cogstone
PALEONTOLOGY - ARCHAEOLOGY - HISTORY

PALEONTOLOGICAL RESOURCES TECHNICAL REPORT FOR THE LATERAL C REVISION OF THE WILDOMAR MASTER DRAINAGE PLAN, CITY OF WILDOMAR, RIVERSIDE COUNTY, CALIFORNIA

Prepared for:
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September 2020

Cogstone Project Number: 3056-05
Type of Study: Paleontological Resources Assessment
Fossil localities: None within the project boundaries. Numerous near to the project in Pleistocene alluvium, Pauba Formation, and the ”unnamed sandstone”
USGS Quadrangles: Lake Elsinore and Wildomar 7.5’
Key Words: negative survey
PFYC 1, very low: modern artificial fill, Holocene very young wash deposits, Cretaceous Paloma Valley Ring Complex, and Cretaceous undifferentiated gabbro
PFYC 2, low near surface; PFYC 3a, moderate and patchy sensitivity more than 8 feet below the original ground surface: Holocene to late Pleistocene young alluvial fan and valley deposits
PFYC 3a, moderate and patchy sensitivity: late to middle Pleistocene old alluvial fan
PFYC 4, high sensitivity: Sandstone Member of the Pleistocene Pauba Formation and Pleistocene to Pliocene “unnamed sandstone”

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EXECUTIVE SUMMARY

This purpose of this study was to determine the potential effects on paleontological resources from the proposed revisions to the Wildomar Master Drainage Plan (MDP) Lateral C Revision project in the City of Wildomar, Riverside County, California.

The project surface is mapped as late Holocene very young wash deposits (<~5,000 years old [<~5 ka]); Holocene and late Pleistocene young axial channel deposits, young alluvial fan, and young alluvial valley deposits (<~ 120 ka); and the middle Pleistocene Pauba Formation (~170 ka to ~700 ka). Modern artificial fill is found near recent construction activities and frequently is not mapped. Unmapped at the surface, but potentially occurring at depth are the Pleistocene to Pliocene "unnamed sandstone" (~240 ka years to ~3 million years old [Ma]), the Cretaceous Paloma Valley Ring Complex (65 to 144 Ma), and undifferentiated Cretaceous gabbro.

Although there were no records of fossils from within the proposed project boundaries or within one mile thereof in the late Pleistocene deposits, 2646 localities and over 100,000 fossils have been recovered from the Diamond Valley Lake Local Fauna in southern Hemet, illustrating how fossiliferous these sediments can be. Both the Western Science Center and the San Bernardino County Museum have numerous fossils from the Pauba Formation and thousands of fossils from the "unnamed sandstone" in the Wildomar to Temecula area. Extinct animals from these formations include ground sloths, saber-toothed cat, American lion, dire wolf, short-faced bear, horses, tapirs, llamas, camels, peccaries, diminutive pronghorn, bison, mastodons, and mammoths.

Megan Wilson, Cogstone staff archaeologist and cross-trained paleontologist completed a paleontological survey on October 18, 2017. No fossils were found, although the sediments of the young alluvial fan and valley alluvium deposits, the old alluvial fan and the Pauba Formation observed were fine enough to be conducive to fossil preservation.

The artificial fill, the Holocene very young wash deposits, the Cretaceous Paloma Valley Ring Complex, and the Cretaceous undifferentiated gabbro have a very low sensitivity for fossil resources (Potential Fossil Yield Classification [PFYC] 1). Holocene to late Pleistocene deposits of young axial channel deposits, young alluvial fan, and valley alluvium deposits are ranked as low (PFYC 2) sensitivity at the surface and increasing to moderate and patchy sensitivity (PFYC 3a) by 8 feet below the original ground surface. The Sandstone Member of the Pleistocene Pauba Formation and the Pleistocene to Pliocene "unnamed sandstone" both have high sensitivity (PFYC 4) throughout.

Planned cut depths for the pipelines are approximately 11 feet deep while the maximum excavation for Bundy Canyon Basin is 45 to 50 feet deep. Sediments that may produce fossils

include the Holocene to late Pleistocene young alluvial fan and valley alluvium deposits at depths greater than 8 feet below the original ground surface, the late to middle Pleistocene old alluvial fans, the Sandstone Member of the Pleistocene Pauba Formation, and if encountered the Pleistocene to Pliocene “unnamed sandstone”.

A Paleontological Resource Impact Mitigation Program and full-time monitoring is currently recommended for deposits with a PFYC ranking of moderate or greater. 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

This purpose of this study was to determine the potential effects on paleontological resources during proposed revisions to the Wildomar Master Drainage Plan (MDP) Lateral C Revision project in the City of Wildomar, Riverside County, California (Figure 1).

PROJECT DESCRIPTION

Riverside County Flood Control and Water Conservation District (District) in partnership with the City of Wildomar (City) is proposing to revise the Wildomar MDP Lateral C facility. The Lateral C channel was originally proposed to be aligned along Bundy Canyon Wash, and would capture storm runoff at the downstream end of the existing Caltrans double 10 foot by 6 foot reinforced concrete box (RCB) culvert under the Interstate 15 (I-15), approximately half a mile south of Bundy Canyon Road, and convey it to Wildomar Channel, just northeasterly of McVicar Street. The revised alignment would begin and end at the same locations. However, instead of a concrete lined trapezoidal channel aligned with the Bundy Canyon Wash, the District moved the alignment and is proposing a RCB to be constructed mostly within existing street right of way. Both existing Lateral C and the proposed revision to Lateral C are shown (Figure 2). In addition to the revision of Lateral C, the District is also proposing the following additional facilities as part of the Wildomar MDP Lateral C system:

Bundy Canyon Basin – the proposed basin is located at the northeast corner of Bundy Canyon Road and Monte Vista Drive, just upstream of the I-15. The basin has a right-of-way footprint of approximately 19.1 acres and a storage volume of 143 acre-foot. The basin outlet is proposed as a double 6 foot wide x 5 foot high RCB and connects to a proposed 14 foot wide x 8 foot high RCB that connects to the existing double 10 foot wide x 6 foot high RCB culvert at I-15.

Lateral C-2 – this facility is proposed as an approximately 1,180 linear feet 60-inch reinforced concrete pipe (RCP) along unimproved Baxter Road as shown on the attached figure.

Lateral C-3 – this facility is proposed as an approximately 720 linear feet 60-inch RCP along unimproved Grove Street as shown on the attached figure.

PROJECT LOCATION

This project is located within the Lake Elsinore and Wildomar 7.5' United Stated Geological Survey topographic maps, in sections 26 and 35, Township 6 South, Range 4 West of the San

Bernardino Base and Meridian. Planned vertical cut depths for the pipelines are approximately 11 feet deep while the maximum excavation for Bundy Canyon Basin is 45 to 50 feet deep.

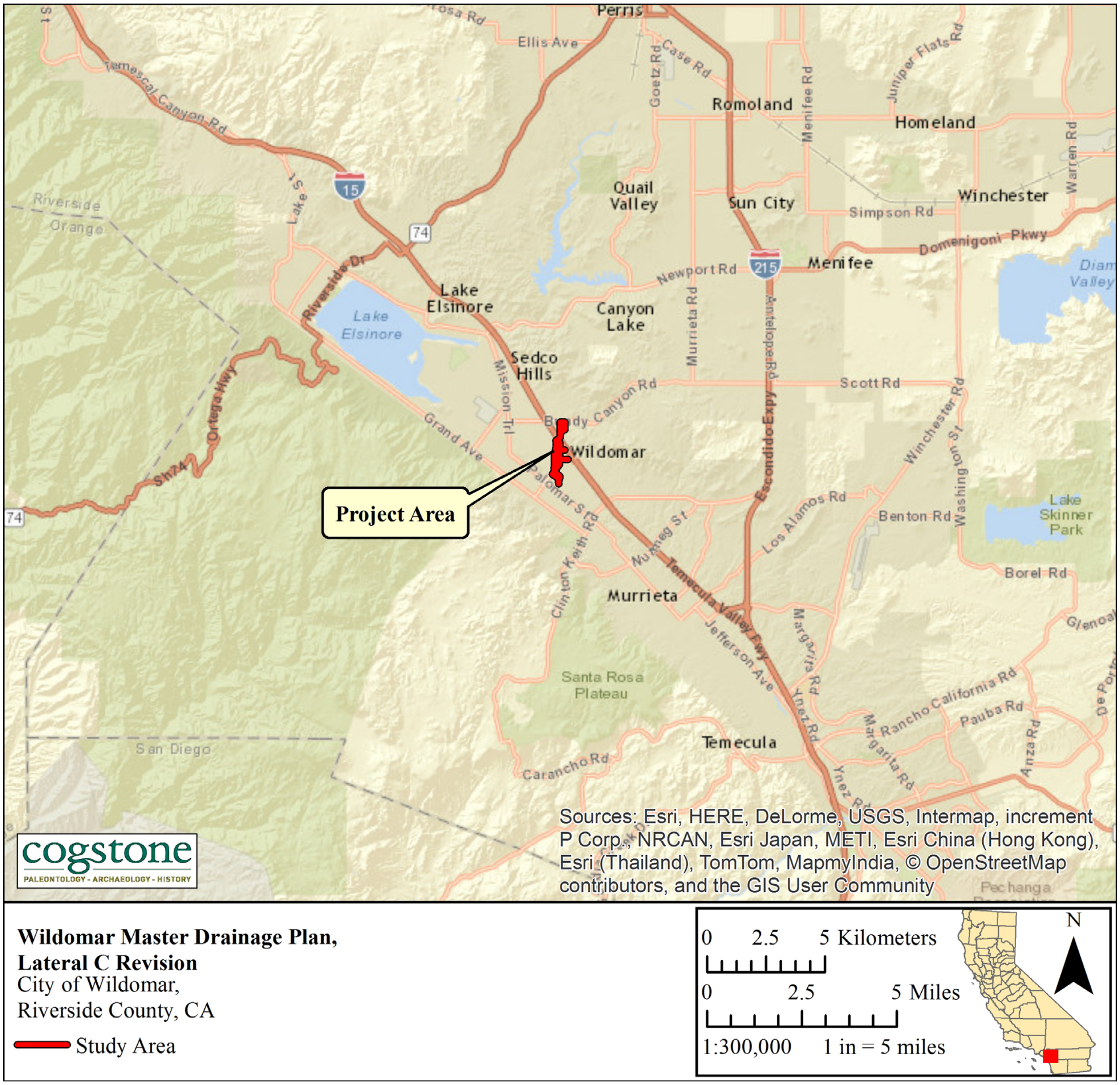
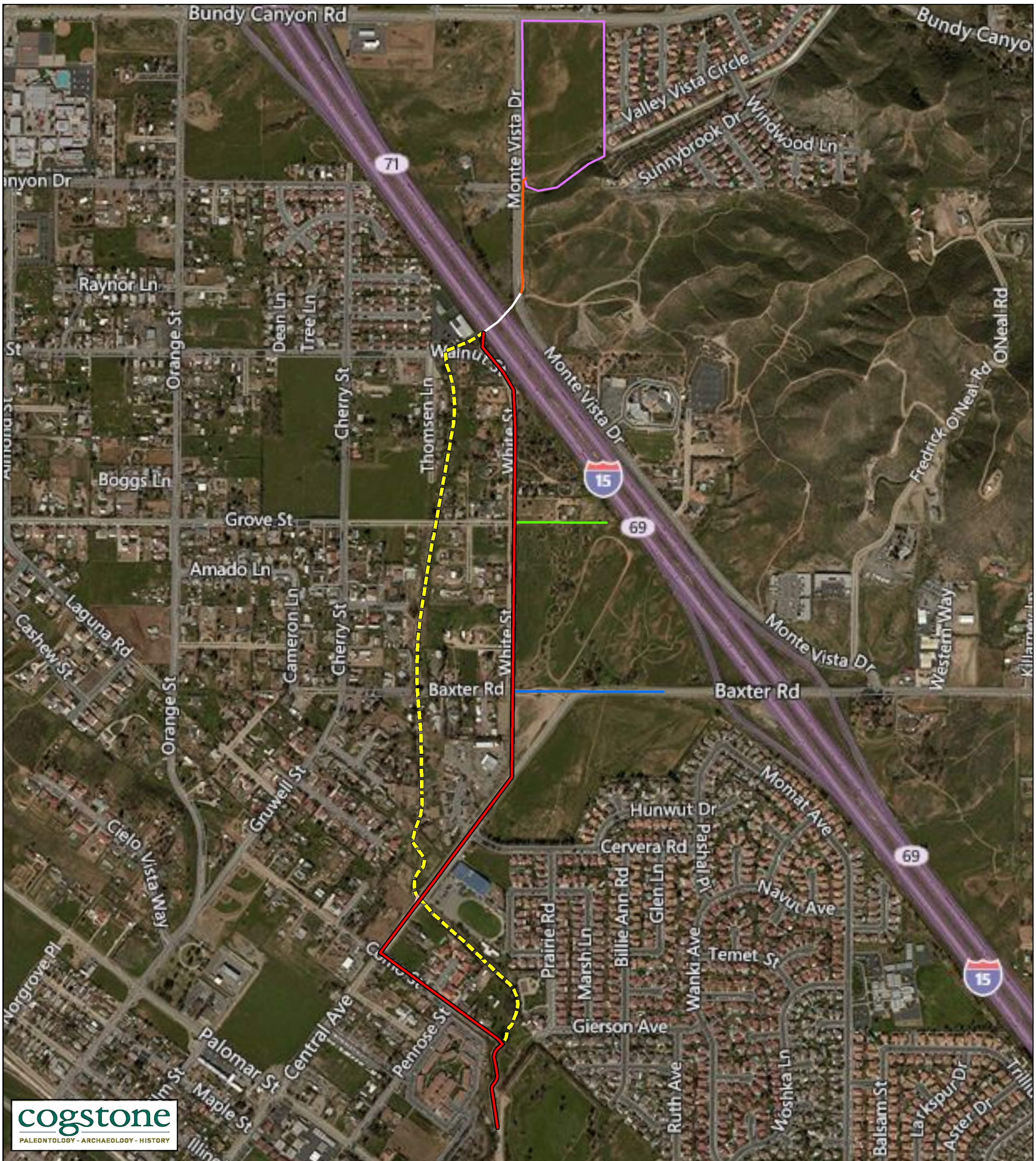


Figure 1. Project vicinity map



Wildomar Master Drainage Plan,
Lateral C Revision
City of Wildomar,
Riverside County, CA

0 0.25 0.5 Miles
0 0.25 0.5 Kilometers
N
1:15,600 1 in = 1,300 ft

Project Proponents
- Bundy Canyon Basin
- Caltrans Culvert
- Existing Lateral C Alignment
- Lateral C Stub Out
- Lateral C-2
- Lateral C-3
- Proposed Lateral C Realignment (North of Freeway)
- Proposed Lateral C Realignment (South of Freeway)

Figure 2. Project Location

PROJECT PERSONNEL

Cogstone Resource Management Inc. (Cogstone) conducted the paleontological resources studies and brief resumes of senior staff are appended (Appendix A).

- Kim Scott served as the Principal Paleontologist for the project 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.

- Dr. John Harris reviewed this report for quality control. He has a Ph.D. in Geology from the University of Bristol (U.K.), an M.A. in Geology from the University of Texas, Austin, a B.S. in Geology from the University of Leicester (U.K.). Dr. Harris has more than 40 years of experience in Cenozoic paleontology and specializes in terrestrial vertebrate species from Rancho la Brea California and Africa.

- Megan Wilson prepared the Geographic Information System (GIS) maps throughout this report and performed the survey. Wilson has a M.A. in Anthropology from California State University Fullerton, a GIS certification, and over nine years of experience in California archaeology and paleontology.

REGULATORY ENVIRONMENT

STATE LAWS AND REGULATIONS

Paleontological resources are protected by state law. This protection extends to all vertebrate fossils (animals with backbones) and any unique paleontological locality.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

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 Related to Paleontological Resources

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.

Section 30244: This section requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands.

Sections 4307-4309: Relating to the State Division of Beaches and Parks, afford protection to geologic features and "paleontological materials," but grant the director of the state park system authority to issue permits for specific activities that may result in damage to such resources, if the activities are for state park purposes and in the interest of the state park system

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."

CITY OF WILDOMAR GENERAL PLAN, OPEN SPACE ELEMENT

Paleontological resources are included with cultural resources in the City of Wild Omar's General Plan[1] and follow the guidelines of CEQA. The County of Riverside has created a sensitivity map for fossiliferous sediments[2].

PALEONTOLOGICAL RESOURCES SIGNIFICANCE CRITERIA

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:

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[1] http://www.cityofwildomar.org/uploads/files/documents/General%20Plan.pdf p. 3.5-13 to 3.5-14, Impacts 3.5.3, 3.5.5

[2] http://planning.rctlma.org/Portals/0/genplan/general_plan_2014/EnvironmentalImpactReport/04-09_CulturalAndPaleoResrcs_2014-04-07.pdf

1. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
2. The fossils provide data useful for 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 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).

BACKGROUND

GEOLOGICAL SETTING

The proposed project sites are situated in one of the most tectonically active regions of North America. To the north of the projects, the San Andreas Fault Zone travels up Cajon Pass where it is the boundary between the Pacific Plate and the North American Plate. The Transverse Ranges are a result of these two plates grinding past each other and “catching” along the bend in the San Andreas. The projects are located on the Pacific Plate which is composed of numerous blocks that can move independently.

The Transverse Range Province is an east-west trending series of steep mountain ranges and valleys, oblique to the normal northwest trend of coastal California, hence the name “Transverse.” The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz islands. Its eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault. Intense north-south compression is squeezing the Transverse Ranges, and as a result this is one of the most rapidly rising regions of the earth (Wagner 2002).

STRATIGRAPHY

The project surface is mapped as late Holocene very young wash deposits, Holocene and late Pleistocene young alluvial fan and alluvial valley deposits, late to middle Pleistocene old alluvial fan deposits, and Pleistocene Pauba Formation. Modern artificial fill is found near recent construction activities and frequently is not mapped. Unmapped at the surface, but potentially occurring at depth in Bundy Canyon Basin are the Cretaceous Paloma Valley Ring Complex and undifferentiated Cretaceous gabbro. At the southern end of the project deposits of the Pleistocene to Pliocene “unnamed sandstone” may appear at depth (Morton and Miller 2006; Figure 3).

ARTIFICIAL FILL, MODERN

Modern fill is typically less than 100 years old in California and will be present along Interstate 15. This material was brought in for freeway construction and any fossils that may be encountered therein are not scientifically significant.

VERY YOUNG WASH DEPOSITS (QW), LATE HOLOCENE

These late Holocene (<~5 ka) deposits are the unconsolidated, active portions of modern rivers and consist of sand to boulder sediments from local sources. Sediments coarsen upstream with the largest clasts being deposited during flash floods. Larger clasts are typically more rounded than smaller clasts (Morton and Miller 2006).

YOUNG AXIAL CHANNEL DEPOSITS (QYA), HOLOCENE AND LATE PLEISTOCENE

These Holocene to late Pleistocene (<~120 ka) sediments are slightly to moderately consolidated, silty sands to gravel deposits depending on the distance from the source (Morton and Miller 2006).

YOUNG ALLUVIAL FAN (QYF, QYF1), HOLOCENE AND LATE PLEISTOCENE

These Holocene to late Pleistocene (<~120 ka) sediments are slightly to moderately consolidated, moderately dissected, silty sands to bouldery deposits depending on the distance from the source. These fans comprise a majority of fill in the valley areas (Morton and Miller 2006).

Both unit 1 of the young alluvial fan deposits and an undifferentiated unit are present within the study area. Specifically the unit 1 sediments are as described above but show indistinct stratification and were deposited between the early Holocene to late Pleistocene (~7 ka to ~120 ka; Morton and Miller 2006).

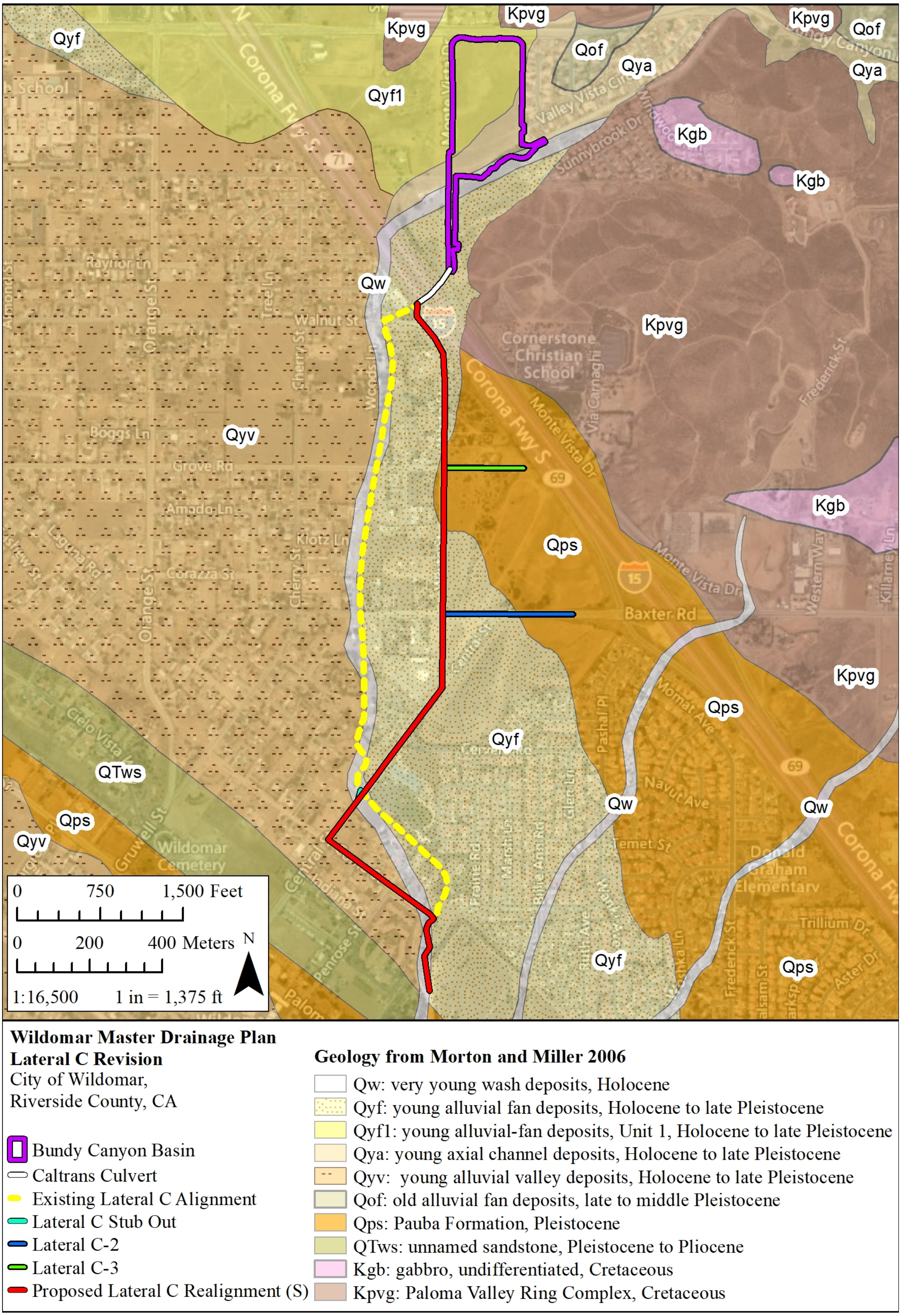

Figure 3. Project geology

Young alluvial valley deposits (Qyv), Holocene and late Pleistocene

These Holocene to late Pleistocene stream deposited sediments which cover valley floors consist of unconsolidated silts and sands with clay (Morton and Miller 2006).

Pauba Formation, Sandstone Member (Qps), middle Pleistocene

The oldest unit in the project area is the Sandstone Member of the Pauba Formation. Mann (1955, p.3) describes the formation as “hardpan lithified-fanglomerates, yellow and red arkoses, brown silts and diatomite”. Kennedy (1977) indicated that the formation consists of moderately well indurated, light brown, crossbedded sandstones and siltstones, or well indurated, grayish brown, poorly sorted fanglomerates and mudstones. Kennedy et al. (2003) and Morton and Miller (2006) describe the sandstone member of the Pauba Formation as moderately indurated, brown, cross-bedded sandstone with a few cobble to boulder beds present. The high level of oxidation (red and brown colors) is characteristic of the Pauba Formation.

The Pauba Formation is middle Pleistocene in age as it contains an early Rancholabrean to late Irvingtonian to North American Land Mammal Age (NALMA) fauna (Reynolds and Reynolds 1990a and 1990b). The early Rancholabrean to late Irvingtonian NALMA ranges from approximately 170,000 to 700,000 years old (Woodburne ed. 2012 p 21-43). The Pauba Formation conformably overlies the “unnamed sandstone” (Morton and Miller 2006).

SEDIMENTS THAT MAY OCCUR AT DEPTH

“Unnamed sandstone” (QTws), Pleistocene and Pliocene

Also called the “sandstone and conglomerate of the Wildomar area”, the upper part of this formation may occur at depth at the southern end of the alignment. Sediments are pale greenish grey, friable to well indurated, medium grained sands with caliche. Crude and discontinuous bedding is also characteristic of this part of the formation. The upper formation sands transition into lower formation cobble to boulder conglomerates (Kennedy et al. 2003, Morton and Miller 2006).

The upper unit of the formation contains a vertebrate fauna of the Irvingtonian NALMA, which ranges from ~240 ka to ~1.8 Ma (Scott and Cox 1993; Pajak et al. 1996). The lower, conglomerate beds of the “unnamed sandstone” contains a vertebrate fauna that is middle to late Blancan NALMA which is 2 to 3 Ma. Based on the fossils present, the “unnamed sandstone” is middle Pleistocene to Pliocene in age. A kaolin deposit interstratified with exposures of the upper unit of the sandstone has been correlated with the widespread Bishop Ash (Kennedy 1977; Pajak et al. 1996). The Bishop Ash also occurs in the Chaney Hill area of Murrieta in this formation and has been radiometrically dated to the middle Pleistocene Epoch, ± 0.758 Ma (Merriam and Bischoff 1975, Morton and Miller 2006); however it is structurally isolated from areas where fossils are known from and cannot be correlated with the localities (Pajak et al. 1996).

Paloma Valley Ring Complex (Kpvg), Cretaceous

The Cretaceous (65 - 144 Ma) granodiorite and gabbro may occur at depth at the northern end of the Bundy Canyon Basin. These igneous rocks make up the cores of the local hills. Uranium-lead ages of zircon from atypical hornblende-bearing granodiorite from the western part of the outer dike are 121 Ma and 118.5 Ma. The $^{40}Ar/^{39}Ar$ age of hornblende is 117.7 Ma and biotite is 118.8 Ma (Morton and Miller 2006). These rocks are unfossiliferous.

Undifferentiated gabbro (Kgb), Cretaceous

This igneous rock unit may occur at depth near the Bundy Canyon Basin. These brown weathering, medium to coarse grained, hornblende gabbro rocks (Morton and Miller 2006). These rocks are unfossiliferous.

PALEONTOLOGICAL RECORD SEARCHES

A record search of the project area and a one mile radius was obtained from the Western Science Center in Riverside County (Radford 2017; Appendix B). Online records from the University of California Museum of Paleontology database (UCMP 2017), and the PaleoBiology Database (PBDB 2017) were searched for fossil records as well as print sources (Jefferson 1991a 1991b; Scott 2015; McLeod 2016; Radford 2016).

No fossil localities are known from the project area or within a mile of the project, however numerous localities have been found within ten-miles of the project in the same sedimentary units that are present in the project area.

LATE PLEISTOCENE FOSSILS

Late Pleistocene fossils are typically found more than 10 feet deep in the valley areas of California, however local faulting and erosion can bring older sediments to the surface. Between 12 and 17.5 miles to the east and north of the proposed project, at the southern end of Hemet, is an area that yielded the late Pleistocene Diamond Valley Lake Local Fauna (DVLLF). This produced 2646 localities and over 100,000 fossils, most of which were recovered from between 10 and 50 feet below the original ground surface (Springer et al. 2009, 2010; Appendix B). The surface of the DVLLF project area is mapped as old alluvial fan and young alluvial valley deposits (Morton and Miller 2006). Although the proposed Wildomar project is in a different drainage basin from the DVLLF, it never less illustrates how fossiliferous these sediments can be. A second fauna from the southern end of the City of Chino Hills is compared with the DVLLF (Appendix B). The surface of the Chino Hills project area is mapped as very old alluvial fan deposits and over 6,000 fossils were recovered from 26 localities between 5 to 25 feet below the original ground surface (Gust and Scott 2005; Morton and Miller 2006).

Extinct animals from the DVLLF (=[1]) and the Chino Hills (=[2]) deposits include California turkey (*Melagris californica*[1]), ground sloths (*Megalonyx jeffersonii*[1], *Nothrotheriops shastensis*[1], *Paramylodon harlani*[1], *Paramylodon*[2]), saber-toothed cat (*Smilodon fatalis*[1]), American lion (*Panthera atrox*[1]), dire wolf (*Canis dirus*[1, 2]), short-faced bear (cf. *Arctodus*[1]), horses and tapirs (*Equus conversidens*[1], *Equus occidentalis*[1], *Equus*[2], *Tapirus*[2]) llamas and camels (*Hemiauchenia macrocephala*[2], *Hemiauchenia*[1], *Camelops hesternus*[1, 2]), peccary (*Platygonus compressus*[2]), diminutive pronghorn (*Capromeryx minor*[2], *Capromeryx* [1]), bison (*Bison antiquus*[1, 2], *Bison latifrons*[1]), mastodons (*Mammut americanum*[1]), and mammoths (*Mammuthus columbi*[1]) (Gust and Scott 2005, Springer et al. 2009). These species have also been found as isolated remains or as smaller faunas in the Inland Empire area of San Bernardino and Riverside counties (Scott 2015).

PAUBA FORMATION

Both the Western Science Center and the San Bernardino County Museum have numerous fossils from the Pauba Formation in the Wildomar to Temecula area (Pajak et al. 1996; Radford 2016, 2017). The University of California Museum of Paleontology database has no records from this formation. However the Paleobiology Database (PBDB 2017) records 28 published localities with approximately 1000 fossils from the Pauba Formation.

Extinct vertebrates recovered from the Pauba Formation include ground sloths (*Paramylodon harlani*), saber-toothed cats (*Smilodon fatalis*), horses (*Equus bautistensis*), tapirs (*Tapirus californicus*), ?peccaries (?*Tayassuidae*), llamas (*Hemiauchenia macrocephalia*), camels (*Camelops*), mastodons (*Mammut americanum*), and mammoths (*Mammuthus* sp. cf. *M*. columbi, *M*. sp. cf. *M*. *meridiaonalis*). Still living larger mammal species include coyotes (*Canis latrans*), deer (cf. *Odocoileus*), big horned sheep (*Ovis* sp. cf. *O. canadensis*), and pronghorns (cf. *Antilocapra*). Fish, rodents, rabbits, and bats are also present in the fauna (Bowden and Scott 1992; Jefferson 1991a, 1991b; Pajack 1993, 1994; Pajak et al. 1996; Scott 1992).

"UNNAMED SANDSTONE"

Together the Western Science Center and the San Bernardino County Museum have thousands of fossils from the "unnamed sandstone" from projects in the Wildomar to Temecula area (Pajak et al. 1996; Radford 2016, 2017). The University of California Museum of Paleontology database (2017) has no records from the unnamed sandstone. However the Paleobiology

Database (2017) records 109 published localities with thousands of fossils from the unnamed sandstone.

Extinct vertebrates recovered from the "unnamed sandstone" include ground sloths (*Megalonyx leptostomus or M. wheatleyi*), cat (Felidae), short-faced bear (*Arctodus simus*), tapir (*Tapirus californicus*), horses (*Equus bautistensis, Equus scotti*), peccary (*Platagonus bicalcacaratus*), llama (*Hemiauchenia*), camel (*Camelops*), pronghorn (?*Tetrameryx* sp.), mastodons (*Mammut*), and mammoths (*Mammuthus*). Still living larger mammal species include badger (*Taxidea*), coyotes (?*Canis latrans*, *Canis*), fox (*Vulpes* sp. cf. *V. velox, Vulpes*), deer (*Odocoileus* sp.), and pronghorn (*Antilocapra*). Fish, amphibians, reptiles, rodents, rabbits, bats and invertebrates are also present in the fauna. The rodents are especially abundant and in many cases temporally-diagnostic (Jefferson 1991a; Pajak et al. 1996; Reynolds et al. 1991; Scott 1992, 1998, 1999; Scott and Cox 1993). The formation has also yielded remains of the extinct giant teratorn *Aiolornis incredibilis;* the largest flying bird known from North America (Campbell et al. 1999).

PALEONTOLOGICAL FIELD RECONNAISSANCE

METHODS

The paleontological resources survey is a crucial part of a project's environmental assessment phase. One purpose is to verify the exact location of all previously identified, accessible paleontological localities within a project area and to check if more fossil materials are present. The survey is also to assess the potential for the project area sediments to contain fossil resources and to confirm that field observations conform to the geological maps of the project area. All undeveloped ground surface areas that may be impacted within the proposed project area are examined. Portions of the project where potentially fossiliferous sediments were present at the surface or where existing ground disturbances (e.g., cutbanks, ditches, animal burrows, etc.) incised into potentially fossiliferous sediments were intensely surveyed. Photographs of the project area, including ground surface visibility and items of interest, are taken with a digital camera.

RESULTS

Megan Wilson, Cogstone staff archaeologist and cross-trained paleontologist completed a paleontological survey on October 18, 2017. Much of the proposed pipelines are to be cut under existing roadways (Figures 2, 3), however, sediments of the areas to be impacted were frequently visible adjacent to these roads. Sediments observed corroborated Morton and Miller (2006) and the descriptions provided in the Stratigraphy section above.

No areas of artificial fill or Cretaceous igneous deposits were examined. Only the stream channel located to the south of Como Street at the southern-most portion of the alignment was sufficiently deep to expose subsurface sediments of the young alluvial fan and young alluvial valley deposits (Figures 4, 5). No fossils were found, although the sediments of the young alluvial fan and valley alluvium deposits, the old alluvial fan and the Pauba Formation observed were potentially suitable for fossil preservation.

Figure 4. Approximately 20 feet of erosion in the Como Street stream channel.

Figure 5. Stream and pond deposits of the young valley alluvium.

Figure 6. Proposed Bundy Canyon Basin, looking NE over the old alluvial fan,

PALEONTOLOGICAL SENSITIVITY

A multilevel ranking system was developed by professional resource managers within the Bureau of Land Management (BLM) as a practical tool to assess the sensitivity of sediments for fossils. The Potential Fossil Yield Classification (PFYC) system (BLM 2007; 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 artificial fill, the Holocene very young wash deposits, the Cretaceous Paloma Valley Ring Complex, and the Cretaceous undifferentiated gabbro have a very low sensitivity for fossil resources (PFYC 1). Holocene to late Pleistocene deposits of young axial channel deposits, young alluvial fan, and valley alluvium deposits are ranked as low (PFYC 2) sensitivity at the surface and increasing to moderate and patchy sensitivity (PFYC 3a) by 8 feet below the original ground surface. The Sandstone Member of the Pleistocene Pauba Formation and the Pleistocene to Pliocene “unnamed sandstone” both have high sensitivity (PFYC 4) throughout (Table 2; Figure 7).

Table 1. Paleontological Sensitivity Rankings

Rock Unit	Map symbol (Figure 3)	PFYC rankings					
		5 very high	4 high	3a moderate; patchy	3b moderate; undemonstrated	2 low	1 very low
artificial fill, modern	none						X
Holocene very young wash deposits	Qw						X
upper 8 feet of the Holocene to late Pleistocene deposits (young axial channel, young alluvial fan, and valley alluvium deposits)	Qyf, Qyf_1, Qyv					X	
more than 8 feet deep into the Holocene to late Pleistocene deposits (young axial channel, young alluvial fan, and valley alluvium deposits)	Qyf, Qyf_1, Qyv			X			
Pauba Formation, Sandstone Member, Pleistocene	Qps		X				
Formations may appear at depth							
“unnamed sandstone”, Pleistocene to Pliocene	QTws		X				
Paloma Valley Ring Complex and undifferentiated gabbro, Cretaceous	Kpvg, Kbg						X

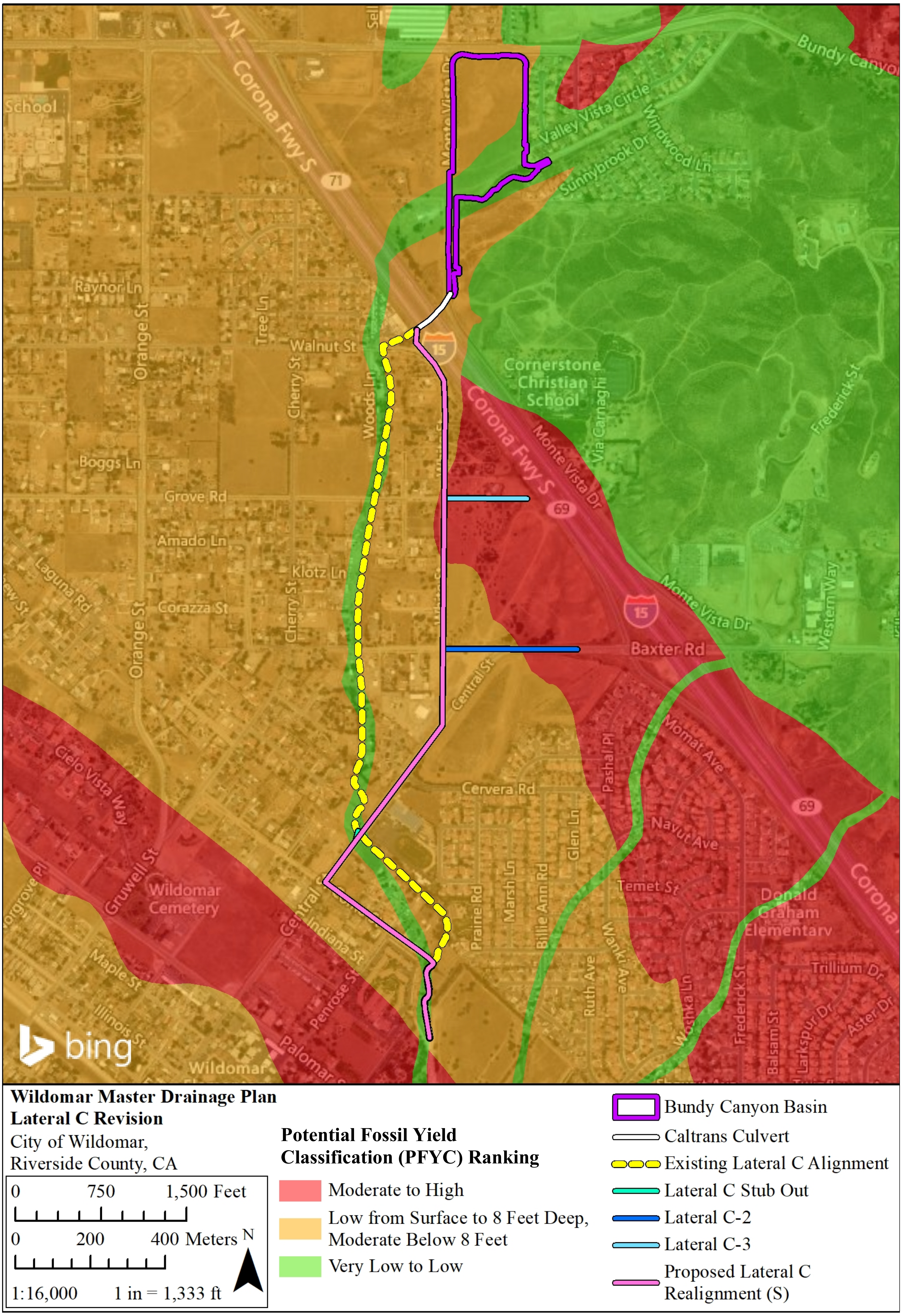

Figure 7. Potential fossil yield classification of project sediments

CONCLUSIONS AND RECOMMENDATIONS

Planned cut depths for the pipelines are approximately 11 feet deep while the maximum excavation for Bundy Canyon Basin is 45 to 50 feet deep.

Artificial fill, Holocene very young wash deposits, Holocene to late Pleistocene young alluvial fan and valley alluvium deposits, late to middle Pleistocene old alluvial fans, and the Sandstone Member of the Pleistocene Pauba Formation will be impacted during excavations. The Pleistocene to Pliocene “unnamed sandstone”, the Cretaceous Paloma Valley Ring Complex, and undifferentiated gabbro also may be impacted.

The artificial fill, the Holocene very young wash deposits, the Cretaceous Paloma Valley Ring Complex, and undifferentiated gabbro have no potential to produce fossils. Fossils may be encountered in all other geologic units present, although fossils are likely only at depths greater than 8 feet below the original ground surface in the Holocene to late Pleistocene young alluvial fan and valley alluvium deposits.

A Paleontological Resource Impact Mitigation Program and full-time monitoring is currently recommended for deposits with a PFYC ranking of moderate or greater. 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.

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APPENDIX A: QUALIFICATIONS

cogstone
PALEONTOLOGY - ARCHAEOLOGY - HISTORY

KIM SCOTT
Principal Paleontologist

EDUCATION

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

SUMMARY QUALIFICATIONS

Scott has more than 20 years of experience in California paleontology and geology. She is a qualified geologist and field paleontologist with extensive survey, monitoring and fossil salvage experience. In addition, she has special skills in fossil preparation (cleaning and stabilization) and preparation of stratigraphic sections and other documentation for fossil localities. Scott serves as company safety officer and is the author of the company safety and paleontology manuals.

SELECTED PROJECTS

Temecula Gateway EIR, Riverside County, CA. A Planned Development Overlay/Zone Change and General Plan Amendment. Prepared an assessment report for a 9-acre parcel for the EIR. Sub to PMC. Co-Principal Investigator/Report Co-author. 2015

Interstate 15 (I-15) / Limonite Avenue Interchange Improvement Project, Caltrans District 8, Eastvale, Riverside County, CA. The proposed project would replace the existing Limonite Avenue OC and would widen the roadway from four lanes to six lanes. Prepared a Paleontological Mitigation Plan. Sub to Dokken Engineering. Co-Principal Investigator/Report Co-author. 2015.

Perris Valley Line Project, Metrolink - Riverside County Transportation Commission, Riverside County, CA. The project was a 24-mile extension of the Metrolink 91 Line. Managed paleontological monitoring for construction of four new stations, upgrading associated track and utility relocations to extend the Metrolink connection from Riverside through Moreno Valley to Perris. Prepared an abbreviated Paleontological Assessment, supervised all field activities and prepared the Paleontological Resources Monitoring Compliance Report. Sub to HDR Engineering. Project Manager and Principal Paleontologist. 2013-2016.

Barren Ridge Transmission Line, Los Angeles Department of Water and Power, Saugus to Mojave, CA. The project is installation of a new transmission line in the Antelope Valley and Santa Clarita Valley. Managing paleontological monitoring for over 75 miles of LADWP electrical lines and across Angeles National Forest, BLM and private lands. Sub to Aspen Environmental Group. Principal Paleontologist. 2015-present.

San Diego River Bridge Double Track Project, San Diego Associate of Governments (SANDAG), San Diego County, CA. An approximate one-mile segment of second main track (double tracking) and a bridge replacement with associated track and signal improvements starting in the vicinity of Control Point (CP) Tecolote and goes to near CP Friar. Work is through the existing LOSSAN corridor as planned for in the 2003 LOSSAN Corridor Strategic Plan and evaluated in the Final Program EIR/EIS. Prepared a Paleontological Assessment Report. Sub to HDR Engineering. Co-Principal Paleontologist/Report Co-author. 2015.

SR 91 Widening Project, Caltrans District 8, Riverside, Riverside County, CA. Caltrans widening from the Interstate 60/ State Route 91/ State Route 215 interchange to the Adams Street bridge (Post mile marker 15.6 to 21.6). Construction activities included the addition of two High Occupancy Vehicle (HOV) lanes (one for either direction), interchange reconfiguration, overhead replacement, and undercrossing widening and pavement restriping within the Right of Way (ROW). Supervised paleontological monitoring, monitored, prepared fossils, and prepared the mitigation report. Under contract to Applied Earthworks. Field and Laboratory Supervisor/Report Co-author. 2011-2012.

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PALEONTOLOGY - ARCHAEOLOGY - HISTORY

JOHN HARRIS
Paleontology Practice Leader

EDUCATION

1970 Ph.D. Geology with paleontology emphasis, University of Bristol (U.K.)
1967 M.A. Geology with paleontology emphasis, University of Texas, Austin
1964 B.S., Geology, University of Leicester (U.K.)

SUMMARY QUALIFICATIONS

Dr. Harris has more than 40 years of experience in Cenozoic paleontology and specializes in terrestrial vertebrate species from Rancho la Brea California and Africa. He is the Chief Curator Emeritus, George C. Page Museum (2015- present); an Adjunct Professor, Department of Geology & Geophysics, University of Utah (1996-present); a Visiting Associate in Geology, Division of Geological and Planetary Sciences, California Institute of Technology (2001-present); and a Research Associate, National Museums of Kenya (2007 – present).

SELECTED PROJECTS

Grove Avenue Corridor, Caltrans District 8, Los Angeles San Bernardino County, CA. Paleontology Practice Leader. Interchange Improvement Project in Ontario. Quality Control and Revisions for the Combined Paleontological Identification and Evaluation Report with Paleontological Mitigation Plan. 2015

Interstate 10 Grove Avenue Interchange, Caltrans District 8, Los Angeles San Bernardino County, CA. Paleontology Practice Leader. Corridor Specific Plan in Ontario. Quality Control and Revisions for the Combined Paleontological Identification and Evaluation Report with Paleontological Mitigation Plan. 2015

SR99 at Avenue 12 Interchange, Caltrans District 6, Madera County, CA. Paleontology Practice Leader. Project was monitoring of excavations; fossils recovered. Quality Control and Revisions for the Paleontological Monitoring Report. 2015

SR178 at Morning Drive Interchange Improvements, Thomas Roads Improvement Program/ Caltrans District 6, Bakersfield, CA. Monitoring for six mile roadway improvements project. Paleontology Practice Leader. Quality Control and Revisions for the Paleontological Monitoring Report. 2015

I-680 North Segment Express Lane Conversion, Contra Costa Transportation Authority/ Caltrans District 4, Walnut Creek, CA. Paleontology Practice Leader. Project to expand lanes including underground utilities. Quality Control and Revisions for the Combined Paleontological Identification and Evaluation Report with Paleontological Mitigation Plan. 2015

1200 S. Figueroa Mixed-Use, Jamison Development, Los Angeles, CA. Paleontology Practice Leader. Project was monitoring of large scale excavations up to 30 ft. deep. Quality Control and Revisions for the Paleontological Monitoring Memo. 2015

North-South Pipeline, CPUC, San Bernardino and Riverside Counties, CA. Paleontology Practice Leader. Proposed project will install large diameter natural gas pipeline through Cajon Pass. Review and Data Gap Analysis. 2015

APPENDIX B: RECORDS SEARCH AND LOCAL FAUNAS

WESTERN SCIENCE CENTER

November 13, 2017

Cogstone
Megan Wilson
1518 W. Taft Avenue
Orange, CA 92865

Dear Ms. Wilson,

This letter presents the results of a record search conducted for the Wildomar MDP Project (Cogstone Project # 3056-05) in the city of Wildomar, Riverside County, California. The project site spans 4 acres located between Bundy Canyon Road and Palomar Street in Township 6 South, Range 4 West, sections 26 and 35, on the Wildomar and Elsinore, CA USGS 7.5 minute quadrangles.

The geologic units underlying this project are mapped primarily as alluvial deposits dating from the Pliocene to Holocene periods, with a portion along the northern project border mapped as Mesozoic granitic rock (Jennings, Strand, and Rodgers, 1977). The alluvial units mapped within the project 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 numerous fossil localities within 5-10 miles that presented paleontological finds within similar alluvial mapped units including those associated with the San Diego Pipeline 6 Project in Hemet, the Harveston II Development in Temecula, and the Principe Collection of Murrieta, California.

Any fossils recovered from the project area would be scientifically significant. Excavation activity associated with development of the project area would impact the paleontologically sensitive alluvial 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 the San Diego Pipeline 6 Project, Harveston II Development, or the Principe Collection of Murrieta, please feel free to contact me at dradford@westerncentermuseum.org

Sincerely,

Darla Radford
Collections Manager

2345 Searl Parkway ♦ Hemet, CA 92543 ♦ phone 951.791.0033 ♦ fax 951.791.0032 ♦ WesternScienceCenter.org

Group	Common Name	Vertebrate Taxon	DVLLF[1]	Chino Hills[2]	Environment
fish	‡arroyo chub	‡*Gila orcutti*		X	requires freshwater
	chub	*Gila* sp.		X	requires freshwater
	three-spined stickleback	*Gasterosteus aculeatus*		X	freshwater or marine
	stickleback	*Gasterosteus* sp.		X	freshwater or marine
	ray-finned fish	Teleostei		X	freshwater or marine
	bony fish	Osteichthyes		X	freshwater or marine
newts and salamanders	California newt	*Taricha torosa*		X	requires freshwater
	probable California newt	*Taricha* sp. cf. *T. torosa*		X	requires freshwater
	?rough skinned newt	*Taricha* sp. ?*T. granulosa*		X	requires freshwater
	newt	*Taricha* sp.		X	requires freshwater
	arboreal salamander	*Aneides lugubris*		X	requires freshwater
	salamander	Urodela	X	X	requires freshwater
toads and frogs	western spadefoot toad	*Scaphiopus hammondii*	X	X	
	western toad	*Bufo boreas*		X	
	probable western toad	*Bufo* sp. cf. *B. boreas*	X		
	southwestern toad	*Bufo microscaphus*		X	
	‡probable red-spotted toad	‡*Bufo* sp. cf. *B. punctatus*		X	
	toad	*Bufo* sp.		X	
	?toad	?*Bufo* sp.		X	
	probable toad family	cf. Bufonidae		X	
	probable California treefrog	*Pseudacris* sp. cf. *P.cadaverina* (formerly *Hyla*)	X		
	‡red-legged frog	‡*Rana aurora*		X	requires freshwater
	frog	*Rana* sp.	X	X	requires freshwater
	frogs and toads	Anura		X	
turtles and tortoises	western pond turtle	*Actinemys marmorata*	X	X	requires freshwater
	probable western pond turtle	*Actinemys* sp. cf. *A. marmorata*		X	requires freshwater
	pond turtle family	Emydidae		X	requires freshwater
	‡desert tortoise	‡*Gopherus* agassizii	X		
	turtles and tortoises	Chelonia		X	
snakes and lizards	probable Gilbert's skink	*Eumeces* sp. cf. *E. gilberti*		X	
	whiptailed lizard	*Cnemidophorus tigris*	X		
	southern alligator lizard	*Elgaria* (*Gerrhonotus*) *multicarinatus*		X	
	alligator lizard	*Elgaria* (*Gerrhonotus*) sp.	X		
	collared lizard	*Crotaphytus collaris*	X		
	coast horned lizard	*Phrynosoma coronatum*	X		
	probable coast horned lizard	*Phrynosoma* sp. cf. *P. coronatum*		X	

Group	Common Name	Vertebrate Taxon	DVLLF[1]	Chino Hills[2]	Environment
snakes and lizards	horned lizard	*Phrynosoma* sp.		X	
	probable sagebrush lizard	*Sceloporus* sp. cf. *S. graciosus*	X		
	western fence lizard	*Sceloporus occidentalis*	X		
	spiny lizard	*Sceloporus* sp.		X	
	side-blotched lizard	*Uta stansburiana*	X		
	side-blotched lizard	*Uta* sp.		X	
	iguana family	Iguanidae	X		
	lizards	Lacertilla		X	
	kingsnake	*Lampropeltis* sp.	X	X	
	whipsnake	*Masticophis* sp.	X	X	
	pine snake	*Pituophis melanoleucus*	X	X	
	Pacific gopher snake	*Pituophis catenifer*		X	
	blackhead snake	*Tantilla* sp.	X		
	garter snake	*Thamnophis* sp.	X	X	
	lyre snake	*Trimorphodon biscutatus*			
	constrictor snake family	Colubridae		X	
	probable sidewinder	*Crotalus* sp. cf. *C. cerastes*	X		
	rattlesnake	*Crotalus* sp.	X	X	
	snakes	Ophids		X	
	snakes and lizards	Squamata		X	
birds	probable mallard	*Anas* sp. cf. *A. platyrhynchos*		X	requires freshwater
	green-winged teal	*Anas crecca*		X	requires freshwater
	duck	*Anas* sp.	X		requires freshwater
	probable ruddy duck	cf. *Oxyura jamaicensis*		X	requires freshwater
	†California turkey	†*Melagris californica*	X		
	golden eagle	*Aquila chrysaetos*	X		
	probable Cooper's hawk	*Accipiter* sp. cf. *A. cooperi*	X		
	hawk	*Buteo* sp.		X	
	falcon	*Falco* sp.	X		
	American coot	*Fulica americana*		X	requires freshwater
	shore bird family	Scolopacidae	X		
	barn owl	*Tyto alba*		X	
	?short-eared owl	*Asio* sp. (?*A. flammeus*)	X		
	probable short-eared owl	cf. *Asio flammeus*		X	
	northern flicker	*Colaptes auratus*	X		
	Steller's jay	*Cyanocitta stelleri*	X		
	common raven	*Corvus corax*	X		
	raven family	Corvidae	X		

Group	Common Name	Vertebrate Taxon	DVLLF[1]	Chino Hills[2]	Environment
birds	swallow	cf. *Hirundo* sp.	X		
	swallow family	*Hirundindae*	X		
	probably American robin	*cf. Turdus migratorius*	X		
	probable house finch	cf. *Carpodacus mexicanus*		X	
	probable western meadowlark	cf. *Sturnella neglecta*	X	X	
	song birds	Passeriformes		X	
	birds	Aves		X	
ground sloths	†Jefferson's ground sloth	†*Megalonyx jeffersonii*	X		
	†Shasta's ground sloth	†*Nothrotheriops shastensis*	X		
	†Harlan's ground sloth	†*Paramylodon harlani*	X		
	†ground sloth	†*Paramylodon* sp.		X	
rabbits	black-tailed jackrabbit	*Lepus californicus*	X	X	
	jackrabbit	*Lepus* sp.		X	
	desert cottontail	*Sylvilagus audubonii*	X	X	
	brush rabbit	*Sylvilagus bachmani*		X	
	rabbit	*Sylvilagus* sp.		X	
	rabbit family	Leporidae		X	
squirrels	‡antelope ground squirrel	‡*Ammospermophilus* sp.		X	
	‡probable antelope ground squirrel	‡cf. *Ammospermophilus* sp.	X		
	California ground squirrel	*Spermophilus beecheyi*	X		
	ground squirrel	*Spermophilus* sp.	X	X	
	Beechey's groind squirrel	*Eutamius* sp.	X		
	?squirrel family	?Sciuridae		X	
rats and mice	Pacific kangaroo rat	*Dipodomys agilis*		X	
	kangaroo rat	*Dipodomys* sp.	X	X	
	little pocket mouse	*Perognathus longimenbris*		X	
	pocket mouse	*Perognathus* sp.	X	X	
	Botta's pocket gopher	*Thomomys bottae*	X	X	
	pocket gopher	*Thomomys* sp.		X	
	California meadow vole	*Microtus californicus*	X	X	
	vole	*Microtus* sp.		X	
	dusky-footed wood rat	*Neotoma fuscipes*	X	X	
	desert wood rat	*Neotoma lepida*	X		
	wood rat	*Neotoma* sp.		X	
	probable canyon mouse	*Peromyscus* sp. cf. *P. crinitus*	X		
	cactus mouse or deer mouse	*Peromyscus eremicus* or *P. maniculatus*		X	
	white-footed mouse	*Peromyscus* sp.		X	
	white-footed mouse or vole	*Peromyscus* sp. or *Microtus* sp.		X	

Group	Common Name	Vertebrate Taxon	DVLLF[1]	Chino Hills[2]	Environment
	harvest mouse	*Reithrodontomys megalotus*		X	
	harvest mouse	*Reithrodontomys* sp.	X	X	
	deer mouse and wood rat family	Cricetidae		X	
	rodents	Rodentia		X	
shrews & moles	desert shrew	*Notiosorex crawfordi*		X	
	ornate shrew	*Sorex ornatus*	X	X	
	broad-footed mole	*Scapanus latimanus*	X	X	
bats	mouse-eared bat	*Myotis* sp.	X		
	guano bat	*Tadarida brasiliansis*		X	
	vesper bat family	Vespertilionidae		X	
carnivores	bobcat	*Lynx rufus*	X		
	bobcat	*Lynx* sp.		X	
	†sabertoothed cat	†*Smilodon fatalis*	X		
	†American lion	†*Panthera atrox*	X		
	?cat family	?Felidae		X	
	coyote	*Canis latrans*	X	X	
	probable coyote	*Canis* sp. cf. *C. latrans*		X	
	†dire wolf	†*Canis dirus*	X	X	
	†?dire wolf	†*?Canis dirus*		X	
	canid	*Canis* sp.		X	
	‡desert kit fox	‡*Vulpes macrotis*		X	
	grey fox	*Urocyon cinereoargenteus*	X		
	†probable short-faced bear	*cf.* †*Arctodus* sp.	X		
	‡black bear	‡*Ursus americanus*	X		
	skunk	*Mephitis* sp.	X		prefers heavy brush
	skunk	*Spilogale* sp.		X	prefers heavy brush
	long-tailed weasel	*Mustela frenata*	X	X	prefers heavy brush
	weasel	*Mustela* sp.		X	prefers heavy brush
	badger	*Taxidea taxus*	X		prefers heavy brush
	?badger	?*Taxidea* sp.		X	prefers heavy brush
	‡ringtail	‡*Bassariscus* sp.		X	prefers heavy brush
	‡probable ringtail	‡cf. *Bassariscus* sp.		X	prefers heavy brush
	probable carnivores	cf. Carnivora		X	
horses and relatives	†Mexican ass	†*Equus conversidens*	X		
	†probable western horse	†*Equus occidentalis*	X		
	†horse	†*Equus sp.*		X	
	†probable horse	†*cf. Equus sp.*		X	
	†tapir	†*Tapirus* sp.		X	prefers heavy brush
	horses and tapirs	Perrisdactyla		X	

Group	Common Name	Vertebrate Taxon	DVLLF[1]	Chino Hills[2]	Environment
even toed- ungulates	†stilt-legged llama	†*Hemiauchenia macrocephala*		X	
	†stilt-legged llama	†*Hemiauchenia* sp.		X	
	†yesterday's camel	†*Camelops hesternus*	X	X	
	†camel	†*Camelops* sp.		X	
	†probable camel	†cf. *Camelops* sp.		X	
	†camel family	†Camelidae		X	
	‡peccary	‡*Platygonus compressus*	X		
	†diminutive pronghorn	†*Capromeryx minor*	X		prefers heavy brush
	†diminutive pronghorn	†*Capromeryx* sp.		X	prefers heavy brush
	†probable diminutive pronghorn	†cf. *Capromeryx* sp.		X	prefers heavy brush
	†?diminutive pronghorn	†?*Capromeryx* sp.		X	prefers heavy brush
	‡pronghorn	‡*Antilocapra americana*	X		
	‡pronghorn	‡*Antilocapra* sp.		X	
	mule deer	*Odocoileus hemionus*	X	X	
	deer family	Cervidae	X	X	
	†long-horned bison	†*Bison latifrons*	X		
	†antique bison	†*Bison antiquus*	X	X	
	†bison	*†Bison sp.*		X	
	†probable bison	†cf. *Bison* sp.		X	
	†?bison	†?*Bison* sp.		X	
	camels, deer, and bovids	Artiodactyla		X	
proboscidians	†American mastodon	†*Mammut americanum*	X		prefers open spaces
	†Columbian mammoth	†*Mammuthus columbi*	X		prefers open spaces
	†proboscidian	†Proboscidae		X	prefers open spaces
	mammals	Mammalia		X	
	vertebrates	Vertebrata		X	

† = the only taxon that this could represent is extinct although the Family or genus may still be extinct
‡ = animal extirpated from most or all valleys of southern California
X = taxon is present
[1] Diamond Valley Lake Local Fauna (DVLLF)- Springer et al. 2009, 2010; [2] southern City of Chino Hills- Gust and Scott 2005

APPENDIX C: SENSITIVITY RANKING CRITERIA

PFYC Rank	PFYC Description (BLM 2007)
1	**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.
2	**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.
3b	**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.
3a	**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.
4	**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.
5	**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.