Appendix E Paleontological Resources Technical Report

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PALEOSERVICES
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Paleontological Resources Technical Report

Temecula Valley Charter School
Riverside County, California

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Prepared for:

BCR Consulting LLC
505 West 8th Street
Claremont, California 91711

Prepared by:

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

thenat | SAN DIEGO NATURAL HISTORY MUSEUM

Katie M. McComas, M.S.
Paleontological Report Writer & GIS Specialist

Thomas A. Deméré, Ph.D.
Principal Paleontologist

Executive Summary

This technical report provides an assessment of paleontological resources at the proposed Temecula Valley Charter School project (Project) site, located in an unincorporated area of southwestern Riverside County, California. The purpose of this report is to identify and summarize paleontological resources that occur within the Project site and immediate vicinity, 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 San Diego Natural History Museum (SDNHM) and Western Science Center (WSC), and a paleontological field survey of the Project site.

The 11.99-gross-acre Project site is comprised of Assessor's Parcel Number (APN) 472-210-002, and is bordered to the west by Washington Street, to the north by Yates Road, to the east by water district property, and to the south by a single-family residential property. The Project proposes to construct a charter school campus for grades TK through 8, to include single-story structures (a 17,292-square-foot main building, 17 single-classroom buildings, 10 double-classroom buildings, and four restroom buildings), outdoor playgrounds and sports fields and courts, surface parking lots, interior roadways, and a storm water basin.

Based on the available published geologic mapping, the proposed Project site is underlain by phyllite (Trmp) that is part of a complex of primarily metasedimentary rocks of Triassic age (approximately 252 to 201 million years old) referred to as "rocks of Menifee Valley." In the northern half of the Project site, these metasedimentary rocks are overlain by early to middle Pleistocene-age (approximately 2.58 million to 129,000 years old) very old axial-channel deposits (Qvoa). These existing conditions were generally confirmed during a pedestrian survey of the Project site, primarily on the basis of the observed topography. Exposures of Trmp strata were identified at the surface in the southwestern and central portions of the site. Previously undisturbed Qvoa deposits were not confidently identified due to the presence of dense vegetation and the presence of unmapped artificial fill deposits that are spread across much of the northern half of the site. Notably, a tall berm (approximately 10 feet thick) of unmapped artificial fill was observed in the southern portion of the site.

Institutional records searches conducted at SDNHM and WSC do not document any recorded fossil collection localities within a one-mile radius of the Project site. However, multiple localities have been documented in Pleistocene-age alluvial deposits exposed elsewhere in western Riverside County. For example, significant fossils were discovered south of Hemet (less than 4 miles NNE of the Project site) in Pleistocene-age braided stream and lake deposits exposed during construction of the Diamond Valley Lake project. Recovered fossils from this project represent a diversity of "Ice Age" mammals (e.g., ground sloth, weasel, skunk, badger, wolf, saber-toothed cat, American lion, puma, peccary, camel, pronghorn antelope, deer, bison, mastodon, and mammoth). Additional fossil localities have been documented in Pleistocene-age alluvial deposits north of the City of Temecula and in the cities of Menifee, San Jacinto, and Moreno Valley. Neither the WSC nor SDNHM have any recorded fossil collection localities from Triassic-aged metasedimentary rocks in the vicinity of the Project site. However, poorly preserved and deformed fossils of large crinoid stems and bivalves of probable Triassic age have been reported from a calc-silicate rock within the "rocks of Menifee Valley" complex located east of Sun City in the City of Menifee.

A high paleontological sensitivity is assigned to the Qvoa deposits underlying the Project site, based on the documented occurrence of fossils in similar deposits elsewhere in western Riverside County. An undetermined paleontological sensitivity is assigned to the Trmp strata exposed within the Project site, based on its Triassic age, original marine depositional setting, low-grade metamorphism, and the reported occurrence of rare, poorly preserved, but scientifically important crinoid and bivalve fossils from the "rocks of Menifee Valley" in southwestern Riverside County. Unmapped artificial fill deposits present within the Project site are assigned a low paleontological sensitivity rating.

Construction of the proposed Project has the potential to impact paleontological resources during earthwork impacting Qvoa or Trmp deposits. Thus, implementation of a paleontological mitigation program centered around paleontological monitoring is recommended, as outlined in the provided 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 Temecula Valley Charter School project (Project) site, located in an unincorporated area of southwestern Riverside County, California (Figure 1). The 11.99-gross-acre Project site is comprised of Assessor's Parcel Number (APN) 472-210-002, and is bordered to the west by Washington Street, to the north by Yates Road, to the east by water district property, and to the south by a single-family residential property. The Project proposes to construct a charter school campus for grades TK through 8, to include single-story structures (a 17,292-square-foot main building, 17 single-classroom buildings, 10 double-classroom buildings, and four restroom buildings), outdoor playgrounds and sports fields and courts, surface parking lots, interior roadways, and a storm water basin.

1.2 Scope of Work

A paleontological resource assessment was conducted in order to evaluate whether the proposed Project has the potential to negatively impact paleontological resources, as required by the Riverside County Planning Department. The assessment 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, evaluating 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 assessment also includes the results of a literature review of relevant geological and paleontological reports, institutional records searches of the paleontological collections at the San Diego Natural History Museum (SDNHM) and Western Science Center (WSC), and a paleontological field survey of the Project site. 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.

Sources: Terrain Hillshade, World Imagery, World Topographic Map, Esri, 2022

Figure 1: Project overview map, Temecula Valley Charter School, Riverside 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]) and local (Riverside County) laws, regulations, and ordinances, outlined below.

1.4.1 State

Notable State legislative protection for paleontological resources includes the California Environmental Quality Act.

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 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). 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.

1.4.2 Local

The Multipurpose Open Space Element of the **Riverside County General Plan** (County of Riverside, 2015) identifies the occurrence of important historical, archaeological, and paleontological resources within the County. Several policies of the County's General Plan Multipurpose Open Space Element address paleontological resources directly, and provide the following recommendations:

- Policy OS 19.6*:* Whenever existing information indicates that a site proposed for development has high paleontological sensitivity … a paleontological resource impact mitigation program (PRIMP) shall be filed with the County Geologist prior to site grading. The PRIMP shall specify the steps to be taken to mitigate impacts to paleontological resources.
- Policy OS 19.7: Whenever existing information indicates that a site proposed for development has low paleontological sensitivity … no direct mitigation is required unless a fossil is encountered during site development. Should a fossil be encountered, the County Geologist shall be notified and a paleontologist shall be retained by the project proponent. The paleontologist shall document the extent and potential significance of the paleontological resources on the site and establish appropriate mitigation measures for further site development.
- Policy OS 19.8: Whenever existing information indicates that a site proposed for development has undetermined paleontological sensitivity … a report shall be filed with the County Geologist documenting the extent and potential significance of the paleontological resources on site and identifying mitigation measures for the fossil and for impacts to significant paleontological resources prior to approval of that department.
- Policy OS 19.9: Whenever paleontological resources are found, the County Geologist shall direct them to a facility within Riverside County for their curation, including the Western Science Center in the City of Hemet.

As outlined below, in Section 2.3, Riverside County has provided criteria to assess the sensitivity of paleontological resources.

2.0 Methods

2.1 Paleontological Records Searches and Literature Review

Paleontological records searches were conducted at the SDNHM and WSC 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 one-mile radius. A formal records search of the paleontological collections at the WSC was also requested and is appended to this report (WSC, 2022; Appendix A).

Additionally, a review was conducted of relevant published geologic mapping (e.g., Dibblee and Minch, 2008; Morton and Kennedy, 2003; Morton and Miller, 2006), published geological and paleontological reports (e.g., Springer et al., 2009, 2010), 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 Field Survey

A paleontological field survey of the Project site was conducted on April 20, 2022 by Katie M. McComas and Kirstin L. Mueller of the Department of PaleoServices, SDNHM. The purpose of the field survey was to confirm the published geologic mapping, to field check the results of the literature and records searches, and to determine the paleontological potential/sensitivity of the strata underlying the Project site. The field survey included inspection of available natural and man-made exposures within the Project site in order to collect stratigraphic data (e.g., bedding type, thickness, geologic contacts), detailed lithologic descriptions of strata (e.g., color, sorting of grains, texture, sedimentary structures, and grain size of sedimentary rocks), and to prospect for any fossil remains present at the surface.

During the survey, the field paleontologists were equipped with standard field equipment (e.g., rock hammer, camera, hand lens, folding tape measure) and an iPhone loaded with Esri's Field Maps app that was used to view relevant maps and collect field data. Collected field data included waypoints that were keyed to field notes and photographs.

2.3 Paleontological Resource Assessment Criteria

The County of Riverside has developed standards for assessing paleontological potential/sensitivity that are based, in part, on the standards set forth by Society of Vertebrate Paleontology (SVP, 2010), and that also take into account the possibility for adverse impacts due to human influence. The County recognizes a tripartite scale: High Potential (High A and High B subcategories), Low Potential, and Undetermined Potential.

The specific criteria for each scale of Paleontological Potential/Sensitivity is included below.

2.3.1 High Potential/Sensitivity

High sensitivity is assigned to geologic units known to contain paleontological localities with rare, well-preserved, critical fossil materials for stratigraphic or paleoenvironmental interpretation, and fossils providing important information about the paleobiology and evolutionary history (phylogeny) of animal and plant groups. Generally speaking, highly sensitive formations produce vertebrate fossil remains or are considered to have the potential to produce such remains.

In Riverside County, High Paleontological Potential A is assigned to rock units present immediately at the surface, while High Paleontological Potential B is assigned to rock units found at a depth of 4 feet or greater below existing grade.

2.3.2 Low Potential/Sensitivity

Low sensitivity is assigned to geologic units that, based on their relative youthful age and/or high-energy depositional history, are judged unlikely to produce important fossil remains. Typically, low sensitivity formations produce invertebrate fossil remains in low abundance. Low paleontological potential is also assigned to geologic formations that are entirely igneous in origin and therefore have no potential for producing fossil remains, or to artificial fill materials which lose the stratigraphic/geologic context of any contained organic remains (e.g., fossils).

2.3.3 Undetermined Potential/Sensitivity

Undetermined sensitivity is assigned to geologic units that exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about the geology and/or paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may be useful for more precisely determining the paleontological sensitivity.

2.4 Paleontological Impact Analysis

Direct impacts to paleontological resources occur when earthwork activities (e.g., mass grading, utility trenching) cut into the geologic units within which fossils are buried and physically destroy the fossil remains. As such, only earthwork activities that will disturb potentially fossil-bearing sedimentary deposits (i.e., those rated with a high or undetermined paleontological potential) have the potential to significantly impact paleontological resources. Paleontological mitigation typically is 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 this earthwork will occur. The paleontological impact analysis involved analysis of available project documents, and comparison with geological and paleontological data gathered during the records searches, literature review, and field survey.

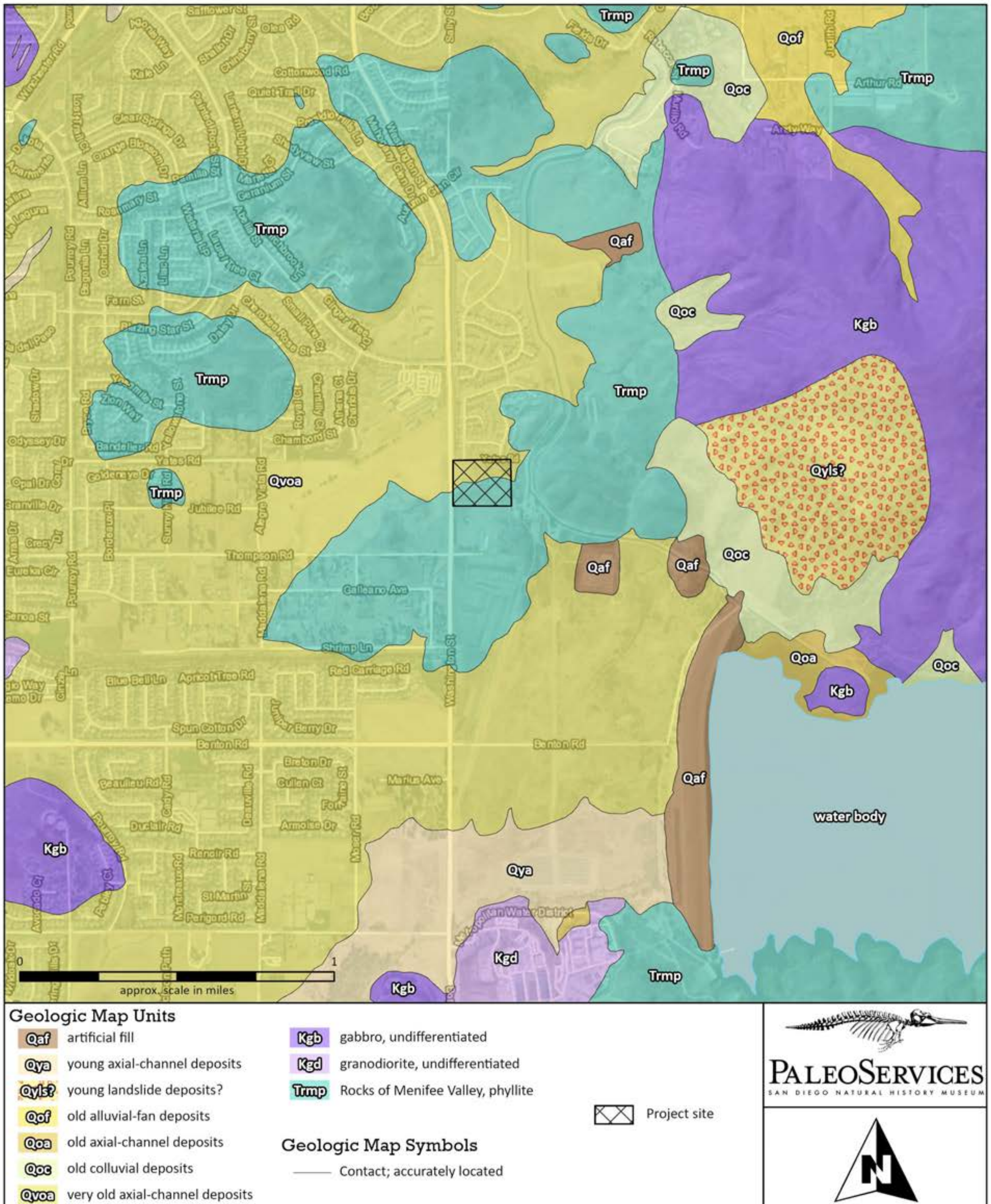
3.0 Results

3.1 Results of the Records Searches and Literature Review

3.1.1 Project Geology

Geologic setting: The proposed Project site is located within the Perris Block of the Peninsular Ranges Geomorphic Province (English, 1926; Norris and Webb, 1990). This structural block is surficially expressed as a relatively low relief, weathered basin punctuated by resistant hills and small mountains, and is surrounded by the Sana Ana Mountains to the west and south, the San Jacinto Mountains to the east, and the San Gabriel and San Bernardino Mountains to the north. The Perris Block is a fault-controlled region, with the San Jacinto Fault to the northeast and the Elsinore Fault to the southwest. Faulting is responsible for the uplift of the surrounding mountain ranges, and the down drop of the Perris Block. As a consequence, the surrounding mountain ranges are actively being eroded, and the sediments derived from this erosion have in the past been, and are still being, deposited in the basin lowlands as alluvial fans and/or stream channel deposits. These surficial deposits overlie a deeply weathered mass of Cretaceous plutonic igneous rocks of the Peninsular Ranges Batholith and older metasedimentary basement rocks.

Project-specific geology: As mapped by Morton and Kennedy (2003) and Morton and Miller (2006), the proposed Project site is underlain by phyllite (Trmp on mapping by Morton and Miller, 2006) that is part of a complex of primarily metasedimentary rocks of Triassic age (approximately 252 to 201 million years old) referred to as “rocks of Menifee Valley” in published reports. In the northern half of the Project site, these metasedimentary rocks are overlain by early to middle Pleistocene-age (approximately 2.58 million to 129,000 years old) very old axial-channel deposits (Qvoa on mapping by Morton and Miller, 2006) (Figure 2). In contrast, the published geologic mapping of Dibble and Minch (2008) depict the majority of the area underlying the Project site as Paleozoic or Mesozoic metasedimentary rocks (schist), overlain by Holocene-age alluvium in the northwestern corner of the site.



Sources: Geology from Morton and Miller, 2006; Terrain Hillshade, World Transportation and Imagery, Esri, 2022

Figure 2: Geologic map of the Project site, Temecula Valley Charter School, Riverside County, California

The Triassic-age metasedimentary rocks underlying this area represent the remnants of “roof pendants” that were metamorphosed during intrusion by magmas of the Cretaceous-age Peninsular Ranges Batholith. Although the actual intrusion of these subduction generated magmas occurred at depths of up to 10 miles below the Earth’s surface, subsequent uplift and erosion over the past 90 million years has resulted in them being exposed today at Bachelor Mountain to the east of the Project site. The Triassic-age “rocks of Menifee Valley” underlying the Project site are characterized as black and fissile phyllite (Morton and Kennedy, 2003; Morton and Miller, 2006).

The early to middle Pleistocene-age very old alluvial deposits mapped in the northern half of the site (very old alluvial valley deposits of Morton and Kennedy, 2003; very old axial-channel deposits of Morton and Miller, 2006) were derived from erosion of the uplifted plutonic igneous bedrock exposed to the east and north of the Project site (e.g., Bachelor Mountain), carried downslope by the action of local streams, and deposited on the valley floor. These deposits are characterized as moderately to well indurated, reddish brown, heavily dissected, arenaceous sand-bearing alluvium (Morton and Kennedy, 2003).

3.1.2 Project Paleontology

A records search request of paleontological collections data at the WSC generated a response that there are no recorded WSC fossil collection localities within a one-mile radius of the proposed Project site, but does note that localities are documented in the region in similar Pleistocene-age alluvial deposits (WSC, 2022; Appendix A). These localities have produced fossil remains of mammoth (*Mammuthus columbi*), mastodon (*Mammut pacificus*), saber toothed cats (*Smilodon fatalis*), camel (*Camelops hesternus*) ancient horse (*Equus* sp.), and other Pleistocene-age large-bodied and small-bodied vertebrates that lived during the Pleistocene. In particular, the WSC houses the significant fossil collection recovered from numerous localities discovered during construction of Diamond Valley Lake, less than 4 miles north-northeast of the Project site in the City of Hemet. There, Pleistocene-age braided stream and lake deposits exposed during construction produced fossil remains of “Ice Age” mammals (e.g., ground sloth, weasel, skunk, badger, wolf, saber-toothed cat, American lion, puma, peccary, camel, pronghorn antelope, deer, bison, mastodon, and mammoth) (Springer et al., 2009, 2010).

A search of the SDNHM paleontological records does not document any fossil collection localities within a one-mile radius of the proposed Project site. The nearest SDNHM fossil localities from Pleistocene-age alluvial deposits lie approximately 7.5 miles south of the Project site, and were discovered during paleontological monitoring of mass grading for the Harveston development, located north of the City of Temecula along the east side of Interstate 15 (SDNHM, unpublished paleontological collections data). The two documented localities produced a partial skull of a mammoth and an isolated mammoth tusk. One additional SDNHM fossil locality from similar Pleistocene-age alluvial deposits is located approximately 17 miles to the north-northeast in the San Jacinto Valley within the City of San Jacinto, where fossil remains of Pleistocene-age physid snails, frogs, colubrid snakes, lizards, and rodents (including the pocket gopher *Thomomys* sp.) were discovered at a depth of 10 feet below ground surface (bgs) during paleontological monitoring of mass grading for a new middle school (SDNHM, unpublished paleontological collections data).

The San Bernardino County Museum (SBCM) reports several recorded paleontological collection localities in the northeastern and eastern portions of the City of Menifee, approximately 8 miles northwest of the Project site. These fossil localities yielded fossil remains of Pleistocene-age western camel (*Camelops hesternus*) and small-bodied vertebrates including lizards, rodents, and rabbits (SBCM, 2010).

In addition, multiple localities were documented in similar Pleistocene-age alluvial deposits during construction of the Aldi Distribution Center in the City of Moreno Valley, located approximately 30 miles north-northwest of the proposed Project site (LSA, 2014). These localities produced isolated fossil remains of giant ground sloth (*Megalonyx jeffersonii* or *Nothrotheriops shastensis*), camelid (*Hemiauchenia*), and horse (*Equus*) (LSA, 2014).

Neither the WSC nor SDNHM have any recorded fossil collection localities from Triassic-aged metasedimentary rocks in the vicinity of the Project site. However, poorly preserved and deformed fossils of large crinoid stems and bivalves of probable Triassic age have been reported from calc-silicate rocks within the "rocks of Menifee Valley" complex located east of Sun City in the City of Menifee (Morton and Miller, 2006).

3.2 Results of the Paleontological Field Survey

As observed during the paleontological field survey, the northern half of the Project site is generally flat-lying or gently undulating, while the southern half of the site consists of several low-relief hills and ridges (Figures 3 and 4). The entire site is covered with dry vegetation and grasses, with a grove of mature trees located in the northeastern quadrant of the site. An old corral surrounded by a wooden fence remains in the south-central portion of the site. A dirt road crosses the eastern portion of the site south from Yates Road, then forks to the west and continues south to form a loop around the corral and low east-west-trending ridge in the southwestern portion of the site. Piles of rock and sediment are present in the northwestern portion of the site, and along the south side of Yates Road (Figure 5).

Exposures of in-place Triassic-age phyllite were observed on the north-, west-, and south-facing slopes of the low-relief ridge encircled by the dirt road in the southern half of the Project site (Figure 6). The phyllite ranges from slightly to moderately metamorphosed—the former is blocky with visible fine-grained texture and the latter is fissile. Its color ranges from medium bluish gray (5B 5/1) to dark gray (N3), and weathers to dark yellowish orange (10YR 6/6) (Figure 7). In the southeastern portion of the site, the phyllite is overlain by relatively thick (up to 10 vertical feet) artificial fill deposits that form a tall berm along the north side of the dirt road following the southern boundary (Figure 8).

Figure 3. Overview of the Project site. The area in the foreground is low-lying and generally flat or gently undulating, with low-relief hills visible in the distance. Photo taken facing east from the northwestern corner.

Figure 4. View of low-relief hills in the southern portion of the site. Photo was taken facing south from the dirt access road.

Figure 5. View of stockpiles of rock debris and sediment located along Washington Street in the northwestern portion of the site, Photo was taken facing north.

Figure 6. Overview of a low-relief ridge of phyllite in the southern half of the Project site. Photo was taken facing east.

Figure 7. Exposures of phyllite within the southern half of the Project site, showing the observed variation in metamorphic grade. At left is an exposure of medium bluish gray to dark yellowish orange weathering blocky phyllite with fine-grained texture. At right is an exposure of dark gray fissile phyllite. Scale bar measures 19 cm across.

Figure 8. View of an ~10 foot tall berm of artificial fill in the southeastern portion of the site. Photo was taken facing west.

Very old axial-channel deposits are mapped in the low-lying northern half of the Project site. These deposits were tentatively identified along the northern boundary of the Project site and consist of moderate yellowish brown (10YR 5/4) silty fine-grained sandstone with metavolcanic clasts (Figure 9). However, it is possible that this is not a natural exposure and instead is the edge of a fill pad of disturbed sediment. Elsewhere, the presence of dense vegetation and topsoil prevented direct observation of in-place deposits (Figure 10). Based on the site topography, the contact between this unit and the underlying phyllite is approximately as depicted in Figure 2.

No fossils were encountered during the paleontological field survey.

Figure 9. View of possible Pleistocene-age axial-channel deposits along the northern boundary of the site. Photos were taken facing south.

Figure 10. View of topsoil and dense vegetation along the northern boundary of the Project site. Photo was taken facing south.

3.3 Results of the Paleontological Resource Assessment

The County of Riverside (2022) assigns the majority of the Project site an undetermined paleontological sensitivity, while the northwestern corner of the site is assigned a low paleontological sensitivity. This assignment is presumably based on geologic mapping by Dibblee and Minch (2008), which depicts Paleozoic or Mesozoic schist and Holocene alluvium underlying the Project site. However, based on the topography observed on the field survey, Triassic-age metasedimentary rocks are likely restricted to the southern half of the site, with Quaternary-age valley-filling alluvium present in the northern half of the site. These observations generally confirm the published geologic mapping by Morton and Kennedy (2003) and Morton and Miller (2006) (Figure 2).

Early to middle Pleistocene-age very old alluvial deposits underlying the northern half of the Project site are assigned a high paleontological sensitivity. This rating is supported by the documented occurrence of scientifically significant terrestrial vertebrate fossils from similar deposits nearby and elsewhere in western Riverside County. Phyllite of the Triassic-age “rocks of Menifee Valley” underlying the southern half of the Project site is assigned an unknown paleontological sensitivity, based on its Triassic age, original marine depositional setting, low grade of metamorphism, and the reported occurrence of rare, poorly preserved, and scientifically important crinoid and bivalve fossils from the “rocks of Menifee Valley” in southwestern Riverside County. Finally, unmapped artificial fill deposits present within the Project site are assigned a low paleontological sensitivity rating because any contained fossil remains will have lost their original stratigraphic and/or geographic context, and are thus of limited scientific research value. These conditions are summarized in Figure 11.

Sources: Terrain Hillshade, World Transportation and Imagery, Esri, 2022

Figure 11: Paleontological sensitivity map, Temecula Valley Charter School, Riverside County, California

3.4 Results of the Paleontological Impact Analysis

Based on the available site plan (dated 28 February 2022), the single-story main building and classroom buildings will be constructed in the north central and south central portions of the Project site. Outdoor playgrounds and sports fields/courts will be located in the northeastern and central portions of the site. Surface parking lots and interior roadways will be located in the western and northeastern portions of the site. A storm water basin will be located in the northwestern corner of the site. No construction is currently proposed for the southeastern corner and eastern edge of the site.

While grading plans were not yet available for review, construction earthwork is anticipated to include: grading for the creation of level building pads (which may include overexcavation and recompaction of the underlying sediments; estimated to extend ~5 feet or more bgs), trenching for subgrade utilities (estimated to extend ~5 feet or more bgs), excavation for the storm water basin (estimated to extend ~5 feet or more bgs), and superficial excavation related to the installation of hardscaping and landscaping (estimated to extend less than ~2 feet bgs).

Based on published geologic mapping of the Project site by Morton and Kennedy (2003) and Morton and Miller (2006) (Figure 2), construction earthwork will occur in areas mapped as early to middle Pleistocene-age very old alluvial deposits and phyllite of the Triassic-age "rocks of Menifee Valley," which are assigned a high and undetermined paleontological sensitivity, respectively. Impacts to paleontological resources are possible where the depth of excavation exceeds the depth of any unmapped artificial fill. Proposed Project components that will involve significant excavations include: site grading, trenching for subgrade utilities, and excavation of the storm water basin. Shallower excavations that occur toward the end of site development (e.g., installation of hardscaping and landscaping) are likely to take place within materials that were already disturbed during site grading, and these excavations are therefore unlikely to impact paleontological resources.

Table 1. Summary of Project impacts and paleontological monitoring recommendations.

Project Components	Anticipated Depth of Earthwork	Impact Analysis	Monitoring recommended?
Site grading	Estimated 5 feet bgs	Impacts possible	**Yes**
Trenching for subgrade utilities	Estimated 5 feet bgs	Impacts possible	**Yes**
Storm water basin excavation	Estimated 5 feet bgs	Impacts possible	**Yes**
Hardscaping, landscaping	Estimated less than 2 feet bgs	No impacts anticipated	No

4.0 Recommendations & Conclusions

Implementation of a paleontological mitigation program, in the form of paleontological monitoring, is recommended for earthwork at the Project site that will directly impact early to middle Pleistocene-age very old alluvial deposits (Qvoa) or Triassic-age phyllite of the "rocks of Menifee Valley" (Trmp).

Implementation of the following mitigation measures will reduce any Project-related impacts to paleontological resources to a level that is less than significant. The mitigation measures outlined below are based on established industry best practices (Murphey et al., 2019).

4.1 Mitigation Measures

1. Prior to the start of earthwork, a qualified Project Paleontologist shall be retained to oversee the paleontological mitigation program and shall attend the pre-construction meeting to consult with Project contractors concerning excavation schedules, paleontological field techniques, and safety issues. A qualified Project Paleontologist is defined as an individual with an M.S. or Ph.D. emphasizing paleontology and sedimentary geology that is experienced with paleontological procedures and techniques, who is knowledgeable in the geology and paleontology of Riverside County, and who has worked as a paleontological mitigation project supervisor for at least two years. In addition, a professional repository shall be designated to receive and curate any discovered fossils. 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 (e.g., Western Science Center, San Diego Natural History Museum).
2. A paleontological monitor shall be on-site during earthwork exceeding the depth of any unmapped artificial fill: on a full-time basis in areas mapped as having high paleontological sensitivity (Figure 11, areas symbolized in red) and on a part-time basis in areas mapped as having an undetermined paleontological sensitivity (Figure 11, areas symbolized in yellow). A paleontological monitor is defined as an individual with a college degree emphasizing paleontology with experience in the recognition and salvage of fossils materials or who has two years of demonstrable equivalent experience in the recognition and salvage of fossil materials. The paleontological monitor shall work under the direction of the Project Paleontologist. The paleontological monitor shall be equipped to salvage fossils as they are unearthed, to avoid construction delays, and to remove samples of sediments that are likely to contain small fossil invertebrates and vertebrates. Monitors shall be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens. Paleontological monitoring may be reduced (e.g., to part-time monitoring or spot-checking) or eliminated, at the discretion of the Project Paleontologist and in consultation with appropriate agencies (e.g., Project proponent, County of Riverside representatives). Changes to the paleontological monitoring schedule shall be based on the results of the mitigation program as it unfolds during site development, and evaluation of current and anticipated conditions in the field.
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 at 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 shall 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 time 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. 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 the monitoring and curation phases of work, and shall summarize the results of the mitigation program. A copy of the paleontological monitoring report shall be submitted to the County of Riverside and to the designated museum repository. The report and specimen inventory, when submitted to the County of Riverside with confirmation of the curation of recovered specimens into an established, accredited repository, shall signify completion of the program to mitigate impacts to paleontological resources.

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Appendix A

Records Search Results: Western Science Center

WESTERN SCIENCE CENTER

San Diego Natural History Museum April 7, 2022
Katie McComas
P.O. Box 121390
San Diego, CA 92101

Dear Ms. McComas,

This letter presents the results of a record search conducted for Temecula Valley Charter School Project in Riverside County, California. The project site is located east of Washington Street, west of Lake Skinner Reservoir, north of Thompson Road and south of Yates Road in Section 34, Township 6 South, and Range 2 West, on the *Bachelor Mountain, CA* USGS 7.5 minute quadrangle.

The geologic units underlying the project area are mapped as roughly half Mesozoic phyllite and half very old alluvial channel deposits dating from the early to middle Pleistocene epoch (Morton et al., 2003). While the Mesozoic phyllite is not considered to be paleontologically sensitive, the Pleistocene alluvial units in the southern half of the project area are considered to be of high paleontological sensitivity. The Western Science Center does not have localities within the project area or within a 1-mile radius we do have numerous fossil localities from similarly mapped units throughout the region, including those associated with the Diamond Valley Lake Project less than 5 miles north in the city of Hemet, California. Southern California Pleistocene alluvial units are well documented to contain extinct fauna including those associated with mastodon (*Mammut pacificus*), mammoth (*Mammuthus columbi*), ancient horse (*Equus sp.*), camel (*Camelops hesternus*), sabertooth cat (*Smilodon fatalis)* and many more.

Any fossil specimens recovered from the Temecula Valley Charter School Project would be scientifically significant. Excavation activity associated with the development of the project area would impact the paleontologically sensitive Pleistocene units, and it is the recommendation of the Western Science Center that a paleontological resource mitigation program be put in place to monitor, salvage, and curate any recovered fossils from the study area.

If you have any questions, or would like further information, please feel free to contact me at dradford@westerncentermuseum.org

Sincerely,

Darla Radford
Collections Manager