of a fossil-bearing outcrop that is protected from natural or human impacts, or may be temporarily exposed and ultimately destroyed, as is the case for fossil-bearing strata uncovered by erosion or construction. Localities are documented with a set of coordinates and a measured stratigraphic section tied to elevation detailing the lithology of the fossil-bearing stratum as well as overlying and underlying strata. This information provides essential context for any future scientific study of the recovered fossils.

1.3.1 Definition of Significant Paleontological Resources

The California Environmental Quality Act (CEQA, Public Resources Code Section 21000 et seq.) dictates that a paleontological resource is considered significant if it "has yielded, or may be likely to yield, information important in prehistory or history" (Section 15064.5, [a][3][D]). The Society of Vertebrate Paleontology (SVP) has further defined significant paleontological resources as consisting of "fossils and fossiliferous deposits[…]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" (SVP, 2010).

1.4 Regulatory Framework

Paleontological resources are considered scientifically and educationally significant nonrenewable resources, and as such they are protected under a variety of federal (e.g., Antiquities Act of 1906; National Environmental Policy Act of 1969; Federal Land Policy Management Act of 1976; Paleontological Resources Preservation Act of 2009), state (e.g., California Environmental Quality Act [CEQA]; Public Resources Code), and local (City of Fullerton) laws, regulations, and ordinances, outlined below.

1.4.1 Federal

The American Antiquities Act of 1906 (P.L. 59–209, 34 Stat. 225, 16 U.S.C. 431–433) establishes a penalty for disturbing or excavating any historic or prehistoric ruin or monument or object of antiquity on federal lands. The act also establishes a permit requirement for collection of antiquities on federal lands. Although not specifically addressing paleontological resources, the act is considered relevant to such resources by number of federal agencies that consider fossils to be objects of antiquity.

The National Environmental Policy Act (NEPA) of 1969 (P.L. 91–190, 83 Stat. 852, 42 U.S.C. 4321–4347) recognizes the continuing responsibility of the Federal Government to "preserve important historic, cultural, and natural aspects of our national heritage..." (Sec. 101 [42 U.S.C. § 4321]) (#382). As with the American Antiquities Act, NEPA does not specifically address paleontological resources but is interpreted by many federal agencies to be applicable to such resources. For example, the BLM and the USFS both view NEPA as one of the major laws protecting paleontological resources on public lands.

The Federal Land Policy and Management Act (FLPMA) of 1976 (P.L. 94–579, 90 Stat. 2744, 43 U.S.C. 1701–1785) defines significant fossils as: unique, rare or particularly well-preserved; an unusual assemblage of common fossils; being of high scientific interest; or providing important new data concerning [1] evolutionary trends, [2] development of biological communities, [3] interaction between or among organisms, [4] unusual or spectacular circumstances in the history of life, [5] or anatomical structure.

The Paleontological Resources Preservation Act (PRPA) of 2009 (P.L. 111–11, 123 Stat. 991, H.R. 146) is the first statute to directly address the management and protection of paleontological resources on federal lands. This law essentially codifies collecting polices of federal land management agencies. It allows reasonable amounts of common invertebrate and plant fossils to be casually collected with negligible disturbance. In addition, it requires protection and preservation of uncommon invertebrate and plants and all vertebrate fossils, including imprints, molds, casts, etc. The PRPA further describes requirements for permitting collection on federal lands, stipulations regarding the use of paleontological resources in education, continued federal ownership of recovered paleontological resources, and standards for acceptable repositories of collected specimens and associated data. The PRPA also provides for criminal and civil penalties for unauthorized removal of paleontological resources from federal lands.

1.4.2 State

The California Environmental Quality Act (CEQA, Public Resources Code Section 21000 *et seq.*) protects paleontological resources on both state and private lands in California. This act requires the identification of environmental impacts of a proposed project, the determination of significance of the impacts, and the identification of alternative and/or mitigation measures to reduce adverse environmental impacts. The Guidelines for the Implementation of CEQA (Title 14, Chapter 3, California Code of Regulations: 15000 *et seq*.) outlines these necessary procedures for complying with CEQA. Paleontological resources are specifically included as a question in the CEQA Environmental Checklist (Section 15023, Appendix G): “Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.” Also applicable to paleontological resources is the checklist question: “Does the project have the potential to… eliminate important examples of major periods of California history or pre-history.”

Other state requirements for paleontological resource management are included in the Public Resources Code (Chapter 1.7), Section 5097.5 and 30244. These statutes prohibit the removal of any paleontological site or feature on public lands without permission of the jurisdictional agency, defines the removal of paleontological sites or features as a misdemeanor, and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state) lands.

1.4.3 Local

The City of Fullerton General Plan (The Fullerton Plan; adopted in 2012) does not directly address paleontological resources. However, an overview of documented paleontological resources from the geologic units underlying the City of Fullerton is provided in Section 5.10: Cultural Resources of the Final Program Environmental Impact Report (EIR) prepared for the General Plan update (RBF Consulting, 2012). The EIR utilizes the CEQA Initial Study Environmental Checklist questions as thresholds of significance when determining whether a project would have a significant impact on paleontological resources. The EIR concludes that implementation of The Fullerton Plan could result in impacts to paleontological resources, and suggests that impacts to paleontologically sensitive geologic units should be mitigated through construction monitoring and fossil salvage and/or resource avoidance, if possible.

2.0 Methods

2.1 Paleontological Records Searches and Literature Review

Paleontological records searches were conducted at the LACM and SDNHM in order to determine if any documented fossil collection localities occur within the Project site or immediate surrounding area. The

SDNHM records search involved examination of the paleontological database for any records of known fossil collection localities from sedimentary deposits similar to those underlying the Project site within an approximately 5-mile radius. A records search of the vertebrate paleontological collections at LACM was also completed (McLeod, 2020; Appendix).

Additionally, a review was conducted of relevant published geologic maps (e.g., Morton and Miller, 2006), published geological and paleontological reports (e.g., Jefferson, 1991a,b), and other relevant literature (e.g., unpublished paleontological mitigation reports). This approach was followed in recognition of the direct relationship between paleontological resources and the geologic units within which they are entombed. Knowing the geologic history of a particular area and the fossil productivity of geologic units that occur in that area, makes it is possible to predict where fossils may, or may not, be encountered.

2.2 Paleontological Resource Assessment Criteria

The Society of Vertebrate Paleontology (SVP, 2010) has developed mitigation guidelines for paleontological resources that conform with industry standards (Murphey et al., 2019) and were developed with input from a variety of federal and state land management agencies. Use of the SVP (2010) guidelines is common practice by CEQA lead agencies.

The SVP (2010) guidelines recognize that significant paleontological resources are considered to include not only actual fossil remains and traces, but also the fossil collecting localities and the geologic units containing those fossils and localities, and thus evaluate paleontological potential (or paleontological sensitivity) of individual geologic units within a project area. Paleontological potential is determined based on the existence of known fossil localities within a given geologic unit, and/or the potential for future fossil discoveries, given the age and depositional environment of a particular geologic unit. The SVP guidelines include four classes of paleontological potential: High Potential, Undetermined Potential, Low Potential, or No Potential (SVP, 2010). A summary of the criteria for each paleontological potential ranking is outlined below.

2.2.1 High Potential

Geologic 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. Geologic units classified as having high potential include, but are not limited to, some volcaniclastic formations (e. g., ashes or tephras), some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and geologic units temporally or lithologically suitable for the preservation of fossils (e. g., deposits aged middle Holocene and older consisting of fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.). Paleontological potential includes both the potential for yielding abundant or significant vertebrate fossils or for yielding significant invertebrate, plant, or trace fossils, as well as the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Geologic units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and geologic units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.

2.2.2 Undetermined Potential

The definition for undetermined potential provided by SVP (2010) has been expanded for the purposes of this report in order to add more information related specifically to the management of paleontological resources in the context of mitigation paleontology. Geologic units are assigned an undetermined potential if there is little information available concerning their paleontological content, geologic age, and depositional environment. Further field study of the specific formation is necessary to determine if these geologic units have high or low potential to contain significant paleontological resources. For planning purposes, this class of resource potential represents a conservative assessment that assumes an undetermined geologic unit is fossiliferous until proven otherwise.

In the context of mitigation paleontology, gaining additional information about a geologic unit assigned an undetermined potential in order to refine the resource potential ranking (e.g., to high potential or low potential) can be accomplished in several ways depending on the nature of the geologic unit and whether it is exposed at the surface. Field surveys (e.g., a pre-construction survey as part of a paleontological resource assessment) can be conducted when a geologic unit is well exposed at the ground surface, allowing paleontologists to physically search for fossils while also studying the stratigraphy of the unit. In cases where the geologic unit is not exposed at the surface (e.g., is covered by disturbed areas such as concrete or agricultural topsoil, or occurs in the subsurface underlying another geologic unit), strategically located excavations into subsurface stratigraphy may be conducted to gain additional information (e.g., geotechnical investigation boreholes or trenches). Paleontological monitoring of excavations into a geologic unit with an undetermined potential as part of a paleontological monitoring program may also allow for refinement of the resource potential ranking of the unit over the course of the monitoring program. In this case, the results of the monitoring program are used to routinely reevaluate the resource potential ranking of the geologic unit.

2.2.3 Low Potential

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

2.2.4 No Potential

Geologic units with no potential are either entirely igneous in origin and therefore do not contain fossil remains, or are moderately to highly metamorphosed and thus any contained fossil remains have been destroyed. Artificial fill materials also have no potential, because the stratigraphic and geologic context of any contained organic remains (i.e., fossils) has been lost. For projects encountering only these types of geologic units, paleontological resources can generally be eliminated as a concern, and no further action taken.

2.3 Paleontological Impact Analysis

Direct impacts to paleontological resources occur when earthwork operations cut into the geologic units within which fossils are buried and physically destroy the fossil remains. As such, only those excavations that will disturb potentially fossil-bearing geologic units have the potential to significantly impact paleontological resources. As described above, potentially fossiliferous geologic units are those rated with a high potential. Taking a conservative approach, geologic units with an undetermined potential are also considered to be potentially fossiliferous until proven otherwise. Although impact avoidance is possible through relocation of a proposed action, paleontological monitoring during construction is typically recommended for geologic units with a high or undertermined potential to reduce any negative impacts to paleontological resources to less than significant levels.

The purpose of the impact analysis is to determine which (if any) of the proposed Project-related earthwork activities may disturb potentially fossil-bearing geologic units, and where and at what depths these impacts are likely to occur. The paleontological impact analysis involved analysis of available Project documents, and comparison with geological and paleontological data gathered during the records searches and literature review.

3.0 Results

3.1 Results of the Records Searches and Literature Review

3.1.1 Project Geology

Geologic setting: The Project site lies near the middle of the Central Plain of the Los Angeles Basin as mapped by Yerkes et al. (1965). This region is characterized by the coalesced floodplains and alluvial fans of the Santa Ana and San Gabriel rivers. Prior to construction of concrete storm channels, the active channels of these rivers meandered across the Central Plain depositing their seasonal bed loads of sediment eroded from the San Gabriel and Santa Ana mountains to the east. The Santa Ana River was also active during earlier Pleistocene glacial low sea levels when downcutting of the river channel eroded through older Pleistocene marine and non-marine sedimentary rocks to create the distinct gaps (i.e., the Bolsa Gap and the Santa Ana Gap) between Bolsa Chica Mesa, Huntington Beach Mesa, and Newport Mesa (California Department of Water Resources, Southern District, 1961). Subsequent interglacial rise in sea level caused the Santa Ana River to backfill its incised river valley with Holocene-age fluvial silts, sands, and gravels. These Holocene surficial sediments are mapped by Morton and Miller (1981) as Quaternary alluvium and colluvium related to the modern Santa Ana River floodplain. Yerkes et al. (1965) noted that the Holocene deposits are not easily separated from upper Pleistocene strata on lithologic grounds, primarily due to the similar depositional environments (i.e., fluvial and alluvial) and the relatively unconsolidated nature of both sequences.

Project-specific geology: The proposed Project site is underlain (at least at the surface) by deposits mapped by Morton and Miller (2006) as Quaternary young alluvial fan deposits (Qyf) of late Pleistocene and Holocene age (Figure 2). These sediments were likely deposited by either the ancient Santa Ana River and/or one of its tributaries, or by local alluvial fans derived from the highlands to the north and east of the Project site. According to the Project geotechnical report (Southern California Geotechnical, Inc., 2019), the upper 12 to 17 feet of alluvial sediments underlying the site primarily consist of silty sands and fine- to coarse-grained sands with varying amounts of gravel and clay. At greater depths are mixtures of silt and fine sand, with fine- to coarse-grained sand horizons. The predominance of finer-grained deposits (silts and sands) rather than coarser grained deposits (gravels) underlying the Project site is more consistent with low energy fluvial depositional conditions rather than the higher energy conditions of an alluvial fan. As indicated in the Project geotechnical report, artificial fill soils up to 3 feet thick overlie the alluvial deposits within the Project site (Southern California Geotechnical, Inc., 2019).

3.1.2 Project Paleontology

There are two documented LACM vertebrate fossil collection localities from Quaternary alluvial deposits located approximately 2.4 and 3.8 miles southeast of the Project site (LACM 1652 and LACM 4943, respectively; see Appendix). LACM 1652 is located in the City of Anaheim just to the west of the Santa Ana River, and yielded fossil remains of a sheep (*Ovis* sp.) at an unknown depth below ground surface (bgs). LACM 4943 is located in the City of Orange to the east of the Santa Ana River, and produced fossil remains of a horse (*Equus* sp.) at a depth of 8 to 10 feet bgs.

In addition, there are five documented SDNHM fossil collection localities that were discovered during paleontological monitoring of initial mass grading for the Gardenwalk commercial development, located at the northwest corner of West Katella Avenue and South Clementine Street in the City of Anaheim. The approximate transition depth from younger, Holocene-age sediments and older, Pleistocene-age sediments at the Anaheim site was estimated to occur at 16 feet bgs. The fossil-bearing horizons were exposed between approximately 20 and 45 feet bgs, and consisted of interbedded fine- to coarse-grained sandstones, claystones/mudstones, and paleosols (ancient soil horizons) deposited in fluvial and lacustrine settings. Paleontological monitoring resulted in the recovery of shells of a small assemblage of pulmonate snails (cf. *Fossaria* sp., *Physella* sp., *Gyraulus* sp., *Planorbella accidentale*, and cf. *Lymnaea* sp.) and freshwater mussels (*Anodonta* sp.), and jaws and teeth of rodents (the pocket gopher *Thomomys bottae* and pocket mouse *Perognathus* sp.).

Pleistocene-age alluvial deposits have produced fossil remains at various generally described (i.e., unspecified depth bgs) sites in northern Orange County (Jefferson, 1991a,b). Several fossil sites in Irvine yielded remains of bony fish, ray, iguana, snake, pond turtle, vulture, rodent, weasel, fox, coyote, dire wolf, bear, jaguar, cougar, bobcat, saber-toothed cat, bison, camel, pronghorn, ground sloth, and mammoth. Additional sites in Seal Beach, Huntington Beach, and Costa Mesa produced fossil remains of bony fish, amphibian, bird, bison, camel, deer, horse, and mammoth.

3.2 Results of the Paleontological Resource Assessment

Following the SVP (2010) impact mitigation guidelines, as outlined in Section 2.2, Holocene-age alluvial deposits underlying the Project site are assigned a low paleontological potential. This rating is based on the relatively young age (generally less than about 11,700 years old) of these deposits and the recognition that organic remains preserved in such deposits are conspecific with organisms living in the area today.

However, as mentioned above, the surficial Holocene-age sediments may transition in the subsurface into older, Pleistocene-age deposits, at depths that may be as shallow as 8 feet bgs or as deep as 16 feet bgs (see Section 3.1.2). Pleistocene alluvial deposits located at depth within the Project site are assigned a high paleontological potential based on the occurrence of scientifically significant vertebrate fossils in similar deposits found at several sites within 5 miles of the Project site.

Considering that the contact between Holocene-age deposits and older, Pleistocene-age deposits may occur as shallow as 8 feet bgs, all deposits underlying the Project area are specifically assigned a low paleontological potential from 0–8 feet bgs, where they are assumed to be Holocene in age, and a high paleontological potential at depths greater than 8 feet bgs, where they may be Pleistocene in age (Figure 3).

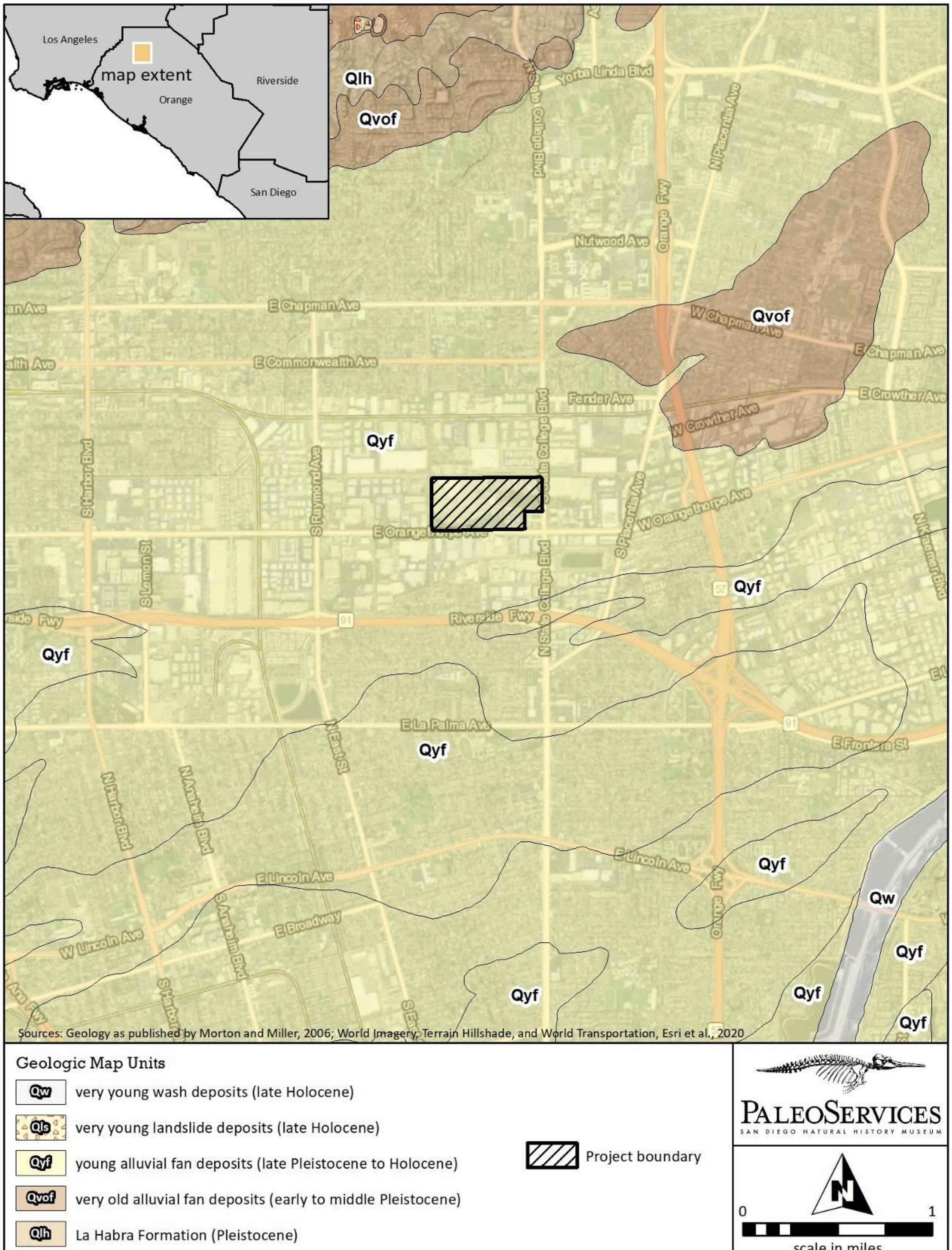


Figure 2: Geologic Map of Goodman Logistics Center Project, City of Fullerton, Orange County, California

Figure 3: Paleontological Sensitivity Map of Goodman Logistics Center Project, City of Fullerton, Orange County, California

3.3 Results of the Paleontological Impact Analysis

The proposed Project will involve construction of four single-story buildings, which will be supported by conventional slab-on-grade shallow foundation systems. In addition, there are also plans for construction of parking lots and driveways, and installation of underground wet and dry utilities. Preliminary designs suggest that the sewer line connection and storm water drain will likely require excavation to depths of 10 to 12 feet bgs.

Based on these proposed construction elements, it is likely that overexcavation and recompaction of surficial fill and loose alluvial sediments for the slab-on-grade building foundations and superficial grading for the attendant parking lots and driveways will be shallower than the estimated 8 foot depth transition between low and high sensitivity. This review indicates that impacts to paleontological resources are, therefore, not likely to occur during the surficial phase of mass grading. However, earthwork related to installation of deep utilities and storm water drains will extend to or beyond the 8 foot depth threshold, and thus has the potential to directly impact paleontological resources.

4.0 Recommendations & Conclusions

Implementation of a paleontological mitigation program, in the form of paleontological monitoring, is recommended for deep utility and storm water drain earthwork at the Project site that will directly impact Quaternary young alluvial fan deposits. Implementation of the following mitigation measures will reduce any Project-related impacts to paleontological resources to a level that is less than significant.

4.1 Mitigation Measures

1. Prior to the start of earthwork, a qualified Project Paleontologist shall be retained to oversee the paleontological monitoring program and shall attend the pre-construction meeting to consult with Project contractors concerning excavation schedules, paleontological field techniques, and safety issues. In addition, a professional repository shall be designated to receive any discovered fossils.

   A qualified Project Paleontologist is defined as an individual with an M.S. or Ph.D. in paleontology or geology that is experienced with paleontological procedures and techniques, who is knowledgeable in the geology and paleontology of Orange County, and who has worked as a paleontological mitigation project supervisor for at least one year.

   A professional repository is defined as a recognized paleontological specimen repository (e.g., an AAM-accredited museum or university) with a permanent curator, and should be capable of storing fossils in a facility with adequate security against theft, loss, damage, fire, pests, and adverse climate conditions.

2. A paleontological monitor shall be on-site during all earthwork operations at or exceeding 8 feet bgs (i.e., trenching for deep utilities and storm water drains) that directly impact Quaternary young alluvial fan deposits. The paleontological monitor should be equipped to salvage fossils as they are unearthed (including bulk matrix samples containing microvertebrate fossils). Paleontological monitoring may be reduced (e.g., part-time monitoring or spot-checking) or eliminated, at the discretion of the Project Paleontologist and in consultation with the City of Fullerton if the Project Paleontologist determines there is a low risk of encountering paleontological resources. Changes to the paleontological monitoring schedule shall be based on the results of the mitigation program as it unfolds during site development, and current and anticipated conditions in the field.

A paleontological monitor is defined as an individual with a college degree in paleontology or geology who has experience in the recognition and salvage of fossil materials. The paleontological monitor should work under the direction of the Project Paleontologist.

3. If fossils are discovered, the Project Paleontologist (or paleontological monitor) shall make an initial assessment to determine their significance. All identifiable vertebrate fossils (large or small) and uncommon invertebrate, plant, and trace fossils are considered to be significant and shall be recovered (SVP, 2010). Representative samples of common invertebrate, plant, and trace fossils shall also be recovered. Although fossil salvage can often be completed in a relatively short period of time, the Project Paleontologist (or paleontological monitor) shall be allowed to temporarily direct, divert, or halt earthwork in his or her discretion during the initial assessment phase if additional time is required to salvage fossils. If it is determined by the Project Paleontologist that the fossil(s) should be recovered, the recovery will be completed in a timely manner. Some fossil specimens (e.g., a large mammal skeleton) may require an extended salvage period. Because of the potential for the recovery of small fossil remains (e.g., isolated teeth of small vertebrates), it may be necessary to collect bulk-matrix samples for screen washing.
4. In the event that fossils are discovered during a period when a paleontological monitor is not on site (i.e., an inadvertent discovery), earthwork within the vicinity of the discovery site shall temporarily halt, and the Project Paleontologist shall be contacted to evaluate the significance of the discovery. If the inadvertent discovery is determined to be significant, the fossils shall be recovered, as outlined in Mitigation Measure 3.
5. Fossil remains collected during monitoring and salvage shall be cleaned, repaired, sorted, taxonomically identified, and cataloged as part of the mitigation program. Fossil preparation may also include screen-washing of bulk matrix samples for microfossils or other laboratory analyses (e.g., radiometric carbon dating), if warranted in the discretion of the Project Paleontologist. Fossil preparation and curation activities may be conducted at the laboratory of the contracted Project Paleontologist, at an appropriate outside agency, and/or at the designated repository, and shall follow the standards of the designated repository.
6. Prepared fossils, along with copies of all pertinent field notes, photos, and maps, shall be curated at a professional repository (e.g., Natural History Museum of Los Angeles County, San Diego Natural History Museum). The Project Paleontologist shall have a written repository agreement with the professional repository prior to the initiation of mitigation activities.
7. A final summary report shall be completed at the conclusion of ground disturbing activities that outlines the results of the mitigation program. The report and inventory, if applicable, shall be submitted to the City of Fullerton, along with confirmation of the curation of recovered specimens into a professional repository, if applicable.

5.0 References

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Appendix

Records Search Results, LACM Vertebrate Paleontology Section

Natural History Museum
of Los Angeles County
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Los Angeles, CA 90007

tel 213.763.DINO
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NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Vertebrate Paleontology Section
Telephone: (213) 763-3325

e-mail: smcleod@nhm.org

31 March 2020

Department of PaleoServices
San Diego Natural History Museum
P.O. Box 121390
San Diego, CA 92112-1390

Attn: Katie McComas, Paleontological Report Writer & GIS Specialist

re: Paleontological resources for the proposed Goodman Logistics Center Project, Orange County, project area

Dear Katie:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed Goodman Logistics Center Project, Orange County, project area as outlined on the portion of the Anaheim USGS topographic quadrangle map that you sent to me via e-mail on 17 March 2020. We do not have any vertebrate fossil localities that lie within the proposed project area boundaries, but we do have localities somewhat nearby from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

Surface sediments throughout the entire proposed project area and in the surrounding vicinity consist of younger terrestrial Quaternary Alluvium, derived primarily as alluvial fan deposits from the hills of the Santa Ana Mountains to the east via Carbon Creek that currently flows immediately to the south of the proposed project area. These younger Quaternary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but are underlain by older Quaternary deposits at varying depths that do contain significant vertebrate fossils. East-southeast of the proposed project area, just west of the Santa Ana River along Rio Vista Avenue south of Lincoln Avenue, we have a vertebrate fossil locality, LACM 1652, that produced a fossil specimen of sheep, *Ovis*. Our closest fossil locality in older Quaternary sediments is LACM 4943, also situated east-southeast of the proposed project area almost due east of locality LACM 1652 along Fletcher Avenue east of Glassell Street east of the Santa Ana River, that produced a specimen of fossil horse, *Equus*, at a depth of 8-10 feet below the surface.

Shallow excavations in the uppermost few feet of the younger Quaternary alluvial sediments exposed throughout the proposed project area are unlikely to uncover significant fossil vertebrate remains. Deeper excavations in the proposed project area that extend down into older Quaternary sediments, however, may well encounter significant vertebrate fossils. Any substantial excavations below the uppermost layers in the proposed project area, therefore, should be closely monitored to quickly and professionally collect any specimens without impeding development. Sediment samples should also be collected and processed to determine the small fossil potential in the proposed project area. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

Samuel A. McLeod

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice