PALEONTOLOGICAL RESOURCES ASSESSMENT REPORT
AND
PALEONTOLOGICAL RESOURCES MANAGEMENT AND MONITORING PLAN

OCOTILLO QUARRY PROJECT

Assessor's Parcel No. 0438-082-01
Near the Town of Apple Valley, San Bernardino County, California

For Submittal to:

San Bernardino County Department of Public Works
825 East 3rd Street
San Bernardino, CA 92415

Prepared for:

Lilburn Corporation
1905 Business Center Drive
San Bernardino, CA 92408

Prepared by:

Harry M. Quinn, Paleontologist/Geologist
Ben Kerridge, Report Writer
CRM TECH
1016 East Cooley Drive, Suite A/B
Colton, CA 92324

Michael Hogan, Principal Investigator
Bai "Tom" Tang, Principal Investigator

October 18, 2019

CRM TECH Contract #3450P
Approximately 20 acres
USGS Apple Valley South, Calif., 7.5' (1:24,000) quadrangle
Section 24, Township 4 North Range 3 West, San Bernardino Baseline and Meridian

EXECUTIVE SUMMARY

Between March and October, 2019, at the request of the Lilburn Corporation, CRM TECH performed a paleontological resource assessment on approximately 20 acres of land on an existing quarry in the southeastern portion of Victor Valley, San Bernardino County, California. The subject property of the study, Assessor's Parcel No. 0438-082-01, is located at the southeast corner of Ocotillo Way and Valley Vista Avenue, in the northeast quarter of Section 24, T4N R3W, San Bernardino Baseline and Meridian.

The study is part of the environmental review process for the proposed Ocotillo Quarry Project, which proposes the continuation of "cut and fill" aggregate materials mining operations on the property. The County of San Bernardino, as the lead agency for the project, required the study in compliance with the California Environmental Quality Act (CEQA). The purpose of the study is to assist the County in determining whether the project would adversely affect any significant, nonrenewable paleontological resources, as required by CEQA, and to design a paleontological resources management and monitoring plan for the project.

In order to identify any paleontological resource localities that may exist in or near the project area and to assess the probability for such resources to be encountered during the project, CRM TECH initiated records searches at the appropriate repositories, conducted a literature review, carried out a systematic field survey, and executed a subsurface testing program. The results of these research procedures indicate that the uppermost sediments in the project area, down to the depth of at least 15 feet below the current ground surface, consist of coarse-grained alluvial deposits from the Holocene Epoch.

Sourced from decomposing granitic bedrock in the nearby Ord Mountains, the Holocene alluvium at this location is considered low in paleontological sensitivity. Underneath these Recent deposits, however, sources indicate the presence of older, finer-grained alluvial sediments at an unknown depth, which are highly sensitive for paleontological resources if they are of sufficient age. As the objective of the quarry operations is to obtain coarse-grained aggregate materials from the surface and near-surface deposits, CRM TECH concludes that the project has a low potential to impact significant, nonrenewable paleontological resources within the top 15 feet of sediments below surface, and no monitoring will be necessary to that depth.

In order to prevent inadvertent impacts on paleontological resources, CRM TECH recommends that all ground disturbances be strictly limited to the coarse-grained Holocene alluvium on and near the surface, and that the older, finer-grained sediments underneath be avoided if encountered during the quarry operations. When project impacts reach the depth of 15 feet below the current ground surface, further paleontological evaluation of the sediments underneath will become necessary. If any disturbance to the finer-grained sediments at depth becomes unavoidable in the future, an updated paleontological resources management and monitoring plan, including some level of paleontological monitoring and/or periodic field inspection by qualified personnel, will need to be designed and implemented at that time in accordance with the extent of impacts anticipated in this potentially fossiliferous formation.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

Between March and October, 2019, at the request of the Lilburn Corporation, CRM TECH performed a paleontological resource assessment on approximately 20 acres of land on an existing quarry in the southeastern portion of Victor Valley, San Bernardino County, California (Fig. 1). The subject property of the study, Assessor's Parcel No. 0438-082-01, is located at the southeast corner of Ocotillo Way and Valley Vista Avenue, in the northeast quarter of Section 24, T4N R3W, San Bernardino Baseline and Meridian (Figs. 2, 3).

The study is part of the environmental review process for the proposed Ocotillo Quarry Project, which proposes the continuation of "cut and fill" aggregate materials mining operations on the property. The County of San Bernardino, as the lead agency for the project, required the study in compliance with the California Environmental Quality Act (CEQA; PRC §21000, et seq.). The purpose of the study is to assist the County in determining whether the project would adversely affect any significant, nonrenewable paleontological resources, as required by CEQA, and to design a paleontological resources management and monitoring plan for the project.

In order to identify any paleontological resource localities that may exist in or near the project area and to assess the probability for such resources to be encountered during the project, CRM TECH initiated records searches at the appropriate repositories, conducted a literature review, carried out a systematic field survey, and executed a subsurface testing program. The following report is a complete account of the methods, results, and final conclusion of this study. Personnel who participated in the study are named in the appropriate sections below, and their qualifications are provided in Appendix 1.

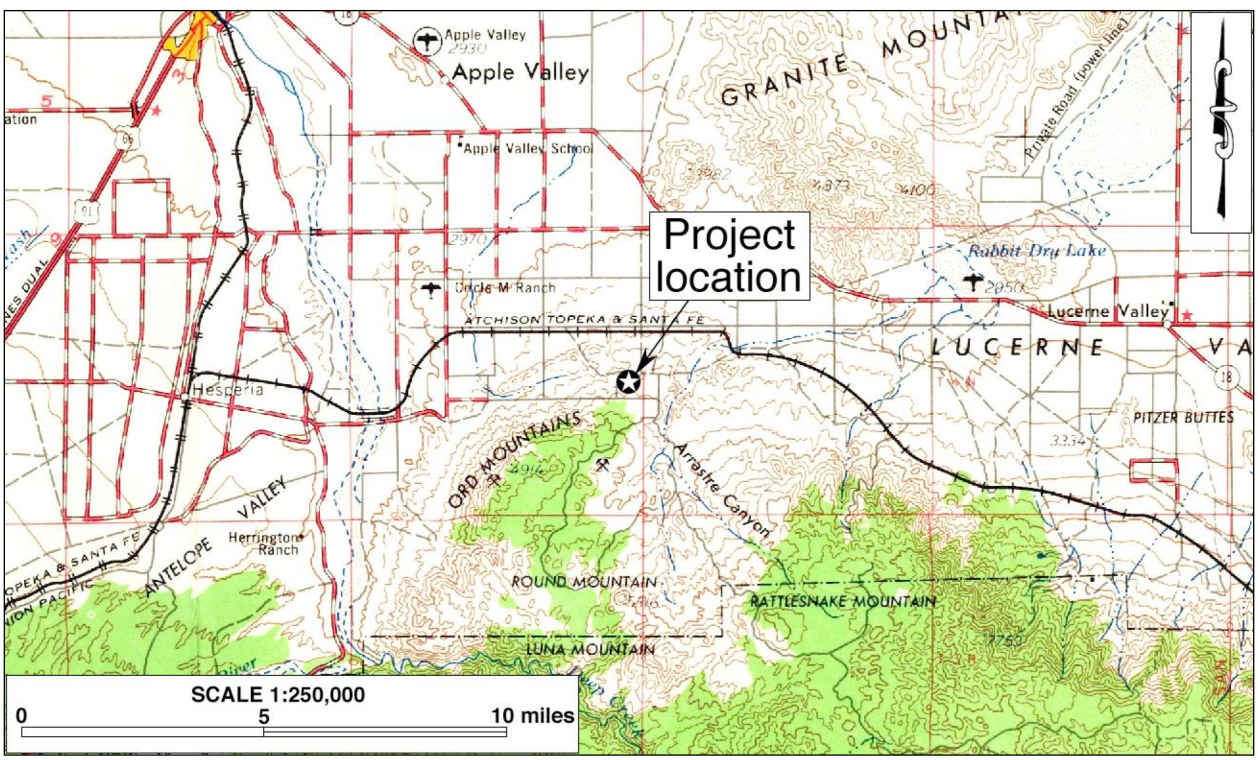


Figure 1. Project vicinity. (Based on USGS San Bernardino, Calif., 30'x60' quadrangle)

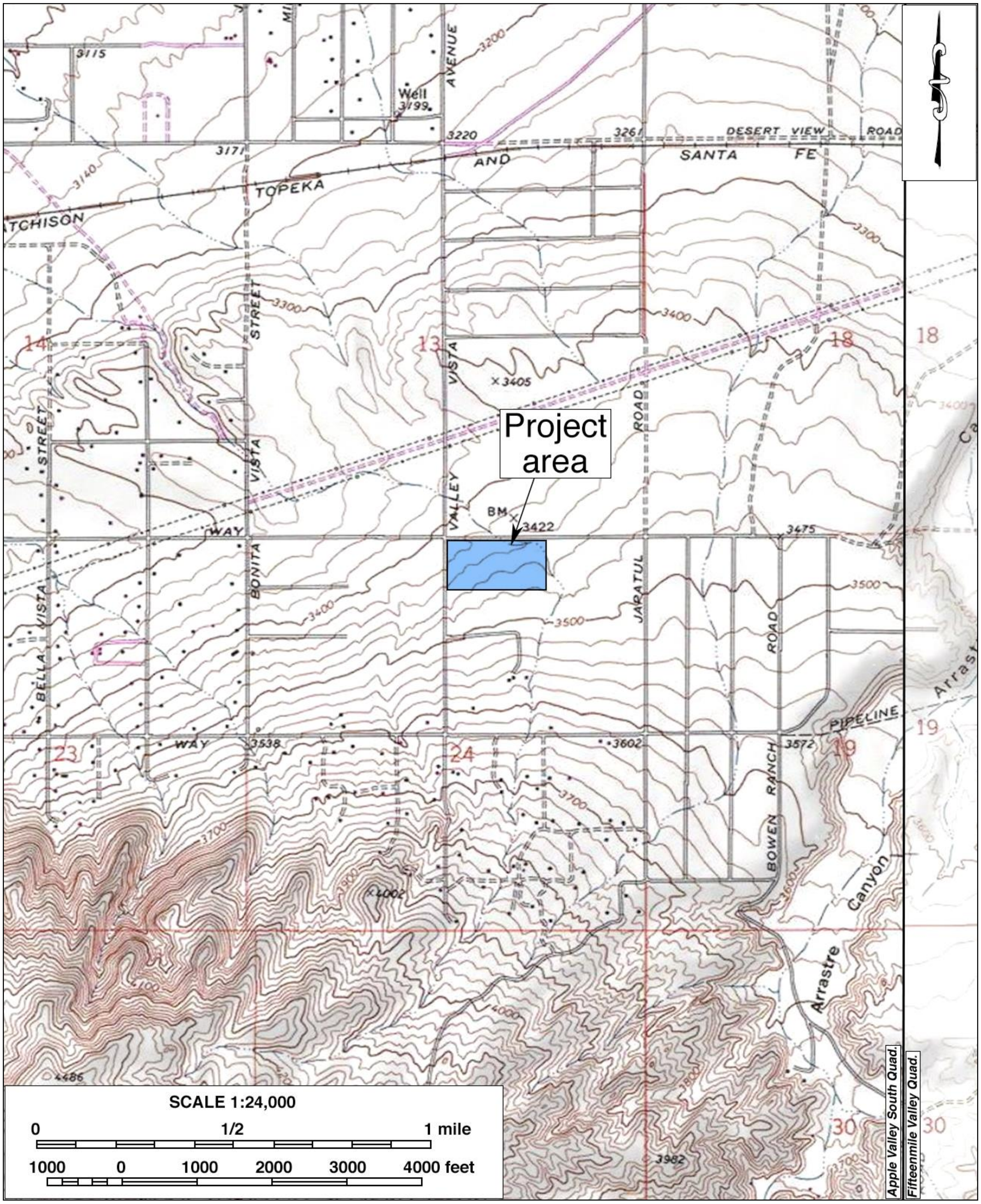


Figure 2. Project area. (Based on USGS Apple Valley South and Fifteenmile Valley, Calif., 7.5' quadrangles)

Figure 3. Aerial photograph of the project area.

PALEONTOLOGICAL RESOURCES

DEFINITION

Paleontological resources represent the remains of prehistoric life, exclusive of any human remains, and include the localities where fossils were collected as well as the sedimentary rock formations in which they were found. The defining character of fossils or fossil deposits is their geologic age, which is typically regarded as older than approximately 12,000 years, the generally accepted temporal boundary marking the end of the last late Pleistocene (circa 2.6 million to 12,000 years B.P.) glaciation and the beginning of the current Holocene epoch (circa 12,000 years B.P. to the present).

Common fossil remains include marine shells; the bones and teeth of fish, amphibians, reptiles, and mammals; leaf assemblages; and petrified wood. Fossil traces, another type of paleontological resource, include internal and external molds (impressions) and casts created by these organisms. These items can serve as important guides to the age of the rocks and sediments in which they are contained and may prove useful in determining the temporal relationships between rock deposits from one area and those from another as well as the timing of geologic events. They can also provide information regarding evolutionary relationships, development trends, and environmental conditions.

Fossil resources generally occur only in areas of sedimentary rock (e.g., sandstone, siltstone, mudstone, claystone, or shale). Because of the infrequency of fossil preservation, fossils, particularly vertebrate fossils, are considered nonrenewable paleontological resources. Occasionally fossils may be exposed at the surface through the process of natural erosion or because of human disturbances; however, they generally lay buried beneath the surficial soils. Thus, the absence of fossils on the surface does not preclude the possibility of their being present within subsurface deposits, while the presence of fossils at the surface is often a good indication that more remains may be found in the subsurface.

SIGNIFICANCE CRITERIA

According to guidelines proposed by Eric Scott and Kathleen Springer (2003) of the San Bernardino County Museum, paleontological resources can be considered to be of significant scientific interest if they meet one or more of the following criteria:

1. The fossils provide information on the evolutionary relationships and developmental trends exhibited among organisms, living or extinct;
2. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;
3. The fossils provide data regarding the development of biological communities or the interactions between paleobotanical and paleozoological biotas;
4. The fossils demonstrate unusual or spectacular circumstances in the history of life; and/or
5. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

PALEONTOLOGICAL SENSITIVITY

The fossil record is unpredictable, and the preservation of organic remains is rare, requiring a particular sequence of events involving physical and biological factors. Skeletal tissue with a high percentage of mineral matter is the most readily preserved within the fossil record; soft tissues not intimately connected with the skeletal parts, however, are the least likely to be preserved (Raup and Stanley 1978). For this reason, the fossil record contains a biased selection not only of the types of organisms preserved but also of certain parts of the organisms themselves. As a consequence, paleontologists are unable to know with certainty, the quantity of fossils or the quality of their preservation that might be present within any given geologic unit.

Sedimentary units that are paleontologically sensitive are those geologic units (mappable rock formations) with a high potential to contain significant nonrenewable paleontological resources. More specifically, these are geologic units within which vertebrate fossils or significant invertebrate fossils have been determined by previous studies to be present or are likely to be present. These units include, but are not limited to, sedimentary formations that contain significant paleontological resources anywhere within their geographical extent as well as sedimentary rock units temporally or lithologically amenable to the preservation of fossils.

A geologic formation is defined as a stratigraphic unit identified by its lithic characteristics (e.g., grain size, texture, color, and mineral content) and stratigraphic position. There is a direct relationship between fossils and the geologic formations within which they are enclosed and, with sufficient knowledge of the geology and stratigraphy of a particular area, it is possible for paleontologists to reasonably determine the formation's potential to contain significant nonrenewable vertebrate, invertebrate, marine, or plant fossil remains.

The paleontological sensitivity for a geologic formation is determined by the potential for that formation to produce significant nonrenewable fossils. This determination is based on what fossil resources the particular geologic formation has produced in the past at other nearby locations. Determinations of paleontologic sensitivity must consider not only the potential for yielding vertebrate fossils but also the potential of yielding a few significant fossils that may provide new and significant taxonomic, phylogenetic, and/or stratigraphic data.

The Society of Vertebrate Paleontology issued a set of standard guidelines intended to assist paleontologists to assess and mitigate any adverse effects/impacts to nonrenewable paleontological resources. The guidelines defined four categories of paleontological sensitivity for geologic units that might be impacted by a proposed project, as listed below (Society of Vertebrate Paleontology 2010:1-2):

- **High Potential**: Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered.
- **Undetermined Potential**: Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment.
- **Low Potential**: Rock units that are poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances.
- **No Potential**: Rock units that have no potential to contain significant paleontological resources, such as high-grade metamorphic rocks and plutonic igneous rocks.

SETTING

The project area is located within the Mojave Desert geomorphic province of southeastern California (Jenkins 1980:40-41; Harms 1996:93-96; Harden 2004:127-136). Dibblee (1967) and Coombs et al. (1979) place the project area within what they call the Western Mojave Desert region. The landscape in the region features a relatively high-elevation desert with scattered, isolated mountains and numerous broad, shallow basins, some with dry lakebeds at the low points (*ibid*.). Many of these basins have pediment surfaces developed along the margins, separating them from the mountains (Coombs et al. 1979:9). The pediment surfaces are commonly covered by desert pavement, which helps protect these areas from sheetwash and channeling (*ibid*.). These mountains and intermountain valleys tend to have a northwest-southeast trend (*ibid*.:7).

The basin areas of the Western Mojave Desert are filled with sediments ranging in age from Miocene to Recent (Dibblee 1967:49-82; Meisling and Weldon 1989:110). These sedimentary rocks are interbedded with volcanic rocks from both acidic and basic flows (Bowen 1954; Dibblee 1967:82-110). Much of the southern portion of this project area is located on what is called the Victorville Fan, which has been thought to have a high potential for nonrenewable vertebrate fossil remains (Meisling and Weldon 1989:108; Reynolds and Reynolds 1994). However, more recent studies indicate that the Victorville Fan sediments, while potentially fossiliferous, are not as fossiliferous as originally thought and that most of the fossils have been recovered from ancestral Plio-Pleistocene-age Mojave River sediments (Scott 2009).

The project area consists of a rectangular-shaped parcel of undeveloped but extensively disturbed desert land in a sparsely populated rural residential area, surrounded on all sides by other parcels of vacant land that largely retain their natural state (Figs. 3, 4). The location is on the southeastern edge of the Victor Valley and near the foothills of the Ord Mountains, a granitic ridge on the

Figure 4. Overview of the current natural setting of the project area. (Photograph taken on March 27, 2019; view to the northeast)

northern rim of the San Bernardino Mountains (Figs. 1, 2). The terrain on most of the property has been mechanically altered, leaving a generally level surface today with an artificial slope along the southern edge (Fig. 4). Elevations range approximately between 3,410 feet and 3,480 feet above sea mean level. Soils on the surface feature brownish-yellow, coarse-grained sands mixed with small to medium-sized rocks. Vegetation on the property is clustered mostly along the perimeters and consists of foxtail, wild mustard, tumbleweed, and other small desert shrubs and grasses.

RESEARCH DESIGN

For any scientific investigation to be able to contribute important knowledge to its field of inquiry it must contribute important information to the scientific field. This can be accomplished by building on previous work, by supporting or refuting current understandings, and by asking questions that lead in new directions and, thus, laying the groundwork for future studies. A paleontological assemblage can be analyzed and evaluated against current research questions of paleontological interest.

A research design for paleontology is intended to guide paleontological investigations, directing paleontologists to focus on those questions that have the best potential to fill gaps in current knowledge and theory. Paleontologists then plan their field and laboratory strategies to collect scientific data that can address questions that are the subject of ongoing debate regarding paleoenvironments and lifeforms. A research design is therefore an important foundation for any such research program.

A standard set of research questions can be applied to almost any paleontological investigation. These questions include chronology, evolutionary development, evolutionary relationships and the development of biological communities, and paleoenvironments. If recovered fossils can address these issues, they could be considered to be significant fossil resources. Fossils can also be considered significant if they are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, or are not found in other geographic locations. Some of the general, but important, paleontological research questions are presented below.

- Do the resources provide data on the evolutionary relationships and developmental trends among both living and extinct organisms, or even within a single species?

Information recovered from the resources such as the taxa that are present in the flora and faunal assemblage(s), how many individuals are present, and what species diversity is evident in the assemblage(s) can help answer this question. Also, noting the relative abundance of different species in the assemblage(s) would be important, as would determining how the observed variety of taxa relate to other assemblages found in southern California and other parts of North America.

- Do the resources provide data useful in determining the age(s) of the rock unit or sedimentary stratum in which they were found? This includes data important in determining the depositional history of the region and the timing of geologic events therein.

By observing the depositional environment of sediments and rock units in the study area, the relative age of the different strata can be determined. Also, the age of the various faunal assemblage(s) is indicative of the age of the geological strata. New techniques and technologies combined with a growing data base can be brought to bear on these questions.

- Can the resources provide data regarding the development of paleobiological communities and/or the interaction between paleobotanical and paleozoological life-forms?

Although construction-related earth-moving activities may negatively impact paleontological resources, enough data may be available to determine if fossil bones had been gradually worn down or if some catastrophic event (mechanical force) had damaged them. It is also important to note which osteological elements are most common in the assemblage(s), and whether these elements vary from species to species. The primary directional orientation of the fossils, and whether there is evidence of abrasion or weathering on some or all of the fossils recovered can provide information regarding the depositional history of the fossils. Observing if the fossils are usually complete or fragmented, or if there is evidence of carnivore, scavenger, or even human activity on the fossils, would also provide important information.

- Do the resources represent unusual or spectacular circumstances in the history of life in the area?

The number of individuals present in the sample and their age structures (i.e., number of adults, subadults, and juveniles) can provide important information regarding this question. If the sample is sufficiently large and unbiased, life tables and survivorship curves can be constructed. If the gender of the recovered resources can be determined, then the ratio of males to females can be established.

- Are the resources in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, commercial exploitation, or development? Are they found in other geographic locations?

Just the fact that there may be very few remaining examples of a particular fossil increases its importance to the discipline of paleontology.

- Can the resources provide any important information regarding the paleo-environment of the area? Was the climate drastically different, or largely the same, as it is now?

Examining the ratio of moist, or even aquatic, species to dry-environment species in the assemblage can lead to a better understanding of the past environment. The same can be said regarding the ratio of presumed grassland-dwelling species to woodland- and/or forest-dwelling species. Additionally, paleobotanical data from the various fossil-bearing formations encountered may shed further light on past climate and environment.

Fossil remains that could help answer research questions regarding ancient life and environmental conditions in the Lucerne Valley area could be present on this property. If such remains are recovered, they may yield important data regarding early life-forms in the area and thus contribute to the discipline of paleontology. If the recovered data can address some of the research questions presented above, the paleontological finds would be considered significant.

METHODS AND PROCEDURES

RECORDS SEARCHES

The records search service for this study was provided by the Western Science Center (WSC) in Hemet, the Natural History Museum of Los Angeles County (NHMLAC) in Los Angeles, and the San Bernardino County Museum (SBCM) in Redlands. These institutions maintain files of regional paleontological localities as well as supporting maps and documents. The records search results were used to identify known paleontological localities as well as previously completed paleontological resource studies, if any, within a one-mile radius of the project location.

LITERATURE REVIEW

In conjunction with the records searches, CRM TECH geologist Harry M. Quinn, California Professional Geologist #3477, pursued a literature review on the project vicinity. Sources consulted during the review include primarily topographic, geologic, and soil maps of the Lucerne Valley area, published geologic literature pertaining to the project location, and other materials in the CRM TECH library and Quinn's personal library, including unpublished reports produced during similar surveys in the vicinity.

FIELD SURVEY

On March 27, 2019, CRM TECH field director Daniel Ballester and paleontological surveyors Michael Richards and Hunter O'Donnell conducted the field survey of the project area under the direction of Harry M. Quinn. The survey was completed by walking a series of parallel north-south transects spaced 15 meters (approximately 50 feet) apart. In this way, the ground surface in the entire project area was systematically examined to determine soil types, verify the geological formations, and search for indications of paleontological remains. Ground visibility was excellent (essentially 100%) over most of the property due to the removal of all vegetation but was poor to fair (50-70%) along the perimeters and in the southeast corner, where pockets of dense vegetation remain.

SUBSURFACE TESTING EXCAVATION

The subsurface testing excavation program was carried out on September 17, 2019, by Harry M. Quinn, Daniel Ballester, CRM TECH principal investigator Michael Hogan, and paleontological surveyor John D. Goodman II. In order to explore the subsurface soils for evidence of any vertebrate fossil remains or potentially fossiliferous sediments, two trenches were cut in the project area with a backhoe excavator. Samples of soils from the trenches were screened through a ¼-inch hardware mesh.

Each measuring 30 feet long and roughly three feet wide, the two trenches were excavated in five-foot levels to a minimum depth of 15 feet. One of the trenches was placed in an east-west direction at the western end of the project area (Fig. 5), and the other was placed in a north-south direction in the central portion. A third trench was originally planned at the eastern end of the property but was cancelled since little variation was observed in the stratigraphy observed in the two trenches that were completed.

Figure 5. Trench No. 1, excavated in the western portion of the project area. (Photograph taken on September 17, 2019; view to the west)

RESULTS AND FINDINGS

RECORDS SEARCHES

The records search results yield no known paleontological localities within the project area or a one-mile radius (Cortez 2019; McLeod 2019; Radford 2019; see App. 2). However, SBCM reports fossil localities approximately five miles to the east where Pleistocene vertebrate remains were discovered in geological units similar to those known to occur in the northeastern portion of the project area (Cortez 2019). Meanwhile, NHMLAC and WSC also report several paleontological localities nearby in similarly sediments to those mapped in the project area (McLeod 2019; Radford 2019).

SBCM states that the project area sits on surface exposures of Quaternary alluvium that overlay older Pleistocene alluvium that has a high potential to contain fossil resources (Cortez 2019). NHMLAC identifies the surface soils at the project location as older Quaternary alluvium derived from intrusive igneous rocks of the nearby Ord Mountains and gives these soils a low sensitivity for significant vertebrate fossils in the uppermost layers (McLeod 2019). Beneath these surface sediments, however, are older, finer-grained sediments that are considered more sensitive (*ibid.*). NHMLAC refers to examples of mammoth, camel, and vole fossils found in these geological units elsewhere in the region (*ibid.*).

WSC finds the project area to be situated entirely atop these older Pleistocene deposits and considers them to be of high paleontological sensitivity (Radford 2019). In comparison, SBMC and NHMLAC consider the coarser alluvial sediments on the surface to be low in sensitivity but the finer-grained, older alluvium at some unknown depth beneath the surface to be high in sensitivity (Cortez 2019; McLeod 2019). WSC recommends monitoring of all earth-moving activities associated with the project, while NHMLAC reserves the monitoring recommendation for "any substantial excavations in the finer-grained sedimentary deposits" (McLeod 2019; Radford 2019).

LITERATURE SEARCH

Bortugno and Spittler (1986) map the surface geology in the project area as *Qo*, or undifferentiated older alluvium of Pleistocene age. Dibblee (2008) maps the surface geology at this location as ***Qoa*,** which he describes as older alluvium of Pleistocene age, made up of poorly bedded to non-bedded cobble gravel and sand. Morton and Miller (2006) identify the surface geology in the project area as mostly Qf_1, with a small portion of Qyf_4 in the northeast corner (Fig. 6). Qf_1 represents very young alluvial fan deposits dating to the late Holocene, with grain sizes varying from sand to boulder, unconsolidated and loosely compacted. Qyf_4 represents young alluvial fan deposits dating to the late Holocene and made up of silt and sand ranging from coarse-grained to boulder-sized in unconsolidated to slightly consolidated units.

Tugel and Woodruff (1986:50, Map Sheet 32) map the surface soil in the project area as entirely Type 143, which belong to the Lucerne sandy loam, 2-5 percent slopes. It is described as a very deep, well-drained soil that formed on alluvial fans and terraces, derived dominantly from granitic material (*ibid*.). Tugel and Woodruff (1986:Map Sheet 32) show the north half and a large portion of the south half of the project area to have been disturbed by past mining activities (*ibid*.).

FIELD SURVEY RESULTS

The field survey produced negative results for any surficial evidence of paleontological resources. As noted above, nearly the entire project area, with the exception of the southeast corner, has been extensively disturbed in the past, and much of the original surface and near-surface soils have been removed. Currently, the surface soils consist of brownish-yellow, coarse-grained sands with small to medium-sized rocks. Because the records search results from WSC, NHMLAC, and SBCM, based on regional overview, disagree on the depth at which potentially fossiliferous sediments occur in the project area, the subsurface testing excavation program was proposed after the surface survey and was subsequently implemented.

SUBSURFACE TESTING EXCAVATION

The testing excavation also produced negative results for potential paleontological resources. More importantly, no evidence of the older, finer-grained alluvial sediments was discovered within the depth reached by the trenching operations. Trench 1, at the western end of the project area, was excavated to a total depth of 18 feet. The soil in this trench consisted of a fairly uniform, well-sorted medium- to coarse-grained alluvial sand, non-bedded. Clayey soils were found in increasing abundance as the depth of the trench increased, but the soil character remained largely unchanged. Trench 2, in the middle portion of the project area, was excavated to a total depth of 15 feet. The soil in this trench was essentially the same as that in Trench 1, and the same increase in clayey soils with depth was also noted in Trench 2.

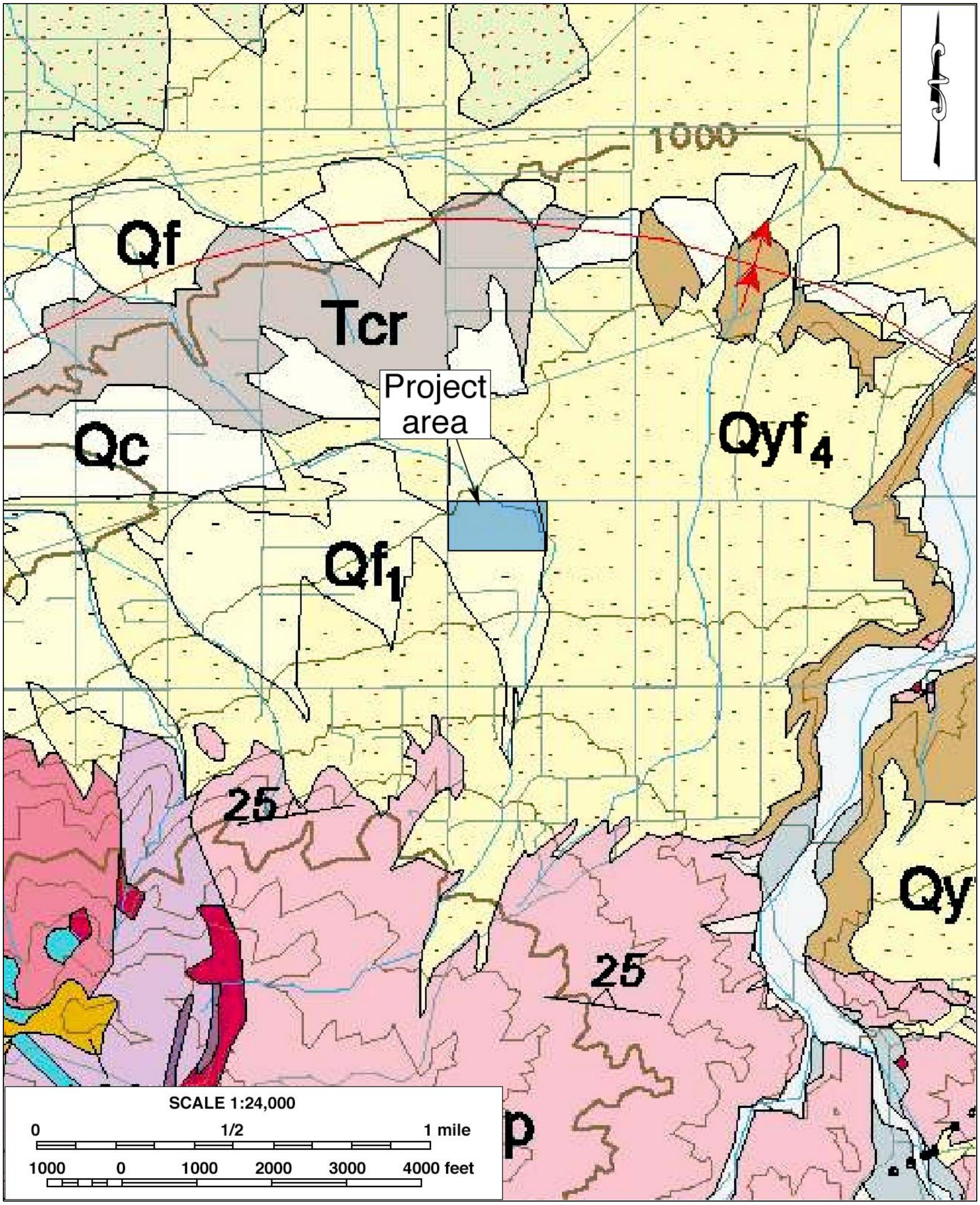


Figure 6. Surface geology in the project vicinity. (Source: Morton and Miller 2006)

DISCUSSION

In summary, sources consulted during this study agree as to the type of soils present at the project location but disagree on their age. Bortugno and Spittler (1986) and Dibblee (2008) show the surface geology in the project area to be mainly alluvial fan sediments of Pleistocene age, while Morton and Miller (2006) show these alluvial fan sediments to be from the late Holocene Epoch. The field survey of the project area found no surface manifestations of paleontological resources within the project area but confirmed the surface soils profile as sandy alluvial deposits.

Alluvial fans are interesting places for the preservation of fossil materials as animals perishing on an alluvial fan normally become food for other animals living on the fan or flying over it. Any bone material left behind tends to be broken and scattered on a sunny surface and is not easily preserved. Much of the deposition on an alluvial fan is by sheet wash and this is not a good setting for the rapid burial of any animal or plant remains left on the surface. However, during times of flash flooding, animals and plants can be trapped in flowing waters and rapidly buried as the flowing waters cease.

In these cases, the entire animal or plant can be preserved. Thus, alluvial fan deposits are not the best places for preservation of animal or plant remains but, in some instances, such as during a flash flood, can be a great place for fossil preservation. WSC has assessed the alluvial fan sediments that make up the entire project area as having a high potential to contain significant, nonrenewable vertebrate fossil remains and recommends monitoring of all earth-moving activities associated with the project (Radford 2019).

Alluvial fans tend to be made up of coarse-grained materials that are often considered detrimental to the preservation of fossil remains. The sediments tend to be coarser near the source and decrease in coarseness further away from the source. At this locality, the alluvial fan sediments appear to have originated from decomposing granitic bedrock in the nearby Ord Mountains, less than a mile to the south.

Both SBMC and NHMLAC consider the coarser alluvial sediments on the surface in the project area to be low in paleontological sensitivity but the older alluvium at some unknown depth beneath the surface, which may be finer-grained, to be much more sensitive (Cortez 2019; McLeod 2019). As mentioned above, NHMLAC recommends monitoring for "any substantial excavations in the finer-grained sedimentary deposits" within the project area (McLeod 2019).

The testing excavation encountered no buried paleontological resources and revealed a fairly uniform subsurface soil profile to the depth of at least 15 feet below the current ground surface, characterized by well-sorted, medium- to coarse-grained alluvial sand, non-bedded, and a gradual increase in clay content with the depth. The non-bedded and well-sorted nature of these soils indicates a slow and consistent deposition throughout the Holocene Epoch, with no evidence of dynamic flows or uplifting. The uniformity of the soils encountered in the trenches is an indicator that they are Holocene in age despite the conflicting geological mapping. Therefore, it is the opinion of CRM TECH that the proposed quarry operations may continue without monitoring within the project area for at least 15 feet in depth without encountering any paleontologically sensitive sediments.

PALEONTOLOGICAL RESOURCES MANAGEMENT AND MONITORING PLAN

CEQA guidelines (Title 14 CCR App. G, Sec. V(c)) require that public agencies in the State of California determine whether a proposed project would "directly or indirectly destroy a unique paleontological resource" during the environmental review process. The present study, conducted in compliance with this provision, is designed to identify any significant, non-renewable paleontological resources that may exist within or adjacent to the project area, to assess the possibility for such resources to be encountered during the project, and to formulate a paleontological resources management and monitoring plan for the protection of such resources.

Based on the research results presented above, the uppermost sediments in the project area, down to the depth of at least 15 feet below the current ground surface, consist of coarse-grained alluvial deposits from the Holocene Epoch. Sourced from decomposing granitic bedrock in the nearby Ord Mountains, the Holocene alluvium at this location is considered low in paleontological sensitivity. Underneath these Recent deposits, however, sources indicate the presence of older, finer-grained alluvial sediments at an unknown depth, which are highly sensitive for paleontological resources if they are of sufficient age.

As the objective of the quarry operations is to obtain coarse-grained aggregate materials from the surface and near-surface deposits, CRM TECH concludes that the project has a low potential to impact significant, nonrenewable paleontological resources within the top 15 feet of sediments below surface, and no monitoring will be necessary to that depth. In order to prevent inadvertent impacts on paleontological resources, CRM TECH recommends that all ground disturbances be strictly limited to the coarse-grained Holocene alluvium on and near the surface, and that the older, finer-grained sediments underneath be avoided if encountered during the quarry operations.

When project impacts reach the depth of 15 feet below the current ground surface, further paleontological evaluation of the sediments underneath will become necessary. If any disturbance to the finer-grained sediments at depth becomes unavoidable in the future, an updated paleontological resources management and monitoring plan, including some level of paleontological monitoring and/or periodic field inspection by qualified personnel, will need to be designed and implemented at that time in accordance with the extent of impacts anticipated in this potentially fossiliferous formation.

REFERENCES

Bortugno, E.J., and T.E. Spittler
1986 San Bernardino Quadrangle (1:250,000). California Regional Map Series 3A. California Division of Mines and Geology, Sacramento.

Bowen, Oliver E., Jr.
1954 Geology and Mineral Deposits of Barstow Quadrangle, San Bernardino County, California (1:125,000). California Division of Mines Bulletin 165, Plate 1. San Francisco.

Connell, S.D., T. Williamson, and S.G. Wells
1994 Reconnaissance Investigation of Holocene and Pleistocene Sediments along the Mojave River, Southern California: Implications for Archaeological Studies. In Dicken Everson and Joan Schneider (eds.): *Kelso Conference Papers 1987-1992*; pp. 95-105. Museum of

Anthropology Occasional Papers in Anthropology No. 4. California State University, Bakersfield.
Coombs, Gary B., Richard McCarty, Tara Shepperson, and Sharon Dean
1979 *The Archaeology of the Western Mojave*. Bureau of Land Management Cultural Resources Publications in Archaeology. U.S. Bureau of Land Management, California Desert District, Riverside.
Cortez, Crystal
2019 Paleontological Records Review for Proposed Ocotillo Quarry Project Site. Letter report prepared by the San Bernardino County Museum, Redlands, California.
Dibblee, Thomas W., Jr.
1967 *Geology of the Western Mojave Desert, California*. U.S. Geological Survey Professional Paper 522. Washington, D.C.
2008 Geologic Map of the Lake Arrowhead and Lucerne Valley Quadrangles, San Bernardino County, California (1:62,500). Dibblee Geology Center Map Series DF-379. Santa Barbara, California.
Harden, Deborah R.
2004 *California Geology*. Prentice Hall, Upper Saddle River, New Jersey.
Harms, Nancy S.
1996 *A Precollegiate Teachers Guide to California Geomorphic/Physiographic Provinces*. National Association of Geoscience Teachers, Far West Section, Concord, California.
Jenkins, Olaf P.
1980 Geomorphic Provinces Map of California. *California Geology* 32(2):40-41. California Division of Mines and Geology, Sacramento.
McLeod, Samuel A.
2019 Paleontological Resources for the Proposed Ocotillo Quarry Project, CRM TECH #3450P, near the Town of Apple Valley, San Bernardino County. Letter report prepared by the Natural History Museum of Los Angeles County, Los Angeles.
Meisling, K.E., and R.J. Weldon
1989 Late Cenozoic Tectonics of the Northwestern San Bernardino Mountains of Southern California. *Geological Society of America Bulletin* 101:106-128.
Morton, Douglas M., and Fred K. Miller
2006 Geologic Map of the San Bernardino and Santa Ana 30'x60' quadrangle, California. United States Geological Survey Open-File Report 06-1217.
Radford, Darla
2019 Letter to Nina Gallardo, CRM TECH. March 16. Prepared by the Western Science Center, Hemet, California.
Reynolds, Robert E.
1989 Mid-Pleistocene Faunas of the West-Central Mojave Desert. In Robert E. Reynolds (ed.): *The West-Central Mojave Desert: Quaternary Studies between Kramer and Afton Canyon*; pp. 45-48. San Bernardino County Museum Association Special Publication. Redlands, California.
Reynolds, Robert E., and R.L. Reynolds
1994 The Victorville Fan and an Occurrence of *Sigmodon*. In Robert E. Reynolds (ed.): *Off Limits in the Mojave Desert*; pp. 31-33. San Bernardino County Museum Association Special Publication 94-1. Redlands, California.

Scott, Eric
2009 Paleontology Records Review: Desert Sky Plaza Project, City of Victorville, San Bernardino County, California. Letter report prepared by the San Bernardino County Museum, Redlands, California.
Scott, Eric, and Kathleen B. Springer
2003 CEQA and Fossil Preservation in California. *Environmental Monitor* Fall:4-10. Association of Environmental Professionals, Sacramento, California.
Society of Vertebrate Paleontology
2010 Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources. http://vertpaleo.org/Membership/Member-Resources/SVP_Impact_Mitigation_Guidelines.aspx.
Quinn, Harry M. and Clarence Bodmer
2008 Paleontological Resources Report: City of Victorville General Plan Update, City of Victorville, San Bernardino County, California. Report prepared by CRM TECH, Colton, California.
Tugel, Arlene, and George A. Woodruff
1986 *Soil Survey of San Bernardino County, California: Mojave River Area*. U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.

APPENDIX 1

PERSONNEL QUALIFICATIONS

PRINCIPAL INVESTIGATOR
Michael Hogan, Ph.D., RPA*

Education

1991	Ph.D., Anthropology, University of California, Riverside.
1981	B.S., Anthropology, University of California, Riverside; with honors.
1980-1981	Education Abroad Program, Lima, Peru.

2002	Section 106—National Historic Preservation Act: Federal Law at the Local Level. UCLA Extension Course #888.
2002	“Recognizing Historic Artifacts,” workshop presented by Richard Norwood, Historical Archaeologist.
2002	“Wending Your Way through the Regulatory Maze,” symposium presented by the Association of Environmental Professionals.
1992	“Southern California Ceramics Workshop,” presented by Jerry Schaefer.
1992	“Historic Artifact Workshop,” presented by Anne Duffield-Stoll.

Professional Experience

2002-	Principal Investigator, CRM TECH, Riverside/Colton, California.
1999-2002	Project Archaeologist/Field Director, CRM TECH, Riverside.
1996-1998	Project Director and Ethnographer, Statistical Research, Inc., Redlands.
1992-1998	Assistant Research Anthropologist, University of California, Riverside
1992-1995	Project Director, Archaeological Research Unit, U. C. Riverside.
1993-1994	Adjunct Professor, Riverside Community College, Mt. San Jacinto College, U.C. Riverside, Chapman University, and San Bernardino Valley College.
1991-1992	Crew Chief, Archaeological Research Unit, U. C. Riverside.
1984-1998	Archaeological Technician, Field Director, and Project Director for various southern California cultural resources management firms.

Research Interests

Cultural Resource Management, Southern Californian Archaeology, Settlement and Exchange Patterns, Specialization and Stratification, Culture Change, Native American Culture, Cultural Diversity.

Cultural Resources Management Reports

Author and co-author of, contributor to, and principal investigator for numerous cultural resources management study reports since 1986.

Memberships

* Register of Professional Archaeologists; Society for American Archaeology; Society for California Archaeology; Pacific Coast Archaeological Society; Coachella Valley Archaeological Society.

PROJECT GEOLOGIST/PALEONTOLOGIST
Harry M. Quinn, M.S., California Professional Geologist #3477

Education

1968 M.S., Geology, University of Southern California, Los Angeles, California.
1964 B.S, Geology, Long Beach State College, Long Beach.
1962 A.A., Los Angeles Harbor College, Wilmington, California.

- Graduate work oriented toward invertebrate paleontology; M.S. thesis completed as a stratigraphic paleontology project on the Precambrian and Lower Cambrian rocks of Eastern California.

Professional Experience

2000-	Project Paleontologist, CRM TECH, Riverside/Colton, California.
1998-	Project Archaeologist, CRM TECH, Riverside/Colton, California.
1992-1998	Independent Geological/Geoarchaeological/Environmental Consultant, Pinyon Pines, California.
1994-1996	Environmental Geologist, E.C E.S., Inc, Redlands, California.
1988-1992	Project Geologist/Director of Environmental Services, STE, San Bernardino, California.
1987-1988	Senior Geologist, Jirsa Environmental Services, Norco, California.
1986	Consulting Petroleum Geologist, LOCO Exploration, Inc. Aurora, Colorado.
1978-1986	Senior Exploration Geologist, Tenneco Oil E & P, Englewood, Colorado.
1965-1978	Exploration and Development Geologist, Texaco, Inc., Los Angeles, California.

Previous Work Experience in Paleontology

1969-1973 Attended Texaco company-wide seminars designed to acquaint all paleontological laboratories with the capability of one another and the procedures of mutual assistance in solving correlation and paleo-environmental reconstruction problems.

1967-1968 Attended Texaco seminars on Carboniferous coral zonation techniques and Carboniferous smaller foraminifera zonation techniques for Alaska and Nevada.

1966-1972, 1974, 1975 Conducted stratigraphic section measuring and field paleontological identification in Alaska for stratigraphic controls. Pursued more detailed fossil identification in the paleontological laboratory to establish closer stratigraphic controls, mainly with Paleozoic and Mesozoic rocks and some Tertiary rocks, including both megafossil and microfossil identification, as well as fossil plant identification.

1965 Conducted stratigraphic section measuring and field paleontological identification in Nevada for stratigraphic controls. Pursued more detailed fossil identification in the paleontological laboratory to establish closer stratigraphic controls, mainly with Paleozoic rocks and some Mesozoic and Tertiary rocks. The Tertiary work included identification of ostracods from the Humboldt and Sheep Pass Formations and vertebrate and plant remains from Miocene alluvial sediments.

Memberships

Society of Vertebrate Paleontology; American Association of Petroleum Geologists; Association of Environmental Professionals; Rocky Mountain Association of Geologists, Pacific Section; Society of Economic Paleontologists and Mineralogists; San Bernardino County Museum.

Publications in Geology

Five publications in Geology concerning an oil field study, a ground water and earthquake study, a report on the geology of the Santa Rosa Mountain area, and papers on vertebrate and invertebrate Holocene Lake Cahuilla faunas.

REPORT WRITER
Ben Kerridge, M.A.

Education

2010	M.A., Anthropology, California State University, Fullerton.
2009	Project Management Training, Project Management Institute/CH2M HILL, Santa Ana, California.
2004	B.A., Anthropology, California State University, Fullerton.

Professional Experience

2015-	Project Archaeologist/Report Writer, CRM TECH, Colton, California.
2015	Teaching Assistant, Institute for Field Research, Kephallenia, Greece.
2009-2014	Publications Delivery Manager, CH2M HILL, Santa Ana, California.
2010-	Naturalist, Newport Bay Conservancy, Newport Beach, California.
2006-2009	Technical Publishing Specialist, CH2M HILL, Santa Ana, California.
2002-2006	English Composition/College Preparation Tutor, various locations, California.

PALEONTOLOGICAL SURVEYOR/FIELD DIRECTOR
Daniel Ballester, M.S.

Education

2013	M.S., Geographic Information System (GIS), University of Redlands, California.
2007	Certificate in Geographic Information Systems (GIS), California State University, San Bernardino.
1998	B.A., Anthropology, California State University, San Bernardino.

- Cross-trained in paleontological field procedures and identifications by CRM TECH Geologist/Paleontologist Harry M. Quinn.

Professional Experience

2002-	Field Director/GIS Specialist, CRM TECH, Riverside/Colton, California.
2011-2012	GIS Specialist for Caltrans District 8 Project, Garcia and Associates, San Anselmo, California.
2009-2010	Field Crew Chief, Garcia and Associates, San Anselmo, California.
2009-2010	Field Crew, ECorp, Redlands.
1999-2002	Project Paleontologist/Archaeologist, CRM TECH, Riverside, California.
1998-1999	Field Crew, K.E.A. Environmental, San Diego, California.
1998	Field Crew, A.S.M. Affiliates, Encinitas, California.
1998	Field Crew, Archaeological Research Unit, University of California, Riverside.

PALEONTOLOGICAL SURVEYOR
John D. Goodman II, M.S.

Education

1993	M.S., Anthropology, University of California, Riverside.
1985	B.S., Anthropology, University of California, Riverside.
2005	Training Session on Senate Bill 18; sponsored by the Government Office of Planning and Research, Riverside, California.
2002	Protecting Heritage Resources under Section 106 of the National Historic Preservation Act; sponsored by the Advisory Council on Historic Preservation, Arcadia, California.
2000	Federal Historic Preservation Law for the Forest Service; sponsored by the Advisory Council on Historic Preservation, San Bernardino, California.
1994	National Environmental Policy Act workshop; Flagstaff, Arizona.

Professional Experience

2011-	Project Archaeologist/Artifact Analyst, CRM TECH, Colton, California.
2008-	Independent sub-contractor (faunal analyses and historical archaeology).
2006-2008	Project Director, Statistical Research, Inc., Redlands, California.
2003-2006	Project Manager/Principal Investigator, Stantec Consulting, Inc. (formerly The Keith Companies [TKC]), Palm Desert, California.
2000-2003	Supervisory Archaeologist, Heritage Resources Program, San Bernardino National Forest, United States Forest Service, Department of Agriculture.
1993-2000	Project Manager, Historical Archaeologist, Faunal Specialist, Human Osteologist, and Shell Specialist, SWCA Inc., Environmental Consultants, Flagstaff, Arizona.
1982-1993	Project Director, Staff Archaeologist, Physical Anthropologist, Faunal Specialist, and Lithic Specialist, Archaeological Research Unit, University of California, Riverside (part-time).

Research Interests

Subsistence practices and related technologies of both prehistoric and historical-period groups; special interest in Archaic sites of western states; ethnic/group markers; zooarchaeology/faunal analyses, lithic analyses, and historical archaeology.

Cultural Resources Management Reports

Co-author of many cultural resources management study reports since 1986.

Memberships

Society for American Archaeology.

PALEONTOLOGICAL SURVEYOR
Michael D. Richards, M.A.

Education

2002	M.A., Anthropology, California State University, Northridge (CSUN).
1986	B.A., Anthropology: University of California, Los Angeles (UCLA).
1982	A.A., Los Angeles Valley College, Los Angeles, California.

Professional Experience

2018-	Project Archaeologist, CRM TECH, Colton, California.
2016-2018	Co-Principal Investigator/Archaeologist, LSA Associates Inc.
2012-2016	Co-Principal Investigator/Archaeologist, ICF International (Jones & Stokes).
2010-2012	Co-Principal Investigator/Archaeologist, various CRM firms (on call).
2007-2010	Principal Investigator/Field Director/Crew Chief, ASM Affiliates, Inc.
2004-2007	Project Manager/Co-Principal Investigator, ArchaeoPaleo Resource Management, Inc.
2003-2004	Staff Archaeologist/Crew Chief, SRI, Inc.
2000-2003	Project Archaeologist/Field Director, Ancient Enterprises (Clewlow, Jr.).
1999-2000	Staff Archaeologist/Lab Crew Chief, CSC/Edwards Air Force Base.

Memberships

Society for American Archaeology; Society for California Archaeology; Archaeological Institute of America; Conejo Open Space Trails Advisory Committee; Conejo Valley Historical Society.

PALEONTOLOGICAL SURVEYOR
Hunter C. O'Donnell, B.A.

Education

2020	M.A. (anticipated), Applied Archaeology, California State University, San Bernardino.
2015	B.A. (*cum laude*), Anthropology, California State University, San Bernardino.
2012	A.A., Social and Behavioral Sciences, Mt. San Antonio College, Walnut, California.
2011	A.A., Natural Sciences and Mathematics, Mt. San Antonio College, Walnut, California.

Professional Experience

2016-	Graduate Research Assistant, Applied Archaeology, California State University, San Bernardino.
2016-2017	Cultural Intern, Cultural Department, Pechanga Band of Luiseño Indians, Temecula, California.
2015	Archaeological Intern, U.S. Bureau of Land Management, Barstow, California.
2015	Peer Research Consultant: African Archaeology, California State University, San Bernardino.

APPENDIX 2

RECORDS SEARCH RESULTS

WESTERN SCIENCE CENTER

March 26, 2019

CRM TECH
Nina Gallardo
1016 E. Cooley Drive, Suite A/B
Colton, CA 92324

Dear Ms. Gallardo,

This letter presents the results of a record search conducted for the Ocotillo Quarry Project (CRM TECH # 3450P) in Apple Valley, San Bernardino County, California. The project site is located on the south east intersection of Ocotillo Way and Valley Vista Avenue in Section 24, Township 4 North, Range 3 West on the Apple Valley South and Fifteen-Mile Valley USGS 7.5 minute quadrangles.

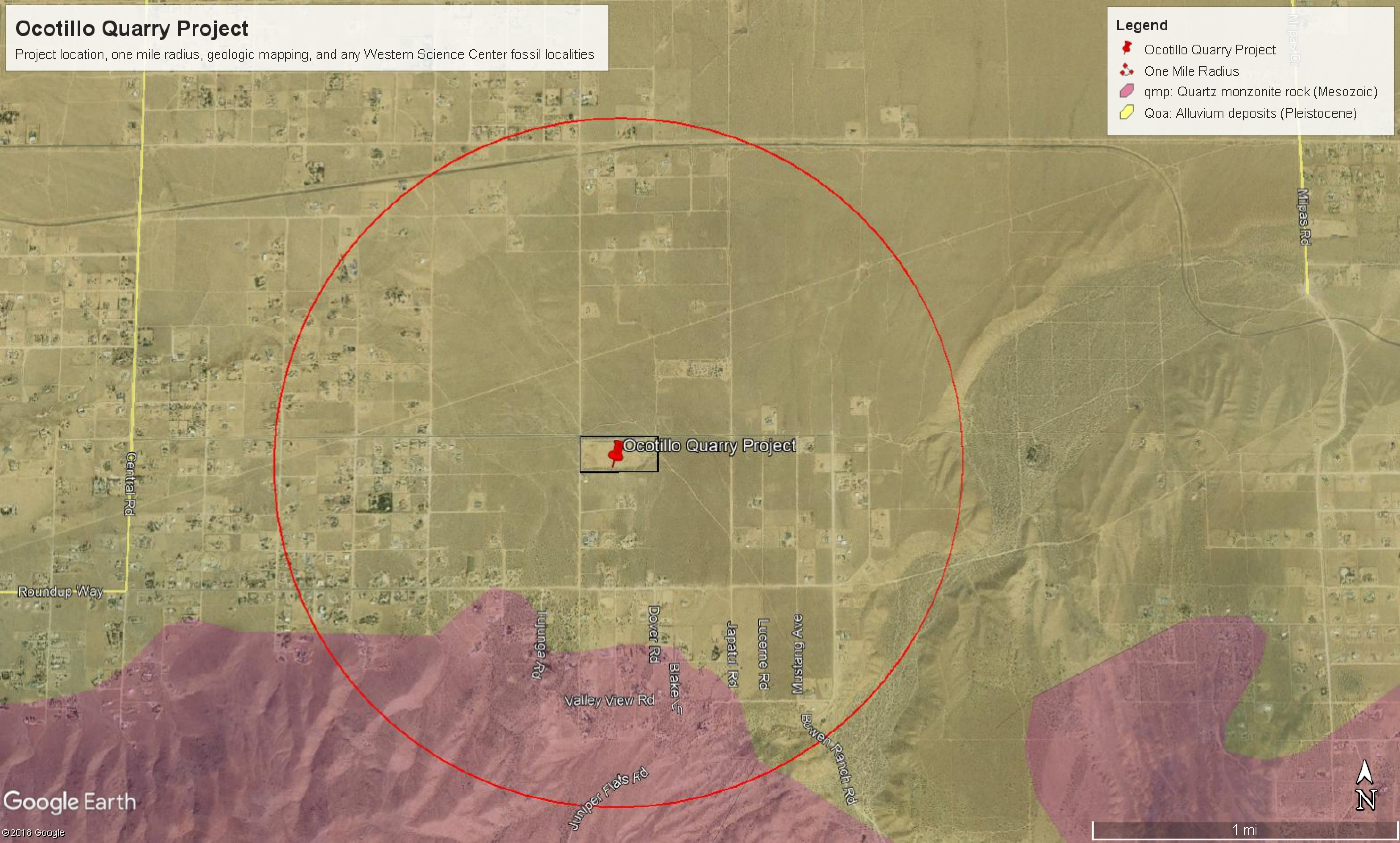
The geologic units underlying this project are mapped entirely as old alluvial deposits dating from the Pleistocene period (Dibblee, 2008). Alluvial units are considered to be of high paleontological sensitivity. The Western Science Center does not have localities within the project area or within a 1 mile radius, but does have fossil localities in similarly mapped units associated with numerous projects in Riverside County that resulted in Pleistocene fossil specimens.

Any fossils recovered from the Ocotillo Quarry Project area would be scientifically significant. Excavation activity associated with 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 associated with the current study area.

If you have any questions, or would like further information about similar Pleistocene alluvial deposit projects, please feel free to contact me at dradford@westerncentermuseum.org

Sincerely,

Darla Radford
Collections Manager


Ocotillo Quarry Project
Project location, one mile radius, geologic mapping, and any Western Science Center fossil localities
Legend
Ocotillo Quarry Project
One Mile Radius
qmp: Quartz monzonite rock (Mesozoic)
Qoa: Alluvium deposits (Pleistocene)
Ocotillo Quarry Project
Mipas Rd
Central Rd
Roundup Way
Tujunga Rd
Dover Rd
Blake Ln
Japatul Rd
Lucerne Rd
Mustang Ave
Valley View Rd
Bowen Ranch Rd
Juniper Flats Rd
Google Earth
©2018 Google
1 mi
N

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Vertebrate Paleontology Section
Telephone: (213) 763-3325

e-mail: smcleod@nhm.org

3 April 2019

CRM Tech
1016 East Cooley Drive, Suite B
Colton, CA 92324

Attn: Nina Gallardo, Project Archaeologist / Native American liaison

re: Paleontological resources for the proposed Ocotillo Quarry Project, CRM TECH # 3450P, near the Town of Apple Valley, San Bernardino County, project area

Dear Nina:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed Ocotillo Quarry Project, CRM TECH # 3450P, near the Town of Apple Valley, San Bernardino County, project area as outlined on the portion of the Apple Valley South USGS topographic quadrangle map that you sent to me via e-mail on 20 March 2019. We do not have any vertebrate fossil localities that lie directly within the proposed project area boundaries, but we do have fossil vertebrate localities nearby that occur in sedimentary deposits similar to those that may occur at depth in the proposed project area.

In the entire proposed project area there are surficial deposits that consist of older Quaternary Alluvium, derived as alluvial fan deposits from the Ord Mountains immediately to the south. Being relatively coarse because they are so close to the intrusive igneous source rocks in the Ord Mountains, these deposits are unlikely to contain significant vertebrate fossils in the uppermost layers. Older and perhaps finer-grained deposits at shallow depth, however, may contain significant vertebrate fossil remains. Our closest fossil vertebrate locality from similar deposits is an otherwise unrecorded specimen of mammoth that was collected in 1961 from older Quaternary Alluvium west-northwest of the proposed project area on the western side of the Mojave River below the bluffs. Our next closest vertebrate fossil locality from these deposits is LACM 1224, further northwest of the proposed project area west of Spring Valley Lake along

Dean Avenue south of Green Tree Boulevard, that produced a specimen of fossil camel, *Camelops*. Even further northwest of the proposed project area, between Adelanto and the former George Air Force Base, our older Quaternary locality LACM 7786 produced a fossil specimen of meadow vole, *Microtus*.

Shallow excavations in the uppermost layers of soil and Quaternary Alluvium in the proposed project area are unlikely to encounter significant fossil vertebrate remains. Deeper excavations that extend down into older and perhaps finer-grained Quaternary sediments, however, may well encounter significant vertebrate fossils. Any substantial excavations below the uppermost layers, therefore, should be closely monitored to quickly and professionally collect any specimens without impeding development. Also, sediment samples should 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

2024 Orange Tree Lane, Redlands, CA 92374 | Phone: 909.798.8616 Fax: 909.307.0539
www.SBCounty.gov

SAN BERNARDINO COUNTY

San Bernardino County Museum
Division of Earth Sciences

Crystal Cortez
Curator of Earth Sciences

email: Crystal.cortez@sbcm.sbcounty.org

28 June, 2019

CRM Tech
Attn: Michael Hogan
1016 E. Cooley Drive, Suite B
Colton, CA 92324

PALEONTOLOGY RECORDS REVIEW for proposed Ocotillo Quarry project site

Dear Michael,

The Division of Earth Sciences of the San Bernardino County Museum (SBCM) has completed a records search for the above-named project in San Bernardino County, California. The proposed Ocotillo Quarry project is located in the City of Apple Valley, as shown on the United States Geological Survey (USGS) 7.5 minute Apple Valley south, California quadrangle (1971).

For this review, I conducted a search of the Regional Paleontological Locality Inventory (RPLI) at the SBCM. The results of this search indicate that no recorded paleontological resource localities are present within the proposed project. Previous geologic mapping indicates that the proposed project sites have surface exposures of Quaternary alluvium of Holocene age that overlay older Pleistocene alluvium. These subsurface Pleistocene sediments have high potential to contain fossil resources. The nearest fossil locality on record is SBCM locality 1.107.2 located 5 miles east of proposed site as shown 7.5 minute on Fifteenmile valley quadrangle (1971), indicates small mammal fragments were found in a red sandy silt.

This records search covers only the paleontological records of the San Bernardino County Museum. 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.

Please do not hesitate to contact us with any further questions that you may have.

Sincerely,

Crystal Cortez, Curator of Earth Sciences
Division of Earth Sciences
San Bernardino County Museum