



PALEONTOLOGICAL RESOURCES ASSESSMENT REPORT FOR THE APPLE VALLEY HEIGHTS COUNTY WATER DISTRICT, MESA VISTA STORAGE TANKS AND TRANSMISSION PIPELINE IMPROVEMENTS, SAN BERNARDINO COUNTY, CALIFORNIA

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Date

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BLM Permit; BLM FA: CA-19-05P; #FA-680-19-26

Cogstone Project Number: 4641

Type of Study: Paleontological Resources Assessment

Acres: BLM owned land 19.96 acres; local city/county owned 0.69 acres

Paleontological localities: none within the study area

USGS Quadrangle: Apple Valley South 7.5' quadrangle

Key Words: early Pleistocene to late Holocene alluvial fans, Miocene Crowder Formation, Paleozoic metamorphic rocks

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SUMMARY OF FINDINGS

The purpose of this report is to determine the potential effects to paleontological resources resulting from construction of the proposed Apple Valley Heights County Water District, Mesa Vista Storage Tank and Transmission Pipeline Improvements Project in an unincorporated portion of San Bernardino County, California. The project proponent, Apple Valley Heights County Water District, is proposing to improve the existing Mesa Vista Water Tank Site, install a direct transmission pipeline to the Mesa Vista Water Tank Site, install a distribution pipeline parallel to the transmission pipeline, and install interconnections with two adjacent water systems. The pipelines will be dug under Mesa Vista Road. Bureau of Land Management (BLM) lands are present in the southernmost portion of the project at the water tank site, and two other BLM parcels are present along Mesa Vista Road in the northern half of the study area. The BLM owns 19.96 of the project acres and local city/county agencies entities own the remaining 0.69 acres of the project under Mesa Vista Road.

The Apple Valley Water District is the Lead Agency under the California Environmental Quality Act (CEQA) and the BLM is the Lead Agency under National Environmental Policy Act (NEPA). Cogstone holds California BLM permit CA-19-05P and the field work was authorized under BLM FA-680-19-26.

The project is mapped as late Holocene colluvium less than 5,000 years old, early Pleistocene to late Holocene alluvial fans less than 2.56 million years old, the Miocene Crowder Formation which is between 17.2 and 9.5 million years old, and mixed metamorphic rocks of Ord Mountains which are likely Paleozoic.

The record search revealed no fossil localities from within the project or immediate vicinity, however localities are known from the same sediments as found within the study area near to the project. Fossils of ground sloth, mammoth, camel, short faced bear have been recovered from the Pleistocene ancestral Mojave River sediments and not from the alluvial fan deposits found within the study area. Fossils of giant tortoise, squirrels and chipmunk, rodents, rabbit, camels, peccary, and horses are known from the Crowder Formation in Cajon Valley. A rhinoceros has been recovered from the Crowder Formation in Cajon Valley (E. Scott, pers. comm). It is good to note that the Crowder Formation is not subject to the proximity “requirement” to the Mojave River for the Pleistocene alluvium in the Victorville-Apple Valley area. No fossils have been recorded from the marble-rich mixed metamorphic rocks of Ord Mountains.

The alluvial fans are assigned a low potential for fossils (PFYC 2) due to the lack of prior fossils found in these fans when distal to the Mojave River. Additionally some of these fans are very coarse nature due to the proximity to the Ord Mountains, and Holocene portions of the fans are too young to contain fossils. The colluvium is also are assigned a low potential for fossils (PFYC 2) due to the lack of prior fossils found in these deposits in the Mojave Desert, as well as

their late Holocene age. The Crowder Formation is assigned a moderate but patchy (PFYC 3a) due the presence of fossils found in Cajon Valley, and the fluvio-lacustrine sediments encountered during the survey. The marble-rich mixed metamorphic rocks of Ord Mountains are assigned a very low potential for fossils (PFYC 1) as they appeared too metamorphosed to contain fossils.

A Paleontological Resource Impact Mitigation Program including full-time paleontological monitoring is currently recommended for the Crowder Formation (Figure 3). No additional actions are recommended for the rest of the study area. If unanticipated fossils are unearthed during construction, work should be halted in that area until a qualified paleontologist can assess the significance of the find. Work may resume immediately a minimum of 50 feet away from the find. This procedure should be included in the Worker Environmental Awareness Program (WEAP) training provided to construction personnel.

INTRODUCTION

PURPOSE OF STUDY

The purpose of this study is to determine the potential effects to paleontological resources resulting from construction of the proposed Apple Valley Heights County Water District, Mesa Vista Storage Tank and Transmission Pipeline Improvements Project (project). The project proposes the construction of a transmission and distribution water line in an unincorporated portion of San Bernardino County, California (Figures 1, 2, 3). The Apple Valley Heights County Water District is the Lead Agency under the California Environmental Quality Act (CEQA) and the Bureau of Land Management (BLM) is the Lead Agency under National Environmental Policy Act (NEPA).

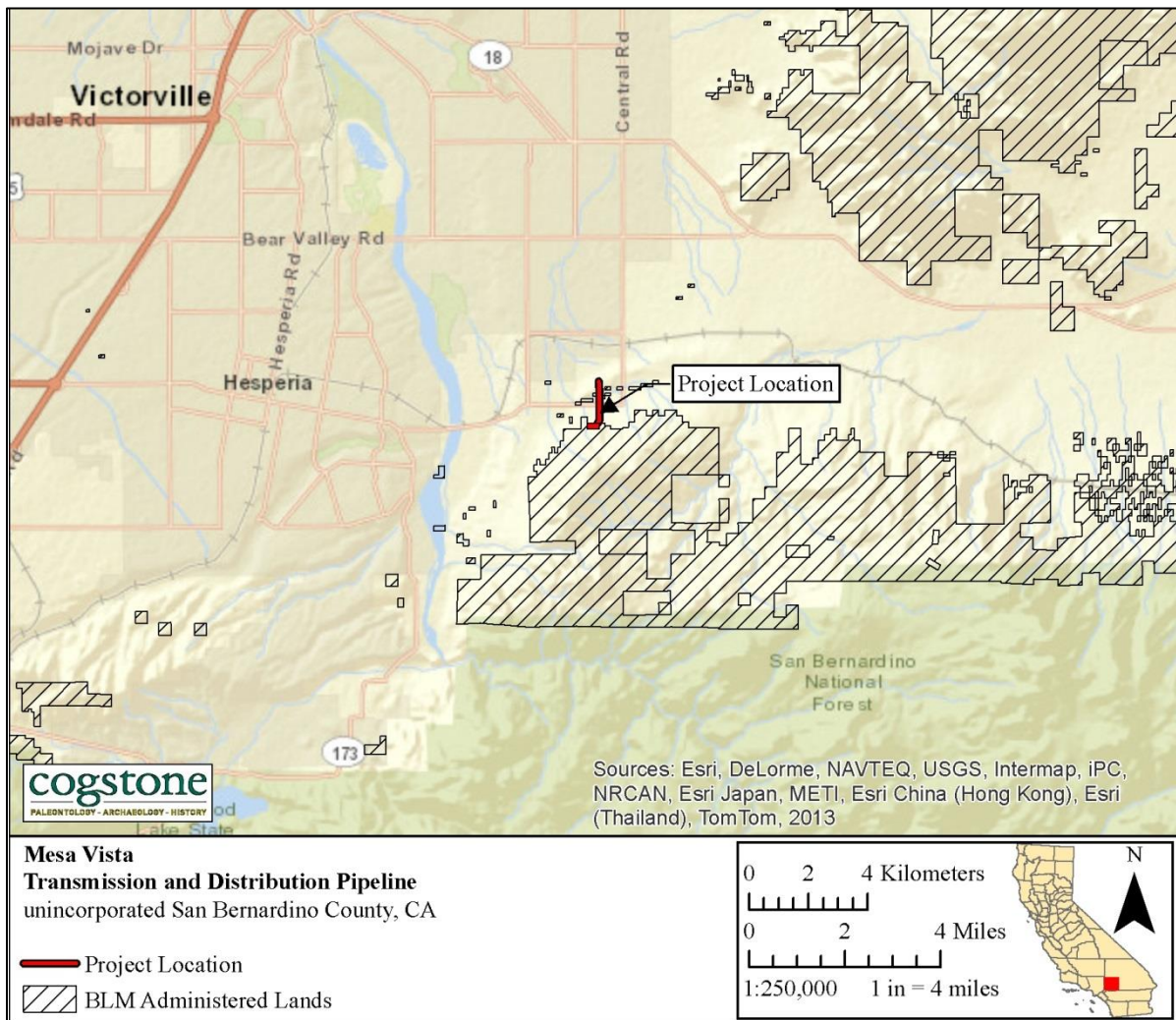


Figure 1. Project vicinity map

PROJECT LOCATION

The project is mapped within Township 4 North, Range 3 West, sections 22 and 27, on the Apple Valley South 7.5' United States Geological Survey topographic map, within the San Bernardino Base Meridian (Figure 2). BLM lands are present in the southernmost portion of the project at the water tank site, and two other BLM parcels are present along Mesa Vista Road in the northern half of the study area. The BLM owns 19.96 of the project acres and local city/county agencies entities own the remaining 0.69 acres of the project under Mesa Vista Road.

PROJECT DESCRIPTION

The project proponent, Apple Valley Heights County Water District, is proposing to improve the existing Mesa Vista Water Tank Site, install a direct transmission pipeline to the Mesa Vista Water Tank Site, install a distribution pipeline parallel to the transmission pipeline, and install interconnections with two adjacent water systems.

Mesa Vista Water Tank Site: This site is located at the southern end of Mesa Vista Street in Township 4 North, Range 3 West, section 27 (Figure 2). The site is located in the northeast corner of the property. The property is owned by the BLM. There are three water tanks that will be replaced on site in the existing location. The three existing tanks will be replaced with two, larger tanks. The new tanks will occupy the site of the existing tanks. The existing tanks will be removed from the site. Minor grading toward the south is anticipated to accommodate the new tanks' larger diameters. Site grading beneath the proposed tanks will consist of over excavation and recompaction to a depth of approximately 4 feet below the existing surface.

Transmission Pipeline Corridor: A new water transmission pipeline will be installed along Mesa Vista Street between Ocotillo Way and the Mesa Vista Tank Site. This pipeline will be installed using trenching methods. Along this pipeline, appurtenant facilities will be installed, including valves. This pipeline will cross BLM-owned land in Township 4 North, Range 3 West, sections 22 and 27 (Figure 2). In most areas, the pipeline will be installed to a depth of approximately 4 to 5 feet below the surface. At Round Up Way, the pipeline may be installed to a depth of approximately 10 feet below the surface.

Distribution Pipeline Corridor: Parallel and adjacent to portions of the proposed transmission pipeline, a new water distribution pipeline will be installed using trenching methods. Along this pipeline, appurtenant facilities will be installed, including valves, hydrants, and reconnections of services to existing customers. The existing pipeline will be either abandoned in place or removed. The new pipeline will be installed to a depth of approximately 4 to 5 feet below the surface.

Interconnecting Pipeline Corridor: The installation of a transmission pipeline will run from existing well site (Well Nos. 3 and 4) north to Tussing Ranch Road for a future tie-in with Golden State Water Company. The pipeline will continue east along Tussing Ranch Road to Central Road, then north along Central Road to Houston Street, then east to Blackfoot Road. At Blackfoot Road, the pipeline will interconnect with the existing distribution system of Apple Valley Foothill County Water District. The length of the pipeline will be approximately 6,700 feet. In most areas, the pipeline will be installed to a depth of approximately 4 to 5 feet below the surface. At the crossings of Tussing Ranch Road and Central Road, the pipeline may be installed at a depth of approximately 10 feet below existing grade. At Apple Valley Heights County Water District's existing well site, a booster pump station will be installed. At the connection with Golden State Water Company, a metering, pressure reducing, and backflow prevention assembly will be installed. At the connection with Apple Valley Foothill County Water District, a metering, pressure reducing, and backflow prevention assembly will be installed.

Staging: The project proponent is going to have two staging sites where they will be storing equipment and material for the project. Staging Area 1 will be located the Apple Valley Heights County Water District office off Cerra Vista Road. Staging Area 2 is located off of Rancho Road. This site is fully enclosed with a chain link fence and has been cleared of vegetation several years; although some re-vegetation has occurred.

PROJECT AREA

The project is approximately 0.8 miles long. Vertical impacts are expected to be between 4 and 10 feet below the current grade.

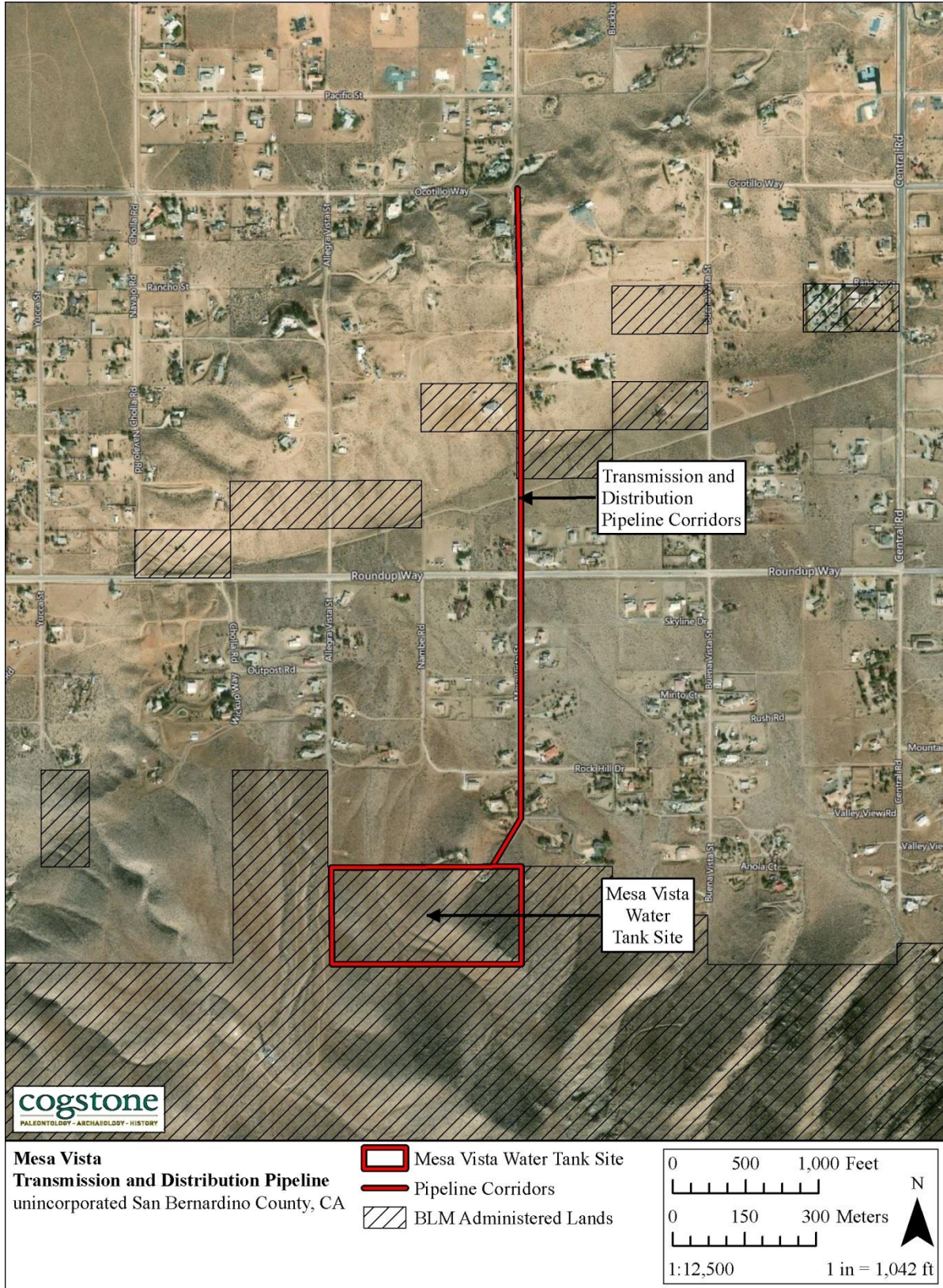


Figure 2. Project location

PROJECT PERSONNEL

Cogstone conducted the paleontological resources studies. A short resumes of Kim Scott is provided (Appendix A). Additional qualifications of key Cogstone staff are available at www.cogstone.com/Staff

- Kim Scott served as the Principal Paleontologist for the project, performed the survey, and wrote this report. Scott has a M.S. in Biology with an emphasis in paleontology from California State University, San Bernardino, a B.S. in Geology with an emphasis in paleontology from the University of California, Los Angeles, and over 20 years of experience in California paleontology and geology.
- John Harris, Paleontology Practice Leader reviewed the report for quality control. He has a Ph.D. in Geology with paleontology emphasis from the University of Bristol (U.K.), an M.A. in Geology with paleontology emphasis from the University of Texas, Austin, and a B.S. (Hons) in Geology from the University of Leicester (U.K.). Dr. Harris has over 40 years of field and research experience in North America and Africa.
- Molly Valsik and Edgar Alvarez prepared the maps. Ms. Valasik has a M.A. in Anthropology with an emphasis in Archaeology. She is a Registered Professional Archaeologist (RPA) with 10 years of professional and academic archaeological field and research experience in California. Mr. Alvarez has a B.A. in Anthropology with a minor in Geographical Information Systems from California State University, Northridge and has two years of experience in southern California archaeology.

REGULATORY ENVIRONMENT

This project is subject to Federal, State, and Local laws and regulations.

FEDERAL LAWS AND REGULATIONS

NATIONAL ENVIRONMENTAL PROTECTION ACT

NEPA directs federal agencies to use all practicable means to "Preserve important historic, cultural, and natural aspects of our national heritage...". If the presence of a significant environmental resource is identified during the scoping process, federal agencies and their agents must take the resource into consideration when evaluating project effects. Consideration of paleontological resources may be required under NEPA when a project is proposed for development on federal land, or land under federal jurisdiction. The level of consideration depends upon the federal agency involved.

ANTIQUITIES ACT

The Antiquities Act of 1906 states, in part: That any person who shall appropriate, excavate, injure or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

Although there is no specific mention of natural or paleontological resources in the Act itself, or in the Act's uniform rules and regulations [Title 43 Part 3, Code of Federal Regulations (CFR)], "objects of antiquity" has been interpreted to include fossils by the National Park Service, the Bureau of Land Management, the Forest Service, and other Federal agencies.

PALEONTOLOGICAL RESOURCES PROTECTION ACT

Paleontological Resources Preservation Act (PRPA; 123 Stat. 1172; 16 U.S.C. 470aaa) requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on Federal land using scientific principles and expertise. The PRPA includes specific provisions addressing management of these resources by the BLM, the National Park Service (NPS), the Bureau of Reclamation (BOR), the Fish and Wildlife Service (FWS), and the U.S. Forest Service (USFS) of the Department of Agriculture.

- a. In general, a person may not—
 - excavate, remove, damage, or otherwise alter or deface or attempt to excavate, remove, damage, or otherwise alter or deface any paleontological resources located on Federal land unless such activity is conducted in accordance with this subtitle;
 - exchange, transport, export, receive, or offer to exchange, transport, export, or receive any paleontological resource if the person knew or should have known such resource to have been excavated or removed from Federal land in violation of any provisions, rule, regulation, law, ordinance, or permit in effect under Federal law, including this subtitle; or
 - sell or purchase or offer to sell or purchase any paleontological resource if the person knew or should have known such resource to have been excavated, removed, sold, purchased, exchanged, transported, or received from Federal land.
- b. Make or submit any false record, account, or label for, or any false identification of, any paleontological resource excavated or removed from Federal land.

Penalties - A person who knowingly violates or counsels, procures, solicits, or employs another person to violate subsection (a) or (b) shall, upon conviction, be fined in accordance with title 18, United States Code, or imprisoned not more than 5 years, or both; but if the sum of the commercial and paleontological value of the paleontological resources involved and the cost of restoration and repair of such resources does not exceed \$500, such person shall be fined in

accordance with title 18, United States Code, or imprisoned not more than 2 years, or both.

Multiple Offenses - In the case of a second or subsequent violation by the same person, the amount of the penalty assessed under subsection (c) may be doubled.

General Exception - Nothing in subsection (a) shall apply to any person with respect to any paleontological resource which was in the lawful possession of such person prior to the date of enactment of this Act.

STATE LAWS AND REGULATIONS

CALIFORNIA ENVIRONMENTAL QUALITY ACT

CEQA includes paleontological, archaeological, and historic resources as integral features of the environment. CEQA states that: It is the policy of the state that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects, and that the procedures required are intended to assist public agencies in systematically identifying both the significant effects of proposed project and the feasible alternatives or feasible mitigation measures which will avoid or substantially lessen such significant effects.

CEQA declares that it is state policy to: "take all action necessary to provide the people of this state with...historic environmental qualities." It further states that public or private projects financed or approved by the state are subject to environmental review by the state. All such projects, unless entitled to an exemption, may proceed only after this requirement has been satisfied. CEQA requires detailed studies that analyze the environmental effects of a proposed project. In the event that a project is determined to have a potential significant environmental effect, the act requires that alternative plans and mitigation measures be considered.

If paleontological resources are identified as being within the proposed project study area, the sponsoring agency must take those resources into consideration when evaluating project effects. The level of consideration may vary with the importance of the resource.

PUBLIC RESOURCES CODE

Section 5097.5: No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands (lands under state, county, city, district or public authority jurisdiction, or the jurisdiction of a public corporation), except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor. As used in this section, "public lands"

means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

CALIFORNIA ADMINISTRATIVE CODE, TITLE 14, SECTION 4307

This section states that “No person shall remove, injure, deface or destroy any object of paleontological, archeological or historical interest or value.”

SAN BERNARDINO COUNTY REGULATIONS

PALEONTOLOGICAL RESOURCES

Paleontological resources are protected by County ordinances (County of San Bernardino 2007b). This protection covers all of unincorporated County of San Bernardino (Development Code §82.20.040) defines a qualified paleontologist as meeting the following criteria:

Education: An advanced degree (Masters or higher) in geology, paleontology, biology or related disciplines (exclusive of archaeology).

Professional experience: At least five years of professional experience with paleontologic (not including cultural) resources, including the collection, identification and curation of the resources.

The County of San Bernardino (Development Code §82.20.030) requires that paleontologic mitigation programs include, but not be limited to:

- (a) All paleontological work will be supervised by a qualified paleontologist.
- (b) Field survey before grading. In areas of potential but unknown sensitivity, field surveys before grading shall be required to establish the need for paleontologic monitoring.
- (c) Monitoring during grading. A project that requires grading plans and is located in an area of known fossil occurrence, or that has been demonstrated to have fossils present in a field survey, shall have all grading monitored by trained paleontologic crews working under the direction of a qualified paleontologist, so that fossils exposed during grading can be recovered and preserved. Paleontologic monitors 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 the remains of small fossil invertebrates and vertebrates. Monitors shall be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens. Monitoring is not necessary if the potentially-fossiliferous units described for the property in question are not present, or if present are determined upon exposure and examination by qualified paleontologic personnel to have low potential to contain fossil resources.

- (d) Recovered specimens. Qualified paleontologic personnel shall prepare recovered specimens to a point of identification and permanent preservation, including washing of sediments to recover small invertebrates and vertebrates. Preparation and stabilization of all recovered fossils is essential in order to fully mitigate adverse impacts to the resources.
- (e) Identification and curation of specimens. Qualified paleontologic personnel shall identify and curate specimens into the collections of the San Bernardino County Museum (SBCM) Division of Geological Sciences¹, an established, accredited museum repository with permanent retrievable paleontologic storage. These procedures are also essential steps in effective paleontologic mitigation and CEQA compliance. The paleontologist must have a written repository agreement in hand prior to the initiation of mitigation activities. Mitigation of adverse impacts to significant paleontologic resources is not considered complete until curation into an established museum repository has been fully completed and documented.
- (f) Report of findings. Qualified paleontologic personnel shall prepare a report of findings with an appended itemized list of specimens. A preliminary report shall be submitted and approved before granting of building permits, and a final report shall be submitted and approved before granting of occupancy permits. The report and inventory, when submitted to the appropriate Lead Agency along with confirmation of the curation of recovered specimens into the collections of the SBCM, will signify completion of the program to mitigate impacts to paleontologic resources.

DEFINITION OF SIGNIFICANCE FOR PALEONTOLOGICAL RESOURCES

Only qualified, trained paleontologists with specific expertise in the type of fossils being evaluated can determine the scientific significance of paleontological resources. Fossils are considered to be significant if one or more of the following criteria apply:

1. The fossils provide information on the evolutionary relationships and developmental trends 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;

¹ Although San Bernardino County codes name the San Bernardino County Museum (SBCM) Division of Geological Sciences, this repository has recently been divesting itself of fossils collected in Joshua Tree National Park to the Western Science Center in Hemet, CA. The SBCM should be consulted as far as obtaining a written repository agreement or at least the right of first refusal for fossils collected during monitoring.

3. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
4. The fossils demonstrate unusual or spectacular circumstances in the history of life;
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.

As so defined, significant paleontological resources are determined to be fossils or assemblages of fossils that are unique, unusual, rare, uncommon, or diagnostically important. Significant fossils can include remains of large to very small aquatic and terrestrial vertebrates or remains of plants and animals previously not represented in certain portions of the stratigraphy. Assemblages of fossils that might aid stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, and paleoclimatology are also critically important (Scott and Springer 2003; Scott et al. 2004).

PERMITS REQUIRED

Cogstone holds California BLM permit CA-19-05P and the field work was authorized under #FA-680-19-26 from the Barstow BLM Office (Appendix B).

BACKGROUND

GEOLOGIC SETTING

The proposed project is located in one of the most tectonically active regions of North America. Southwest of the project in Cajon Pass is the San Andreas Fault Zone (SAFZ) which forms the boundary between the Pacific Plate and the North American Plate. This section of the SAFZ, spanning from south of Indio to western Kern County, bends relative to the rest of the SAFZ. Because of this the Pacific Plate which is moving towards the northwest relative to the North American Plate “catches” on the bend. The intense north-south compression in this area has created the Transverse Range Geomorphic Province; a series of east-west trending steep mountain ranges and valleys spanning from the Channel Islands to the Little San Bernardino Mountains. These mountains are obliquely oriented to the typical northwest trend of California mountains and valleys, hence the name “Transverse.” The impact of the Pacific Plate and the North American Plate has also uplifted the High Desert portion of the Mojave Desert Geomorphic Province. The force of the compression has made this area one of the most rapidly rising regions of the earth and the proposed project area is essentially at the junction of these two Geomorphic Provinces.

STRATIGRAPHY

The project is mapped as late Holocene fans less than 5,000 years old, late Holocene colluvium, early to middle Pleistocene alluvial fans between 2.56 million and 126,000 years old, the Miocene Crowder Formation which is between 17.2 and 9.5 million years old, and the mixed metamorphic rocks of Ord Mountains which are likely Paleozoic (Weldon 1984, 1985, Woodburne 1991, Carrasco et al. 2005, Morton and Miller 2006; Figure 3).

LATE HOLOCENE ALLUVIAL-FAN DEPOSITS

Alluvial fan deposits are deposited along the outer slopes of our valleys from local mountains via the mouths of canyons. Clasts coarsen upstream with boulders up to several meters across being deposited near the mountains during flash floods. Both very young alluvial fan deposits Unit 1 and young alluvial fan deposits Unit 4 are mapped within the project area. Both units are late Holocene in age and presumed to be less than 5,000 years old, although characteristics of the young alluvial fan deposits Unit 4 indicate that it is the older of the two units. The sediments are unconsolidated to loosely consolidated, subangular to subrounded, sand, gravel, and boulders of active and recently active parts of alluvial fans. Typically the fans lack soil development.

The two fan deposits can be differentiated as the surface of the very young alluvial fan deposit Unit 1 is undissected while those of the young alluvial fan deposit Unit 4 are slightly to moderately dissected.

LATE HOLOCENE COLLUVIUM

Similar to alluvial fan deposits, colluvium is deposited at the base of slopes. However, the material does not travel through a canyon and is instead produced from the adjacent slope directly. As with alluvial fans, clasts coarsen upstream with boulders up to several meters across being deposited near the mountains during flash floods. The sediments are unconsolidated and poorly sorted.

EARLY TO MIDDLE PLEISTOCENE ALLUVIAL-FAN DEPOSITS

Much of these sediments between the Mojave River and the Sheep Creek alluvial fan are part of the early to middle Pleistocene (2.6 million to 126,000 year old) Victorville Fan. These sediments consist of moderately indurated, oxidized, reddish-brown, sands to boulders. The fan deposits record the development of the San Bernardino and San Gabriel Mountains through the Pleistocene and Holocene and includes abundant clasts of Pelona Schist (Morton and Miller 2006).

CROWDER FORMATION, MIOCENE

Most of the Crowder Formation is found in Cajon Valley to the north and east of the Interstate 5 and Stater Route 138 interchange. The Crowder Formation consists of pale pinkish-tan, pale gray to near-white, and pale brown, indurated arkosic sand, pebbly arkosic sandstone, and conglomerate. These sediments were deposited in rivers prior to the uplift of the San Bernardino and San Gabriel Mountains. Structures present range from large scale trough crossbedding and channels, to near massive, silty beds. Overall the formation shows a generally, but very irregularly fining-upward sequence. Much of upper part of the formation is indistinctly bedded, almost massive-appearing silts to arkosic sandstone. The Crowder Formation east of the Mojave River probably includes some Phelan Peak deposits of Weldon (1984) and may include Harold Formation (Morton and Miller 2006).

MIXED METAMORPHIC ROCKS OF ORD MOUNTAINS

Dibblee (2008) assigned these rocks to the Carboniferous Furnace Creek Limestone while Morton and Miller (2006) state that these rocks are probably part of the Cambrian Bonanza King Formation or Cambrian Stirling Quartzite. This unit is dominated by dolomitic marble, but also includes limestone marble, minor calc-silicate rock, schist, and quartzite. The marble is pale grayish-tan while the other rocks are generally pale green, dark gray, and white (Morton and Miller 2006).

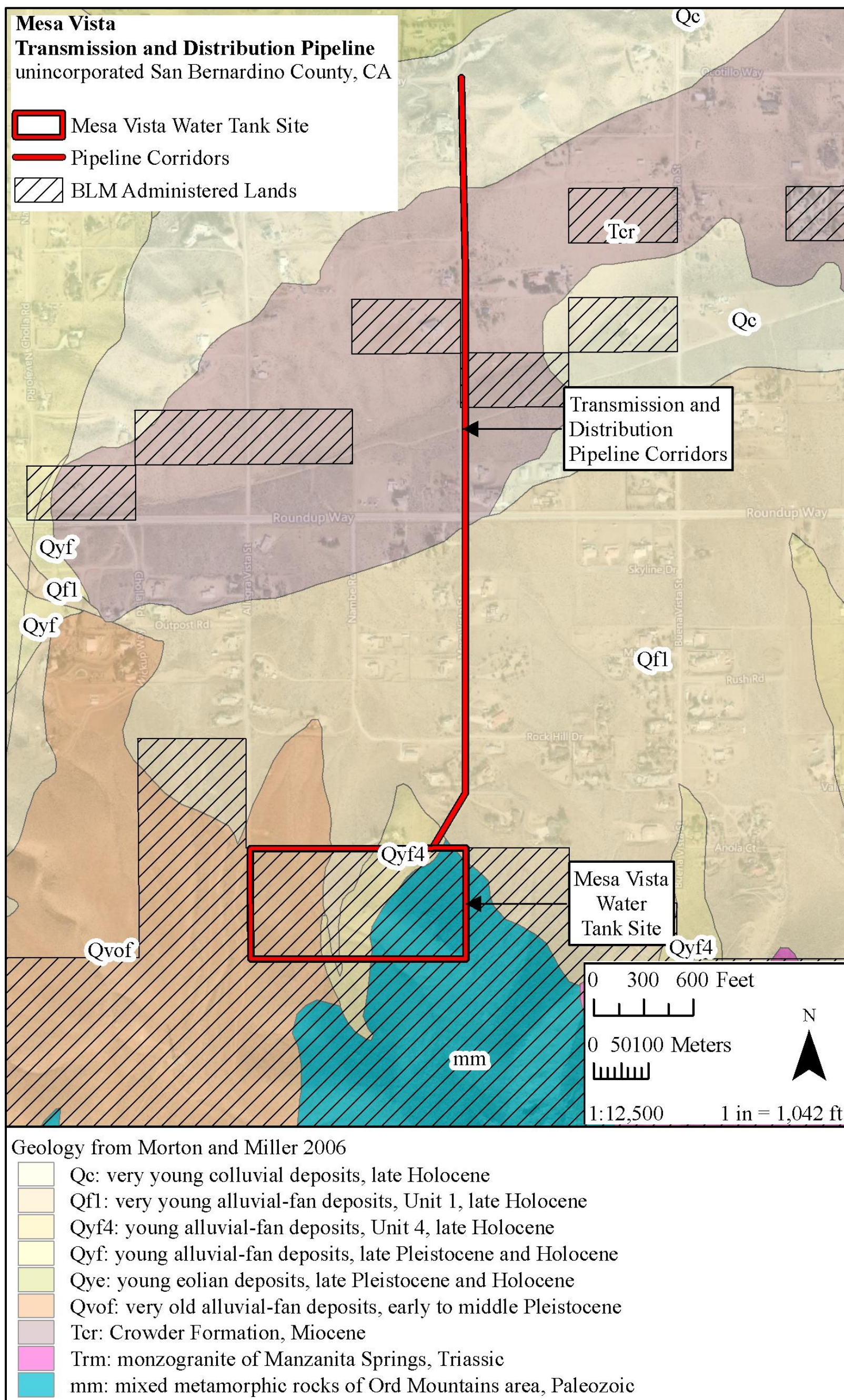


Figure 3. Project geology

RECORD SEARCH

A search for paleontological records was completed by the Natural History Museum of Los Angeles County (LACM; McLeod 2019; Appendix C), and by the Western Science Center (Radford 2019; Appendix C). Additional records from the University of California Museum of Paleontology database (UCMP 2019), the PaleoBiology Database (PBDB 2019), previously requested records searches, and print sources were searched for fossil records. No fossils are known from within the project or immediate vicinity.

The following are confidential museum records. As such no maps of the localities are provided unless the locality may be impacted by the project.

PLEISTOCENE DEPOSITS

Based upon published records (Jefferson 1989, 1991a, 1991b; Reynolds 1989, Reynolds and Reynolds 1994, Scott et al 2004), database searches, previous Cogstone literature searches, and prior knowledge of monitoring projects in the area (Eric and Kim Scott), the nearest confirmed Pleistocene fossils are recorded from the Mojave River sediments to the west of the project. Fossils of ground sloth, mammoth, camel, short faced bear have been recovered from the ancestral Mojave River and not from the Victorville Fan.

CROWDER FORMATION

Within the project area the Crowder Formation is undivided, however in Cajon Valley this formation has been divided into five units. The first and third (1, 3) units of the Crowder have also produced fossils of late Hemingfordian (17.5-15.9 mya) to Clarendonian (12.5-9 mya) age (Woodburne 1991, Carrasco et al. 2005). Fossils previously found include giant tortoise (†²*Geochelone* sp.), flying squirrel (†*Sciuropterus* sp.), squirrels and chipmunk (†*Miospermophilus* cf. *M. wyomingensis*, †*Protospermophilus* sp., †*Spermophilus* sp., †*Tamias* sp.), rodents (†*Cupidinimus* cf. *C. halli*, †*Mookomys* cf. *M. altifluminus*, †*Proheteromys sulculus*, †*Parapliosacomys* sp., †*Perognathus furlong*, †*Copemys* cf. *C. dentalis*, †*Copemys* cf. *C. esmeraldensis*, †*Copemys* cf. *C. pagei*, †*Copemys* cf. *C. tenuis*, †*Paraneotoma* (small) sp., †*Plesiosminthus* (*Schaubemys*) sp., †*Trogomys* n. sp.), rabbit (†*Russellagus* sp.), camels (†cf. *Aepyamelus* sp., †cf. *Michenia* sp., †cf. *Miolabis* sp., †cf. *Procamelus* sp.), peccary (†*Dyseohyus* sp.), and horses (†*Archaeohippus* sp. cf. *A. mourningi*, †“*Merychippus*” cf. “*M. carrizoensis*, †*Merychippus* cf. *M. tehachapiensis*, †*Scaphohippus intermontanus*, †*Nannippus*

² † = the only taxon that this could represent is extinct although the Family or genus may still be extant

sp.), are known from the Crowder Formation in Cajon Valley (Woodburne 1991, Scott 2004a; Table 1).

A portion of rhinoceros skull has been recovered from the Crowder Formation in Cajon Valley (E. Scott, pers. comm). It is good to note that unlike Pleistocene fossils being concentrated near to the Mojave River in the Victorville-Apple Valley area, all of the Crowder Formation has the potential to contain fossils as these sediments were deposited during the Miocene before the Mojave River or even the San Bernardino and San Gabriel mountains even existed.

MIXED METAMORPHIC ROCKS OF ORD MOUNTAINS AREA

No fossils have been recorded from this formation. Although fossils are known from the Carboniferous Furnace Creek Limestone, the Cambrian Bonanza King Formation, and the Cambrian Stirling Quartzite, the lack of prior studies determining the age of this unit indicates that few to no fossils are known from these deposits.

Table 1. Fossils from the Crowder Formation in Cajon Valley

Common Name	Taxon	Crowder Fm. Unit #	Locality	Location	Reference	
giant tortoise	† <i>Geochelone</i> sp.	unknown	UCR RV-69127, UCR RV-69129	Cajon Valley	UCMP 2019	
mammal	† <i>Paradomina</i> cf. <i>P. relictus</i>	1		Cajon Valley	Reynolds 1985 as per Woodburne 1991	
flying squirrel	† <i>Petauristodon</i> “ <i>Sciuropterus</i> ” cf. <i>S. matthewi</i>	1		Cajon Valley		
squirrel	† <i>Miosperomophilus</i> cf. <i>M. wyomingensis</i>	1		Cajon Valley		
squirrel	† <i>Protospermophilus</i> sp.	3		Cajon Valley		
squirrel	† <i>Spermophilus</i> sp.	3		Cajon Valley		
chipmunk	† <i>Tamias</i> sp.	1		Cajon Valley		
heteromyid rodents	† <i>Cupidinimus</i> cf. <i>C. halli</i> , † <i>Cupidinimus</i> sp.	3		Cajon Valley		
heteromyid rodent	† <i>Mookomys</i> cf. <i>M. altifluminus</i>	1		Cajon Valley		
heteromyid rodent	† <i>Proheteromys sulculus</i>	1		Cajon Valley		
geomyid rodent	† <i>Parapliosacomys</i> sp.	3		Cajon Valley		
pocket mouse	† <i>Perognathus furlongi</i>	1		Cajon Valley		
pocket mouse	† <i>Perognathus</i> cf. <i>P. furlongi</i>	3		Cajon Valley		
cricetid rodents	† <i>Copemys</i> cf. <i>C. dentalis</i> , † <i>Copemys</i> cf. <i>C. esmeraldensis</i> , † <i>Copemys</i> cf. <i>C. pagei</i> , † <i>Copemys</i> cf. <i>C. tenuis</i>	3		Cajon Valley		
wood rat	† <i>Paraneotoma</i> (small) sp.	3		Cajon Valley		Woodburne 1991
jumping mouse	† <i>Plesiosminthus</i> (<i>Schaubemys</i>) sp.	1		Cajon Valley		Reynolds 1985 as per Woodburne 1991
rodent	† <i>Trogomys</i> n. sp.	1		Cajon Valley	Woodburne 1991	
rabbit	† <i>Russellagus</i> sp.	3		Cajon Valley	Woodburne 1991	
camel	†cf. <i>Aepycamelus</i> sp.	1		Cajon Valley	Reynolds 1985 as per Woodburne 1991	
camel	†cf. <i>Michenia</i> sp.	1		Cajon Valley		
camel	†cf. <i>Miolabis</i> sp.	1		Cajon Valley		
camel	†cf. <i>Procamelus</i> sp.	1		Cajon Valley		
camel	†Camelidae	unknown	UCR RV-69131, UCR RV-69133	Cajon Valley	UCMP 2019	
peccary	† <i>Dyseohyus</i> sp.	1		Cajon Valley	Reynolds 1985 as per Woodburne 1991	
ruminant	† <i>Bouromeryx</i> cf. <i>B. milleri</i>	unknown	UCR RV-69127	Cajon Valley	UCMP 2019	
horse	† <i>Archaeohippus</i> cf. <i>A. mourningi</i>	1		Cajon Valley	Reynolds 1985 as per Woodburne 1991	
horse	†“ <i>Merychippus</i> ” cf. “ <i>M.</i> ” <i>carrizoensis</i>	3		Cajon Valley	Woodburne 1991	

Common Name	Taxon	Crowder Fm. Unit #	Locality	Location	Reference
horse	† <i>Merychippus</i> cf. <i>M. tehachapiensis</i>	unknown	UCR RV-69126, UCR RV-69128	Cajon Valley	UCMP 2019
horse	†" <i>Merychippus</i> cf. <i>M. intermontanus</i> " = † <i>Scaphohippus intermontanus</i>	unknown	LACM L 40	Cajon Valley	Woodburne and Golz 1972
horse	† <i>Nannippus</i> sp.	unknown	UCR RV-69129	Cajon Valley	UCMP 2019
horse	†Equidae	unknown	UCMP B-3143	Cajon Valley	Woodburne and Golz 1972

† = the only taxon that this could represent is extinct although the Family or genus may still be extant

These are confidential museum records. As such no maps of the localities are provided unless the locality may be impacted by the project.

SURVEY

METHODS

The survey stage is important in a project's environmental assessment phase to verify the exact location of each identified paleontological resource, the condition or integrity of the resource, and the proximity to areas of paleontological resources. An additional purpose is to confirm that field observations conform to the geological maps of the project area. All undeveloped ground surface areas within the ground disturbance portion of the project were examined for fossils or sediments that are favorable for the preservation of fossils. Existing ground disturbances (e.g., cutbanks, ditches, animal burrows, etc.) were intensely inspected. Photographs of the project area, including ground surface visibility and items of interest, are taken with a digital camera.

RESULTS

Cogstone paleontologist Kim Scott, completed the pedestrian survey on May 10, 2019 (Figure 4). Ground visibility throughout the project was very good and ranged from 70 to 100 percent visibility. Grain size of the alluvial fans ranged from coarse cobble and boulder conglomerate / breccia in the early to middle Pleistocene old alluvial fan in the Ord Mountains to pebbly sands in the wash portion of the late Holocene alluvial fan (Figures 5, 6). Crowder Formation sediments ranged from coarse grained, reddish hued paleosols and/or alluvial fan deposits to finer grained fluvio-lacustrine deposits (Figure 7). The marble-rich mixed metamorphics (Figure 8) were also inspected, however the outcrops surveyed appeared too metamorphosed to contain fossils.

Only the finer grained Crowder Formation sediments at the northern-most end of the project appeared to have the potential to contain fossils.



Figure 4. Two views of the study area looking south.



Figure 5. Late Holocene alluvial fan



Figure 6. A boulder in the early to middle Pleistocene alluvial fan

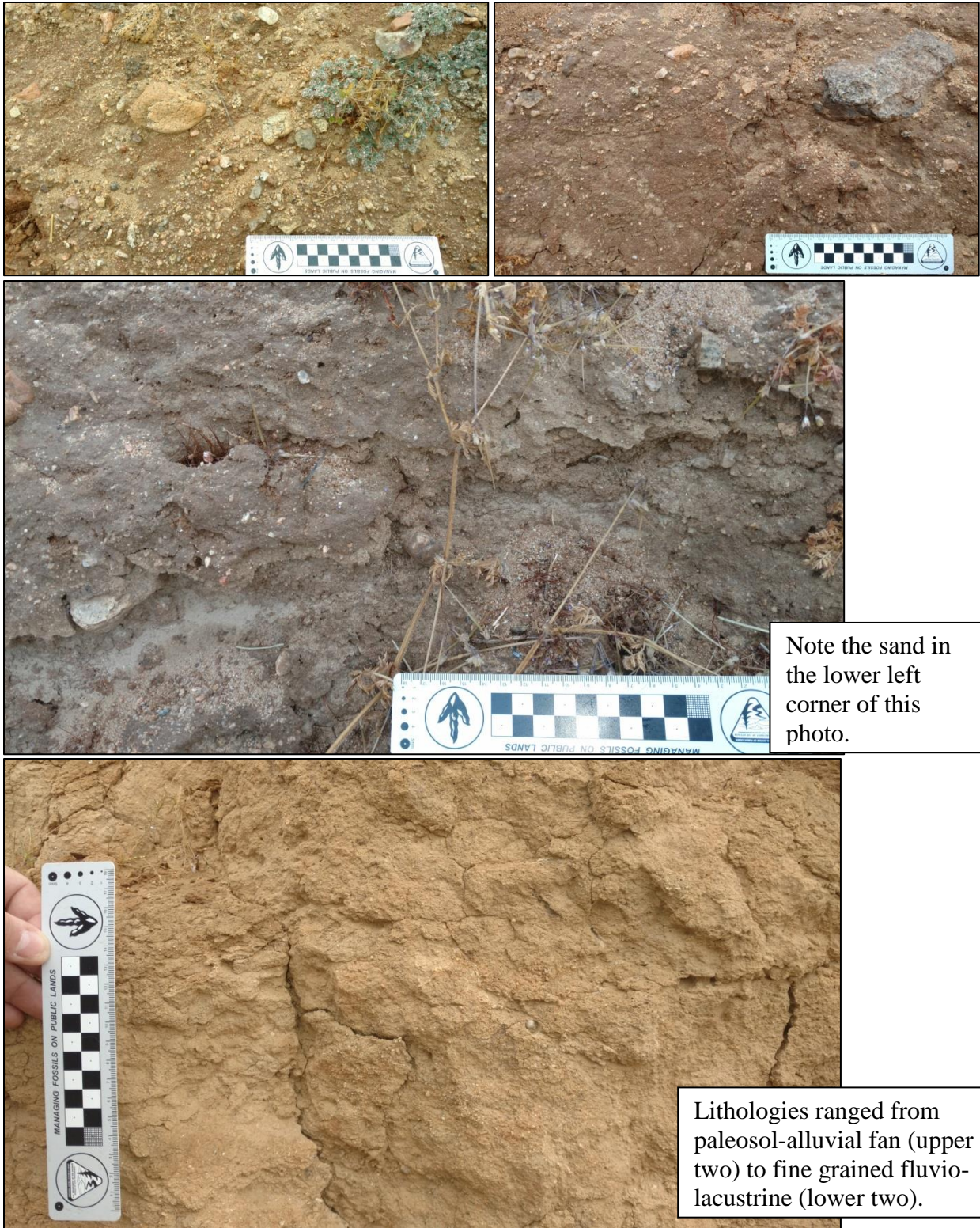


Figure 7. The Crowder Formation at the northern edge of the project.



Figure 8. Outcrop of marble-rich metamorphics at the southern end of the project.

IMPACT ANALYSIS

PALEONTOLOGICAL SENSITIVITY

A multilevel ranking system was developed by professional resource managers within the BLM as a practical tool to assess the sensitivity of sediments for fossils. The Potential Fossil Yield Classification (PFYC) system (BLM 2016; Appendix C) has a multi-level scale based on demonstrated yield of fossils. The PFYC system provides additional guidance regarding assessment and management for different fossil yield rankings.

Fossil resources occur in geologic units (e.g., formations or members). The probability for finding significant fossils in a project area can be broadly predicted from previous records of fossils recovered from the geologic units present in and/or adjacent to the study area. The geological setting and the number of known fossil localities help determine the paleontological sensitivity according to PFYC criteria

All alluvial deposits may increase or decrease in fossiliferous potential depending on how coarse the sediments are. Sediments that are close to their basement rock source are typically coarse; those farther from the basement rock source are finer. The chance of fossils being preserved greatly increases once the average size of the sediment particles is reduced to 5 mm or less in

diameter. Moreover, fossil preservation also greatly increases with rapid burial in flood-plains, rivers, lakes, oceans, etc. Remains left on the ground surface become weathered by the sun or consumed by scavengers and bacterial activity, usually within 20 years or less. So the sands, silts, and clays of flood-plains, rivers, lakes, and oceans are the most likely sediments to contain fossils.

Using the PFYC system, geologic units are classified according to the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts within the known extent of the geological unit. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher PFYC value; instead, the relative abundance of localities is intended to be the major determinant for the value assignment.

The alluvial fans are assigned a low potential for fossils (PFYC 2) due to the lack of prior fossils found in these fans when distal to the Mojave River, as well the coarse nature of the deposits due to the proximity to the Ord Mountains, and for some their late Holocene age. Colluvium is also assigned a low potential for fossils (PFYC 2) due to the lack of prior fossils found in these deposits in the Mojave Desert, as well as their late Holocene age. The Crowder Formation is assigned a moderate but patchy (PFYC 3a) due the presence of fossils found in Cajon Valley, and the fluvio-lacustrine nature of some of the sediments. The marble-rich mixed metamorphic rocks of Ord Mountains are assigned a very low potential for fossils (PFYC 1) as they appeared too metamorphosed to contain fossils (Table 2, Figure 9).

Table 2. Paleontological Sensitivity Rankings

Rock Unit	Map symbol (Figures 4, 5)	PFYC rankings					
		5 very high	4 high	3a moderate; patchy	3b moderate; undemonstrated	2 low	1 very low
alluvial fan, late Holocene	Qf ₁ , Qyf ₄					X	
colluvium, late Holocene	Qc					X	
very old alluvial fan, early to middle Pleistocene	Qvof					X	
Crowder Formation, Miocene	Tcr			X			
marble-rich mixed metamorphic rocks of Ord Mountains	mm						X

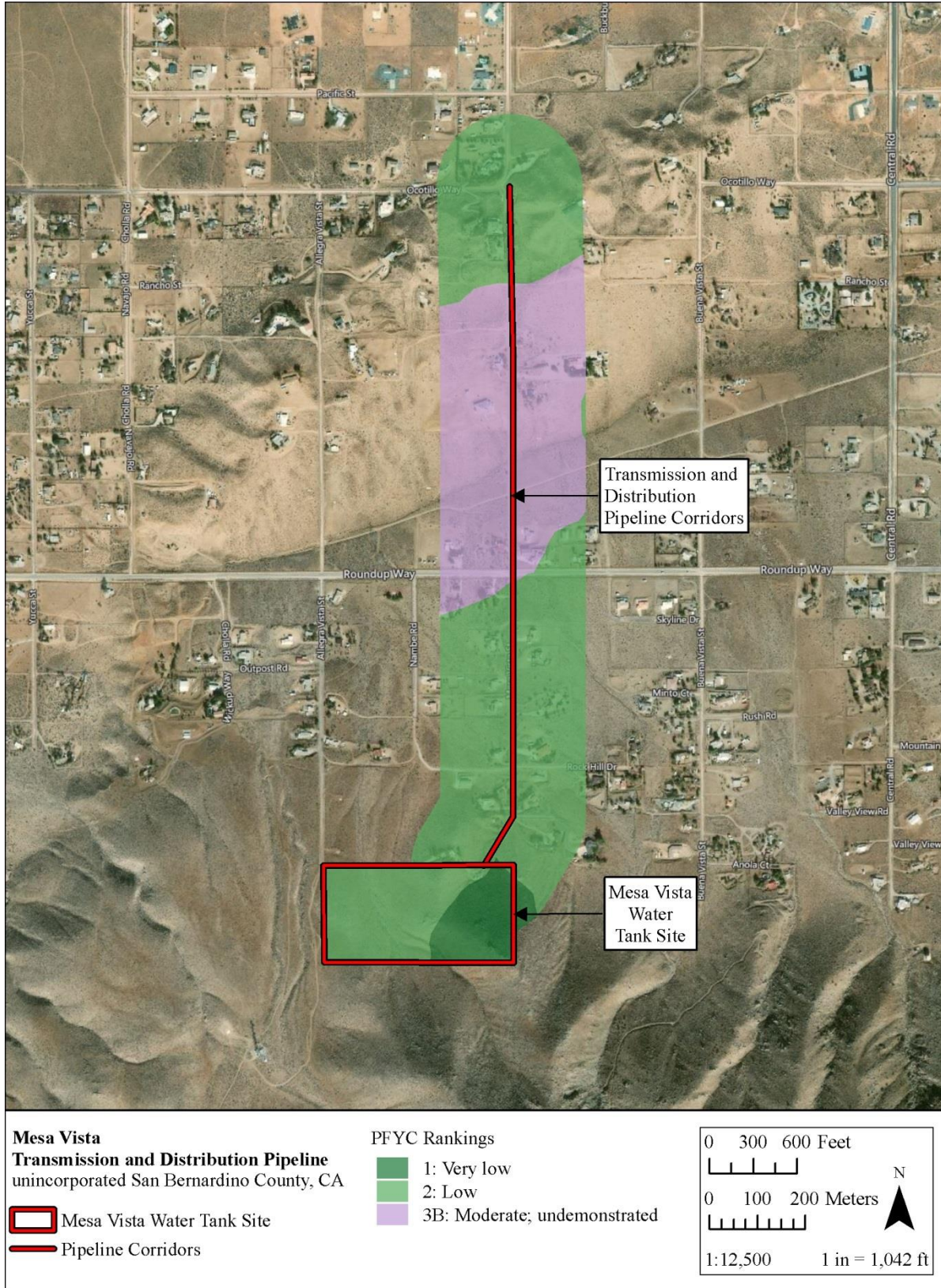


Figure 9. Paleontological sensitivity map

CONCLUSIONS AND RECOMMENDATIONS

PALEONTOLOGICAL MITIGATION

The project is mapped as late Holocene fans less than 5,000 years old, late Holocene colluvium, early to middle Pleistocene alluvial fans between 2.56 million and 126,000 years old, the Miocene Crowder Formation which is between 17.2 and 9.5 million years old, and the mixed metamorphic rocks of Ord Mountains which are likely Paleozoic.

The record search revealed no fossil localities from within the project or immediate vicinity, however localities are known from the same sediments as found within the study area near to the project. The alluvial fans are assigned a low potential for fossils (PFYC 2) due to the lack of prior fossils found in these fans when distal to the Mojave River, as well the coarse nature of the deposits due to the proximity to the Ord Mountains, and for some their late Holocene age. Colluvium is also are assigned a low potential for fossils (PFYC 2) due to the lack of prior fossils found in these deposits in the Mojave Desert, as well as their late Holocene age. The Crowder Formation is assigned a moderate but patchy (PFYC 3a) due the presence of fossils found in Cajon Valley, and the fluvio-lacustrine sediments encountered during the survey. The marble-rich mixed metamorphic rocks of Ord Mountains are assigned a very low potential for fossils (PFYC 1) as they appeared too metamorphosed to contain fossils.

A Paleontological Resource Impact Mitigation Program and full-time paleontological monitoring is currently recommended for the Crowder Formation. The Paleontological Resource Impact Mitigation Program outside of BLM lands should follow all requirements set forth by San Bernardino County and the State of California (see Regulatory Environment: San Bernardino County Regulations and State Laws and Regulations). This shall include:

- Completed with this report: In areas of potential but unknown sensitivity, field surveys before grading shall be required to establish the need for paleontologic monitoring.
- Completed with this report: A preliminary report shall be submitted and approved before granting of building permits.
- All paleontological work will be supervised by a qualified paleontologist as per the Requirements of San Bernardino County.
- Prior to grading, a written repository agreement shall be obtained from the San Bernardino County Museum Division of Geological Sciences. If the museum does not wish to accept additional collections, then the Western Science Center or the Natural History Museum of Los Angeles County are both acceptable institutions.
- Monitoring during grading of areas that are known to contain or has been demonstrated to have fossils present in a field survey.

- Recovered specimens shall be prepared by qualified paleontologic personnel to a point of identification and permanent preservation, identified by qualified paleontologic personnel, and curated into the collections of an established, accredited museum repository with permanent retrievable paleontologic storage.
- A final Paleontological Monitoring Report submitted to the Lead Agency along with confirmation of the curation of recovered specimens into the collections of the SBCM (or other established museum, will signify completion of the program to mitigate impacts to paleontologic resources

If unanticipated fossils are unearthed during construction, work should be halted in that area until a qualified paleontologist can assess the significance of the find. Work may resume immediately a minimum of 50 feet away from the find. This procedure should be included in the Worker Environmental Awareness Program (WEAP) training provided to construction personnel.

REFERENCES CITED

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County of San Bernardino

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McLeod, S. (Natural History Museum of Los Angeles County)

2019 Vertebrate Paleontology Records Check for paleontological resources for the proposed Mesa Vista Project, Cogstone Project #4641, near Apple Valley, San Bernardino County, project area. See Appendix C.

Morton, D. M., and Miller F. K

2006 Preliminary digital geologic map of the San Bernardino and Santa Ana 30' x 60' quadrangles, Southern California, version 1.0: U.S. Geological Survey Open-File Report 06-1217; scale 1:100,000.

PBDB

2019 Online records search of the Paleobiology Database.

Radford, D. (Western Science Center)

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Reynolds, R. E.

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- 1994 The Victorville fan and an occurrence of *Sigmodon*. *In* J. Reynolds (ed.), Off limits in the Mojave Desert. Redlands: SBCM Association Special Publication 94-1, p. 31-33.

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APPENDIX A. QUALIFICATIONS



KIM SCOTT
Principal Investigator for Paleontology

EDUCATION

2013 M.S., Biology with a paleontology emphasis, California State University, San Bernardino
2000 B.S., Geology with paleontology emphasis, University of California, Los Angeles

SUMMARY QUALIFICATIONS

Ms. Scott has more than 20 years of experience in California paleontology. She is a sedimentary geologist and qualified paleontologist with extensive experience. She is a skilled professional who is well-versed in the compliance procedures of CEQA, NEPA, and the Paleontological Resources Preservation Act (PRPA). Ms. Scott regularly prepares reports for paleontological assessments, mitigation and monitoring plans and measures, and monitoring reports for a variety of federal, state, and local agencies throughout California. In addition, she has prepared paleontological resources reports for CEQA/ EIR compliance documents for project-level and program-level Specific Plans, General Plans, Master Plans, and Zoning Amendments for mixed-use, residential, commercial and industrial developments. Scott serves as company safety officer.

SELECTED PROJECTS

Purple Line Extension (Westside Subway), Metro/FTA, Los Angeles, CA. The project involves extension of the subway from Wilshire/Western to the VA Facility in Westwood for 9 miles. Cogstone prepared the supplemental Archaeology and Architectural History Reports and the cultural and paleontological sections of the FEIS/FEIR. Cogstone subsequently prepared the cultural and paleontological mitigation and monitoring plans for the entire project. Currently providing monitoring and all other cultural and paleontological services for Section One of the project. Paleontological Field and Lab Director, Report Co-author. 2011-present

Barren Ridge Transmission Line, Los Angeles Department of Water and Power (LADWP), Saugus to Mojave, Los Angeles and Kern Counties, CA. Over 75 miles of LADWP electrical lines were installed Angeles National Forest, BLM and private lands. Supervised paleontological monitoring and lab work and prepared a Paleontological Monitoring Report to CEQA, BLM, and PRPA standards. subto Aspen Environmental Group. Principal Paleontologist. 2015-present.

City of La Verne General Plan, Los Angeles County, CA. The project was for an update to the City's General Plan, a 5,446 acre area. Provided a Paleontological and Cultural Assessment Report for the City. subto De Novo Planning Group. Principal Paleontologist. 2018.

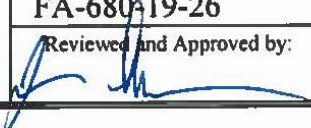
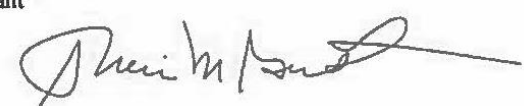

Interstate 405 Paleontological Resources Mitigation Plan, Los Angeles and Orange Counties, CA. Improvements to a 6-miles of Interstate 405 (I-405) between State Route 73 and Interstate 605. Provided a Paleontological Mitigation and Monitoring Plan. subto OC 405 Partners. Principal Paleontologist. 2018.

PATH Metro Villas, 320-340 Madison Ave., Los Angeles, CA. The project was to construct 190 permanent supportive/affordable housing units in three housing development complexes on 1.9 acres. Provided a Paleontological Monitoring Report. Prime to Affirmed Housing Group, Inc. Principal Paleontologist. 2017.

Little Tujunga Canyon Bridge, Angeles National Forest, Los Angeles County, CA. The project was to replace the Little Tujunga Canyon Road Bridge along Little Tujunga Canyon Road. Provided a Paleontological Assessment Report. subto Michael Baker International. Principal Paleontologist. 2017.

Park Place Extension Project, City of El Segundo, Los Angeles County, CA. The City proposes to extend Park Place from Allied Way to Nash Street with a railroad grade separation to implement a critical project improving traffic and circulation in the project area. Provided a combined Paleontological Identification and Evaluation Report (PIR/PER). subto Michael Baker International. Principal Paleontologist. 2017.

APPENDIX B. BLM FIELDWORK AUTHORIZATION

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT		INFORMATION REQUIREMENT APPROVED OMB NO. 1024-0037
FIELDWORK AUTHORIZATION		FOR BLM USE ONLY
To Conduct Specific Cultural Resource Work Under the Authority of a Cultural Resources Use Permit Issued by the Bureau of Land Management Pursuant to Sec. 302(b) of P.L. 94-579, October 21, 1976, 43 U.S.C. 1732 and Sec. 4 of P.L. 96-95, October 31, 1979, 16 U.S.C. 470cc		Request No. FA-680-19-26
		Reviewed and Approved by: 
1. CA Cultural Use Permit Number and Date Issued	Name of Permittee	
CA-19-05P, 03/01/2019	Sherri Gust, Cogstone Resource Management, Inc.	
2. Mailing Address	3. Telephone Number(s)	
1518 W. Taft Ave., Orange CA, 92865	(714) 974-8300	
4. Nature of Cultural Resources Work (If Consultation Work, Identify Client and Project):		
Consultation: Survey for the Apple Valley Heights County Water District, Mesa Vista Storage Tank and Transmission Pipeline Improvements. Client: NV5, 7620 N Hartman Lane, Suite 162, Tuscon, AZ, 85734		
5. Location of Proposed Work (Include Map)		
a. Description of Public Lands Involved b. Identification of Cultural Resource(s) Involved (if applicable)		
a. Portions of T4N R3W sec 22 of the San Bernardino Base Meridian under and to the south of Mesa Vista Road, Apple Valley		
b. none known		
6. Period During Which Work Will be Conducted		
To be determined. 1 day of survey once the FWA has been approved by the BLM.		
7. Name of Individual(s) Responsible for Planning & Supervising Field Work & Approving Reports, Evaluations, & Recommendations:		
Sherri Gust		
8. Signature of Applicant		
/s/ 		
Date: August 15, 2019		
9. Signature of BLM Authorizing Officer		
/s/ 		
Date: 8-21-19		

Form 8151-3

Attach Additional Sheets of Information as Necessary

APPENDIX C. PALEONTOLOGICAL RECORDS SEARCHES



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

tel 213.763.DINO
www.nhm.org

Vertebrate Paleontology Section
Telephone: (213) 763-3325

e-mail: smcleod@nhm.org

15 May 2019

Cogstone Resource Management, Inc.
1518 West Taft Avenue
Orange, CA 92865-4157

Attn: Edgar Alvarez

re: Vertebrate Paleontology Records Check for paleontological resources for the proposed
Mesa Vista Project, Cogstone Project # 4641, near Apple Valley, San Bernardino
County, project area

Dear Edgar:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed Mesa Vista Project, Cogstone Project # 4641, near 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 1 May 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 more elevated terrain of the southeastern-most portion of the proposed project area there are apparently exposures of metamorphic rocks of the Carboniferous Furnace Limestone that are highly unlikely to contain significant vertebrate fossils. Otherwise the more elevated terrain in the southeastern portion of the proposed project area has exposures of plutonic igneous rocks that will not contain recognizable fossils. The slightly less elevated terrain in the western and northern portions of the proposed project area is mapped as having surficial deposits of older Quaternary Alluvium, derived as fan deposits from the more elevated terrain of the Ord Mountains immediately to the east and south. Being relatively coarse because they are so close to the 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 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*.

Excavations in the metamorphic rocks in the proposed project area almost certainly won't uncover significant vertebrate fossils. Excavations in the igneous rocks in the proposed project area will not encounter recognizable fossils. Shallow excavations in the coarse older Quaternary Alluvium in the proposed project area are unlikely to uncover significant fossil vertebrate remains. Deeper excavations in the latter deposits that extend down into older and perhaps finer-grained Quaternary sediments, however, may well encounter significant vertebrate fossils. Any substantial excavations in the sedimentary deposits in the proposed project area 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, Ph.D.
Vertebrate Paleontology

enclosure: invoice



May 14, 2019

Cogstone
Edgar Alvarez
1518 W. Taft Ave.
Orange, CA 92865

Dear Mr. Alvarez,

This letter presents the results of a record search conducted for the Mesa Vista Project in San Bernardino County, California. The project site runs along Mesa Vista Street from south of Ocotillo Way to the base of the Ord Mountains in Section 22, Township 4 North, Range 3 West on the Apple Valley South USGS 7.5 minute quadrangles.

The geologic units underlying this project are mapped primary as old alluvium deposits dating from the late Pleistocene period, with segments of gneissoid granite dating from the Jurassic to Cretaceous periods, and limestone dating to the Mississippian period in the south eastern portions of the project area (Dibblee, 2008). While gneissoid granite is considered to be of low paleontological sensitivity, old alluvium units as well as Mississippian limestone 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 alluvial units throughout Riverside County.

Any fossils recovered from the Mesa Vista Project area would be scientifically significant. In particular, fossil bearing Mississippian units would be of incredible scientific value due to their relative rarity within California. Excavation activity associated with development of the project area would impact the paleontologically sensitive Pleistocene and Mississippian 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 similarly mapped projects, please feel free to contact me at dradford@westerncentermuseum.org

Sincerely,

A handwritten signature in black ink, appearing to read 'Darla Radford', written over a white rectangular background.

Darla Radford
Collections Manager

APPENDIX C. SENSITIVITY RANKING CRITERIA

Potential Fossil Yield Classification (PFYC) rankings are as per the Bureau of Land Management (BLM 2016)

PFYC Description	PFYC Rank
Very Low. The occurrence of significant fossils is non-existent or extremely rare. Includes igneous or metamorphic and Precambrian or older rocks. Assessment or mitigation of paleontological resources is usually unnecessary.	1
Low. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils. Includes rock units too young to produce fossils, sediments with significant physical and chemical changes (e.g., diagenetic alteration) and having few to no fossils known. Assessment or mitigation of paleontological resources is not likely to be necessary.	2
Potentially Moderate but Undemonstrated Potential. Units exhibit geologic features and preservational conditions that suggest fossils could be present, but no vertebrate fossils or only common types of plant and invertebrate fossils are known. Surface-disturbing activities may require field assessment to determine appropriate course of action.	3b
Moderate Potential. Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered and of low abundance. Common invertebrate or plant fossils may be found. Surface-disturbing activities may require field assessment to determine appropriate course of action.	3a
High. Geologic units containing a high occurrence of significant fossils. Fossils must be abundant per locality. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. On-site monitoring or spot-checking may be necessary during construction activities.	4
Very High. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils. Vertebrate fossils or scientifically significant invertebrate fossils are known or can reasonably be expected to occur in the impacted area. On-the-ground surveys prior to authorizing any surface disturbing activities will usually be necessary. On-site monitoring may be necessary during construction activities.	5