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Paleontological Resources Technical Report

The Crossings
City of Bakersfield, Kern County, California

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Executive Summary

This technical report provides an assessment of paleontological resources at the proposed The Crossings project (Project) site in the southeastern portion of the City of Bakersfield, Kern County, California. The purpose of this report is to identify and summarize paleontological resources that occur in 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 an institutional records search conducted at the San Diego Natural History Museum (SDNHM).

The Project proposes to construct a multi-use commercial development on approximately 28.8 acres located at the southwest corner of Hosking Avenue and South H Street. The site is bordered to the north by Hosking Avenue, to the east by South H Street, to the west by the State Route (SR-) 99 northbound offramp to Hosking Avenue, and to the south by vacant residential land. The development would include approximately 184,196 square feet of gross square footage of leasable commercial space. As currently designed, Phase I of construction in the northern and northeastern 6.69 acres of the site would include several retail, fast food, and restaurant buildings, a fueling station, convenience store, car wash, and attendant surface parking. Phase II of construction in the central 12.01 acres of the site would include six additional retail buildings, a drive-thru building, and additional surface parking spaces. Construction is not currently proposed for Phase III in the southern 8.48 acres of the site. A retention basin would be located in the southwestern corner of the Project site. The Project also includes off-site road widening along the south side of Hosking Avenue and west side of South H Street.

The Project site is located within the southern San Joaquin Valley portion of the southern Great Valley geomorphic province, and is entirely underlain by alluvial fan deposits of late Holocene age that were derived from regional erosion of the southern Sierra Nevada, and comprise part of the Kern River alluvial fan. Presumably, the Holocene-age deposits transition in the subsurface into older, Pleistocene-age deposits. Because areas mapped as Pleistocene-age alluvial deposits occur approximately 4 miles to the north and southeast of the Project site, the depth of this transition is conservatively estimated to occur at 15 feet or more below ground surface (bgs).

Based on the results of the paleontological record search and literature review, fossils have not been documented specifically from Holocene- or Pleistocene-age alluvial deposits within a 5-mile radius of the Project site. However, fossils are known from alluvial deposits at numerous locations elsewhere in the southern San Joaquin Valley. These deposits have yielded fossil remains of freshwater snails, bony fish, insects, frogs, lizards, birds, small-bodied mammals (e.g., rabbits and hares, pocket mice, kangaroo rats, geomyid rodents, shrews) and large-bodied mammals (e.g., horse, deer, pronghorn, dog).

Following the paleontological potential criteria developed by the Society of Vertebrate Paleontology, the alluvial fan deposits within the Project site are assigned a low paleontological potential at depths of less than 15 feet bgs (where they are assumed to be Holocene in age), and an undetermined paleontological potential at depths greater than 15 feet bgs (where the strata may represent older sedimentary deposits of Pleistocene age). Geologic units with undetermined paleontological potential are considered to be potentially fossil-bearing until proven otherwise. Therefore, following a conservative approach, Project-related earthwork that would disturb deposits with an undetermined potential (i.e., earthwork extending greater than 15 feet bgs) are assumed to have the potential to result in impacts to paleontological resources unless mitigated. The types of earthwork typically associated with construction of one- to two-story commercial developments that can be monitored for paleontological resources include, but are not limited to: mass grading for creation of level building pads and roadways, excavation of stormwater management basins, trenching for underground wet and dry utilities, and large-diameter drilling (greater than about 18 inches in diameter) for foundation supports. Certain types of earthwork cannot feasibly be monitored for paleontological resources, and include pile-driving and small-diameter drilling.

If excavations extending greater than 15 feet bgs are required for construction of the Project, potential impacts to paleontological resources should be minimized through implementation of recommended mitigation measures PAL-1 (development and implementation of a Paleontological Resources Monitoring and Mitigation Plan) and PAL-2 (procedures to be implemented in the event of an inadvertent discovery). Implementation of these measures will reduce the impacts to a level below the threshold of significance. If no excavations will extend greater than 15 feet bgs, only mitigation measure PAL-2 is recommended.

Contents

1.0 Introduction

1.1 Project Description

This technical report provides an assessment of paleontological resources for the proposed The Crossings project (Project) site, located in the southeastern portion of the City of Bakersfield, Kern County, California (Figure 1). The 28.8-acre Project site is located at the southwest corner of Hosking Avenue and South H Street. The site is bordered to the north by Hosking Avenue, to the east by South H Street, to the west by the State Route (SR-) 99 northbound offramp to Hosking Avenue, and to the south by vacant residential land.

The Project proposes to construct a multi-use commercial development. The development would include approximately 184,196 square feet of gross square footage of leasable commercial space. As currently designed, Phase I of construction in the northern and northeastern 6.69 acres of the site would include several retail, fast food, and restaurant buildings, a fueling station, convenience store, car wash, and attendant surface parking. Phase II of construction in the central 12.01 acres of the site would include six additional retail buildings, a drive-thru building, and additional surface parking spaces. Construction is not currently proposed for Phase III in the southern 8.48 acres of the site. A stormwater retention basin would be located in the southwestern corner of the Project site. The Project also includes off-site road widening along the south side of Hosking Avenue and west side of South H Street.

1.2 Scope of Work

The Project is located in an area underlain by native sedimentary deposits. For this reason, a paleontological resource assessment was conducted in order to determine whether construction of the Project has the potential to negatively impact paleontological resources. This technical report is intended to summarize existing paleontological resource data within the Project site, discuss the significance of these resources, examine potential Project-related impacts to paleontological resources, and suggest mitigation measures to reduce potential impacts to paleontological resources to less than significant levels, as needed. The assessment also includes the results of a literature review of relevant geological and paleontological reports, and an institutional records search of the paleontological collections at the San Diego Natural History Museum (SDNHM). This technical 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.

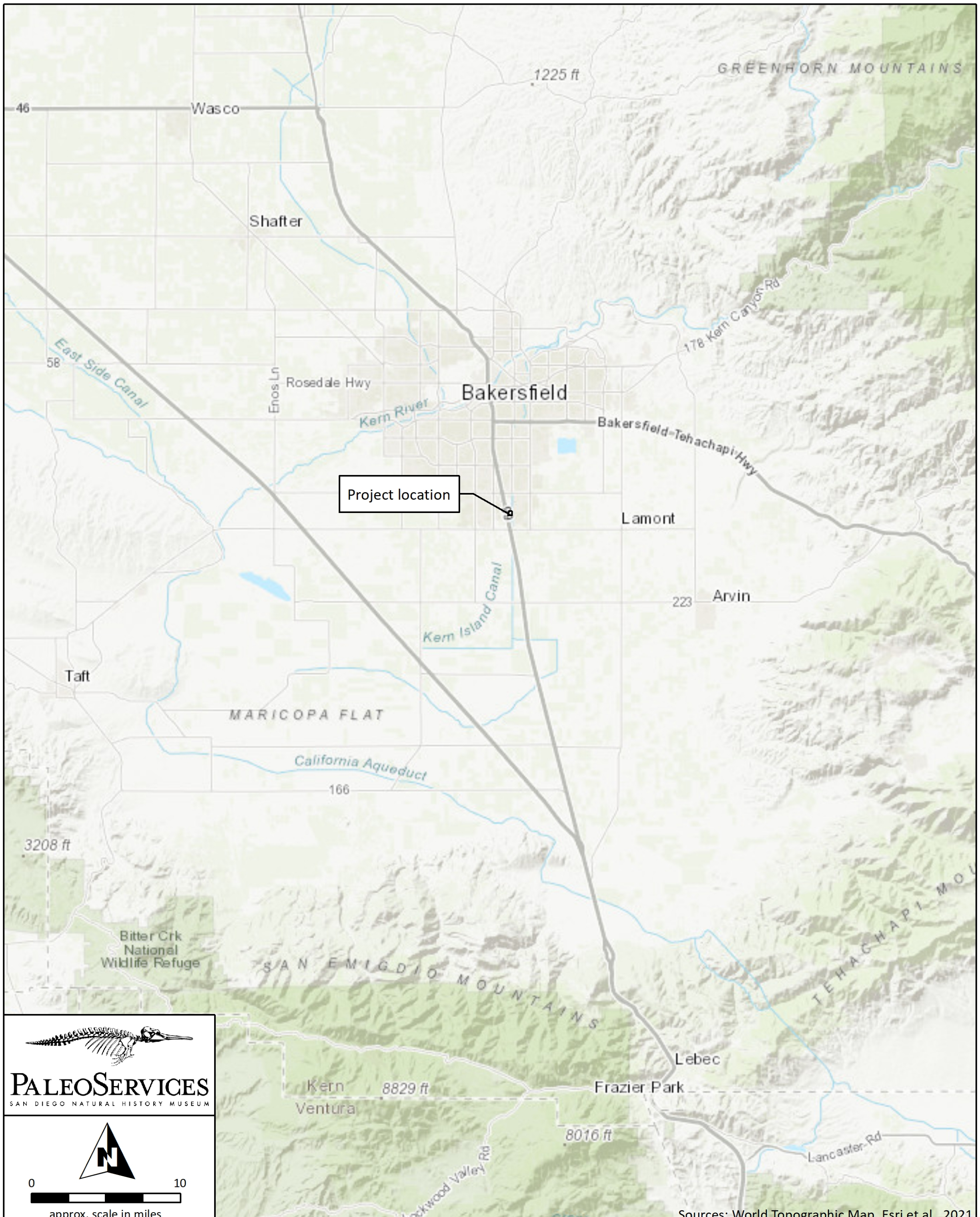

Figure 1: Project Index Map, The Crossings, City of Bakersfield, Kern County, California

Finally, paleontological resources can be thought of as including not only the actual fossil remains and traces, but also the fossil collection 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 that of overlying and underlying strata. This information provides essential context for any future scientific study and educational use 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 state (e.g., California Environmental Quality Act [CEQA]; Public Resources Code) and local (City of Bakersfield) laws, ordinances, and regulations, outlined below.

1.4.1 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."

Most CEQA lead agencies follow the definitions and guidelines provided by SVP (2010), which are in line with industry standards (e.g., Murphey et al., 2019). SVP (2010) additionally provides criteria for determining the significance of paleontological resources (see sections 1.3.1 and 2.2), and for appropriate measures to minimize impacts to paleontological resources. As advised by SVP (2010), impacts to paleontological resources can be minimized to a level below the threshold of significance through 1.) the permanent preservation of a fossil locality and its contained fossil resources); or 2.) the implementation of a paleontological mitigation program that would reduce any adverse impacts to a level below the threshold of significance through the salvage and permanent storage of any salvaged fossils in an established scientific institution.

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.

1.4.2 Local: City of Bakersfield

The City of Bakersfield addresses impacts to paleontological resources (fossils) under mineral resources (Chapter V. Conservation Element: Section B. Mineral Resources) in the Metropolitan Bakersfield General Plan (adopted in 2002, updated in 2016), and sets forth the following policy and related implementation program specific to paleontological resources:

- Policy 9: Encourage preservation of any known deposits of gemstones and fossils.
- Implementation Program 2: [...] Unique gem and fossil localities shall be protected from extraction operations. [...]

2.0 Methods

2.1 Paleontological Records Search and Literature Review

A paleontological records search was conducted at the SDNHM in order to identify known fossil collection localities within an approximately 5-mile radius of the Project site.

In addition, a literature review was conducted to gain a greater understanding of the geologic history of the area surrounding the Project site, as well as to determine the types of fossils that specific geologic units underlying the Project site have produced. The review included examination of relevant published geologic maps and reports, peer-reviewed papers, and other relevant literature (e.g., field trip guidebooks, unpublished theses and dissertations, archived 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, it is possible to predict where fossils may or may not be encountered. Understanding the fossil content of a geologic unit everywhere it occurs is important for outlining the types of fossils that may occur within the unit, and confidently assigning a paleontological potential rating.

2.2 Paleontological Resource Assessment Criteria

The Society of Vertebrate Paleontology (SVP, 2010) has developed mitigation guidelines for paleontological resources that were developed with input from a variety of federal and state land management agencies and conform with industry standards (Murphey et al., 2019). As described in Section 1.4.1, 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 sedimentary rock 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 fossil-bearing 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 fossil-bearing geologic units are those rated with a high or undetermined potential. Although impact avoidance is possible through relocation of a proposed action, paleontological monitoring during construction is typically recommended 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 potential impacts will occur. The paleontological impact analysis involved analysis of available Project documents and comparison with geological and paleontological data gathered during the records search and literature review.

3.0 Results

3.1 Results of the Records Search and Literature Review

3.1.1 Project Geology

Geologic setting: The Project site is located in the southeastern portion of the City of Bakersfield, in central Kern County, California. Bakersfield is located in the southern Great Valley geomorphic province, which encompasses the entire San Joaquin Valley. The San Joaquin Valley is bounded by the southern Coast Ranges to the west, the Tehachapi Mountains to the south, and the foothills of the Sierra Nevada to the east (Figure 1). For the most part, the San Joaquin Valley is a broad alluvial plain, the southern portion of which is primarily a closed basin with Sierran rivers like the Tule River and Kern River flowing into it and, until the 20th Century, filling large and landlocked freshwater lakes (e.g., Tulare Lake, Kern Lake, and Buena Vista Lake). From the Pleistocene through the present, sediments eroded out of the surrounding highlands have been transported downslope to form extensive coalesced alluvial fans near the mountain fronts, and finer-grained fluvial and lacustrine deposits farther out on the valley floor. The Project site is underlain by late Holocene-age alluvial fan deposits that comprise part of the modern Kern River alluvial fan and flood plain (Figure 2). The extensive Kern River alluvial fan is the southernmost alluvial fan complex of the western Sierra Nevada, and consists of sediments derived from granitic rocks and transported by the Kern River as it incised the Kern River gorge (Dale et al., 1966).

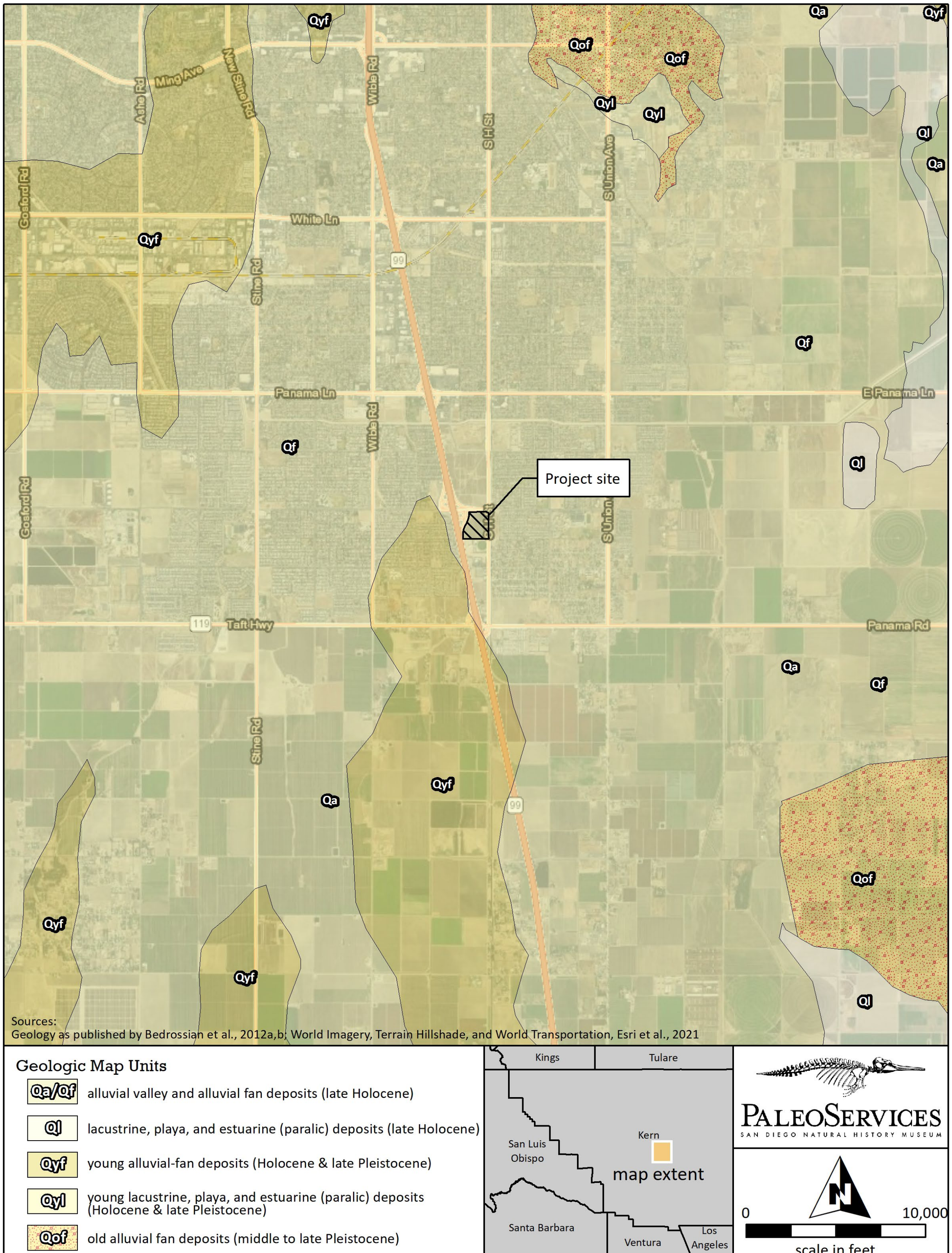

Figure 2: Geologic Map of The Crossings, City of Bakersfield, Kern County, California

Project-specific geology: As mapped by Smith (1964) and Haydon & Hayhurst (2011), the entire Project site is underlain by alluvial fan deposits (Qf) of late Holocene age (Figure 2). These deposits are mapped in adjacent areas to the east and north of the Project site as younger alluvium (Qya) of Holocene and late Pleistocene age by Bartow (1984), and represent alluvial deposits deposited in modern channels and across modern flood plains, on low-lying terraces along streams, and in undissected alluvial fans (Bartow, 1984). As described above, these alluvial deposits are generally derived from erosion of the surrounding highlands and comprise part of the Kern River alluvial fan complex. According to the geotechnical investigation report prepared for the Project site, the sediments underlying the Project site consist of sandy silt, silty fine- to medium-grained sand, and fine- to medium-grained sand, the upper 6 to 12 inches of which are disturbed (Krazan & Associates, 2021).

Presumably, the Holocene-age deposits transition in the subsurface into older, Pleistocene-age sedimentary deposits. It is estimated that the maximum thickness of Holocene-age alluvial sediments in the San Joaquin Valley is up to 100 feet, but alluvial sediments can be found as veneers as thin as 1 foot (Dibblee, 1999). Because areas mapped as Pleistocene-age alluvial deposits occur approximately 4 miles to the north and southeast of the Project site, the depth of this temporal transition is conservatively estimated here to occur at 15 feet or more below ground surface (bgs).

3.1.2 Project Paleontology

A records search of the paleontological collections at the SDNHM indicates that there are no known fossil collection localities from similar Holocene- or Pleistocene-age alluvial deposits located within a 5-mile radius of the Project site. However, fossil localities are known from early Holocene- and Pleistocene-age alluvial deposits elsewhere in the southern San Joaquin Basin, as documented in the paleontological literature.

In the San Joaquin Valley, vertebrate fossils are known from sites at the Eagle Crest residential development in the City of Bakersfield (located approximately 10 miles northwest of the Project site); at the Arvin Landfill (located approximately 12 miles east of the Project site); at the Midway Sunset Oil Field; at sites near Corcoran, near Delano, and near Poso Creek; and a site identified during cutting of a canal in Bakersfield (Reynolds, 1990; Jefferson, 1991b; Fay and Thiessen, 1993). Fossils recovered from these sites include remains of freshwater snails, bony fish, insects, frogs, lizards, finches, small mammals (e.g., rabbits and hares, pocket mice, kangaroo rats, geomyid rodents, shrews) and large mammals (e.g., horse, deer, pronghorn, dog). Similar fossils are known from Pleistocene-age alluvial sediments in other inland valleys of California (e.g., Jefferson, 1991a,b; Reynolds and Reynolds, 1991; Scott and Cox, 2008; Springer et al., 2009, 2010), indicating the potential for the recovery of additional fossils from similar deposits in other parts of the southern San Joaquin Valley.

3.2 Results of the Paleontological Resource Assessment

Following the SVP (2010) resource assessment criteria as outlined in Section 2.2, Holocene-age alluvial fan deposits are assigned a low paleontological potential based on their relatively young age (less than about 11,700 years old) and the lack of known, scientifically significant paleontological resources from similar Holocene-age deposits in the southern San Joaquin Valley. However, the Holocene-age alluvial deposits likely transition to older, Pleistocene-age deposits in the subsurface, at a depth that may be as shallow as 15 feet bgs. Pleistocene-age alluvial deposits are assigned an undetermined paleontological potential (see Section 2.2.2), and therefore are considered to be potentially fossil-bearing, as discussed in greater detail below.

Because the contact between the Holocene-age alluvial deposits and Pleistocene-age alluvial deposits may be as shallow as 15 feet bgs, the sedimentary deposits underlying the Project site are specifically assigned a low paleontological potential from 0–15 feet bgs where they are assumed to be Holocene in age and an undetermined paleontological potential at depths greater than 15 feet bgs where they may be Pleistocene in age (Figure 3).

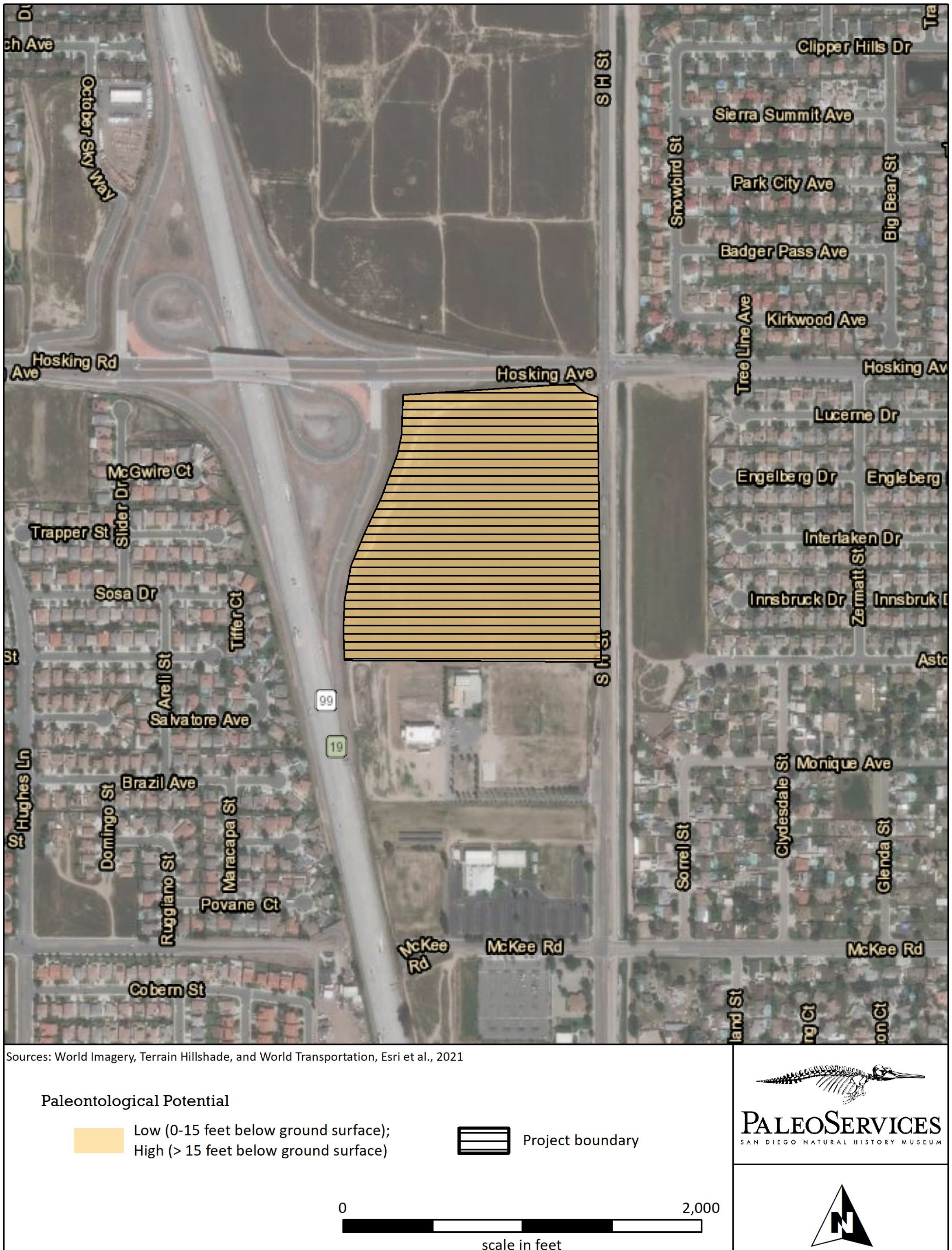

Figure 3: Paleontological Potential Map of The Crossings, City of Bakersfield, Kern County, California

3.3 Results of the Paleontological Impact Analysis

As discussed above, the Project site is immediately underlain by late Holocene-age alluvial fan and flood plain deposits at the surface. The Holocene portions of these deposits are presumably underlain by Pleistocene-age alluvial deposits at a depth that may be as shallow as 15 feet bgs. Impacts to paleontological resources are only likely to occur during excavations at the Project site that will disturb alluvial deposits of Pleistocene-age, which, following a conservative approach, are considered to be potentially fossil-bearing. Therefore, only excavations that will extend greater than about 15 feet bgs have the potential to impact paleontological resources (Figure 3, Table 1).

Although specific construction details about the extent and dimensions of earthwork that will eventually take place within the Project site have not been finalized at this time, the types of earthwork typically associated with construction of one- to two-story commercial developments that can be monitored for paleontological resources include, but are not limited to: mass grading for creation of level building pads and roadways, excavation of stormwater management basins, trenching for underground wet and dry utilities, and large-diameter drilling (greater than about 18 inches in diameter) for foundation supports.

Notably, not all types of earthwork can be feasibly monitored for paleontological resources. For example, it is not practical to monitor post-driving or drilling with a small-diameter auger (less than about 18 inches) for unearthed paleontological resources. Paleontological monitoring of boreholes is typically conducted by examining spoils brought up during the drilling process for any contained fossil remains. For post-driving, no spoils are produced, thus paleontological monitoring cannot occur. Drilling operations using a helical auger smaller than about 18 inches in diameter produce spoils of pulverized sedimentary rock, and thus destroy most, if not all, macrofossil remains that may have been present. Similarly, drilling with bucket augers of any size, as well as fixed cutter bits or roller cone bits (typically, such bits are smaller than 18 inches in diameter) will grind up any encountered macrofossils, and thus such drilling cannot be mitigated. Further, small-diameter augering yields spoils with poor stratigraphic control, with only a small volume of sediment recovered from any given targeted horizon. While it is possible that microvertebrate or microinvertebrate fossils may be recovered intact from spoils produced during small-diameter augering, the lack of stratigraphic control makes collecting test samples from a targeted horizon difficult to execute, and screen washing of all matrix generated during small-diameter augering is not practicable for a project of this size.

The geotechnical investigation report prepared for the Project (Krazan & Associates, 2021) recommends removal (i.e., excavation) and recompaction of the upper 3 feet of native sediments within proposed building areas, and overexcavation of the site to a minimum of 5 feet below structural foundations. Buildings are recommended to be supporting on shallow spread and continuous footings or shallow foundations. Such excavations are unlikely to extend more than 15 feet bgs. Similarly, the off-site road widening of Hoskings Avenue and South H Street is likely to require superficial grading extending less than 5 feet bgs. Deeper earthwork within the Project site that may or may not extend greater than 15 feet bgs includes, but is not limited to: trenching for underground wet and dry utilities and excavation of the proposed stormwater retention basin in the southwestern corner of the site.

Table 1. Summary of geology underlying the Project site and paleontological monitoring recommendations for the Project.

Geologic Unit	Age	Paleontological Potential	Monitoring recommended?*
alluvial fan deposits (Qf)	late Holocene (Pleistocene at depth)	low potential, 0–15 feet; undetermined potential, >15 feet	No, 0–15 feet; **Yes, >15 feet**

*excluding post-driving and small diameter (<18 inches) drilling, which cannot be feasibly mitigated for paleontological resources

4.0 Recommendations

For the Project, deep earthwork that will extend greater than about 15 feet bgs has the potential to impact paleontological resources (Table 1, Figure 3). At this time it is not known whether there will be any earthwork extending below the 15 feet bgs threshold. However, in the event that such deep earthwork will occur, development and implementation of a project-specific Paleontological Resources Mitigation and Monitoring Plan (PRMMP), as outlined in Mitigation Measure (MM) PAL-1, below, is recommended to mitigate potentially adverse impacts to paleontological resources during construction through the recovery and conservation of any fossils that are unearthed during construction.

Standards elements of a PRMMP include a description of the project earthwork to be monitored for paleontological resources (e.g., specific areas, depths of excavation, and/or project components), proposed methods for paleontological monitoring, procedures for fossil discoveries and determining the significance of a discovery, proposed field and laboratory methods for fossil collection, preparation, and curation, reporting requirements, and a curatorial agreement with a regional repository.

MM PAL-2 is recommended to account for possible inadvertent fossil discoveries made during Project earthwork extending less than 15 feet bgs.

4.1 Recommended Mitigation Measures

The following mitigation measures are recommended to be implemented for the proposed Project. Implementation of these measures will reduce potential adverse impacts to paleontological resources through the recovery and conservation of any fossils that are unearthed during construction.

MM PAL-1: Prior to the issuance of grading permits, if earthwork will extend deeper than 15 feet bgs, a Qualified Paleontologist shall be retained and approved by the City to prepare a Paleontological Resources Mitigation and Monitoring Plan (PRMMP). The PRMMP shall contain monitoring procedures, define areas and types of earthwork to be monitored, provide methods for determining the significance of fossil discoveries, and state that any fossils that are collected should be prepared to the point of curation, identified to the lowest reasonable taxonomic level, and curated into an accredited institutional repository.

The PRMMP should also direct that a qualified paleontological monitor (working under the supervision of the Qualified Paleontologist) shall monitor excavations or grading that occur at a depth of 15 feet or deeper bgs in areas of low paleontological potential, which occur throughout the Project site. Pile-driving and small-diameter drilling (less than 18-inches) excavation methods do not require monitoring, nor does shallow grading associated with building foundations and roadways. The duration and timing of monitoring, which shall be set forth in the PRMMP, shall be determined by the Qualified Paleontologist and based on the grading plans and construction schedule. Initially, all excavation or grading activities recommended for monitoring shall be monitored. However, during the course of monitoring, if the Qualified Paleontologist can demonstrate that the level of monitoring should be reduced, the Qualified Paleontologist, in consultation with the City of Bakersfield, may adjust the level of monitoring to fit the circumstances, as warranted. The PRMMP should emphasize screen washing of bulk matrix samples of potentially fossil-bearing sediment (e.g., paleosol horizons) as a tool for evaluating paleontological potential, and should provide appropriate methods.

If potentially significant fossils are found, the Qualified Paleontologist (or paleontological monitor) shall be allowed to temporarily divert or redirect grading and excavation activities in the vicinity of the discovery site, as needed, to facilitate evaluation of the fossil and, if necessary, salvage. Salvaged fossils shall be prepared, curated, and donated to an accredited institutional repository with a research interest in the materials, such as the Natural History Museum of Los Angeles County or the San Bernardino County Museum. Accompanying notes, maps, and photographs shall also be filed at the repository.

Following the completion of the above tasks, the Qualified Paleontologist shall prepare a final mitigation report documenting the absence or discovery of fossil resources on-site. The report shall summarize the results of the PRMMP, including a description of monitoring procedures, a summary of recovered data, and conclusions. If fossils are recovered, the report shall include a description of the salvaged fossils and their significance, and the methods used to salvage, prepare, identify, and curate them. A copy of the report shall be provided to the City of Bakersfield and to the accredited repository that receives the fossils (if fossils are discovered and salvaged).

MM PAL-2: If paleontological resources are encountered during project ground disturbing activities when a Qualified Paleontologist (or paleontological monitor) is not onsite (an inadvertent discovery), all excavation work in the immediate vicinity of the find shall halt until the Qualified Paleontologist can evaluate the find and make recommendations. If the Qualified Paleontologist determines that the discovery represents a potentially significant paleontological resource, additional measures such as fossil salvage may be required to mitigate adverse impacts from project implementation. Ground-disturbance in the vicinity of the discovery site shall not resume until the resource-appropriate measures are implemented or the materials are determined to be less than significant.

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