Shoemaker Bridge Replacement Project

Combined Paleontological Identification and Evaluation Report

07-LA-710 PM6.0/6.4

EA: 27300

SCH No. 2016041007

April 2019

CITY OF LONG BEACH PUBLIC WORKS

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Combined Paleontological Identification and Evaluation Report

Shoemaker Bridge Replacement Project

City of Long Beach, Los Angeles County, California
California Department of Transportation District 7
07-LA-710 PM 6.0/6.4
EA: 273000
SCH No. 2016041007

Prepared for:

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ACRONYMS AND ABBREVIATIONS

b.g.s.	below ground surface
Caltrans	California Department of Transportation
CRM	Cultural Resources Management
LA	Los Angeles
LACM	Natural History Museum, Los Angeles County
LARIO	LA River and Rio Honda
MHWL	Mean High Water Level
NB	Northbound
PBDB	Paleobiology Database
PEAR	Preliminary Environmental Analysis Report
PIR/PER	Paleontological Identification and Evaluation Report
PMP	Paleontological Mitigation Plan
PMR	Paleontological Mitigation Report
SB	Southbound
SR	State Route
SER	Standard Environmental Reference
UCMP	University of California Museum of Paleontology
USC	United States Code

INTRODUCTION

The City of Long Beach (City) and the California Department of Transportation (Caltrans) propose to relocate Shoemaker Bridge in the City of Long Beach, Los Angeles County, California.

The Shoemaker Bridge Replacement Project (Project) involves new right-of-way. The Project limits include construction and all proposed work areas. This Paleontological Identification and Evaluation Report (PIR/PER) for the Project was prepared in conformance with the format set forth in Caltrans (2011). The City and Caltrans propose:

1) Replacing the existing Shoemaker Bridge with a new bridge located just south of its present location.
2) Providing improvements to associated roadway connectors to downtown Long Beach and along West Shoreline Drive from State Route 710 (SR-710) and improvements along portions of 3rd, 6th, and 7th Street, and Broadway from Cesar E. Chavez Park to Magnolia Avenue.
3) Removing the Golden Shore grade separation over West Shoreline Drive and providing modifications to Golden Shore to create a new controlled intersection at Golden Shore and West Shoreline Drive.
4) Evaluation of street improvements on 6th and 7th Streets from Magnolia Avenue to Atlantic Avenue and on Anaheim Street between 9th and Atlantic Avenue.

The Project is located at the southern end of SR-710 in the City and is bisected by the Los Angeles River (LA River) (Appendix A, Project Vicinity Map and Study Location Map).

This PIR/PER provides general guidance for developing, and subsequently implementing, paleontological mitigation efforts including minimum proposal requirements, general fieldwork and laboratory methods, and curation considerations. Specifically, it is intended to summarize the Project and the assumed Project footprint, identify the data sources consulted, identify specific geological units and fossils that may be encountered, provide a recommended course of action related to those paleontological resources, and establish the need for the production of a Paleontological Mitigation Plan (PMP) prepared by a Principal Paleontologist (Caltrans, 2012) prior to any ground disturbing activities.

PROJECT LOCATION AND DESCRIPTION

The City, in cooperation with Caltrans, is proposing three alternatives as part of the Project:

Alternative 1 (No Build)

Under the Alternative 1 (No Build), the Project improvements would not be implemented and therefore, no construction activities would occur under this alternative. The existing structure and highway facility would not meet current structural and geometric design standards and thus, safety and connectivity would not be improved within the Project.

Alternative 2

Build Alternative 2 includes the replacement of the ramp structures that connect to the downtown Long Beach roadway system and will evaluate both the roundabout Design Option (Design Option A) and the "Y" interchange design option (Design Option B) at the east end of the proposed bridge. This new bridge consists of multiple structures, with multiple spans that cross the LA River, the northbound (NB) lanes of SR-710, and the LA River and Rio Hondo (LARIO) trail. The new ramps would be located approximately 500 feet (measured from centerline) south of the existing Shoemaker Bridge, which will be re-purposed into a non-motorized recreational public space maintained by the City. The bottom of the new river-spanning structures will exceed the existing 43-foot Mean High Water Level (MHWL).

The deck of the new bridge will accommodate two through ramp lanes in each direction, shoulders, barriers, and a pedestrian/bikeway on the south side of the bridge. Under Design Option B, the bridge will also include two turn lanes in the southbound (SB) direction. On the west side of the LA River, the ramps will connect on the left-hand side of the freeway, at approximately the same merge and diverge locations of the existing ramps. On the east side of the LA River, a roundabout or controlled intersection is provided at the ramp termini. The ramp termini are located at/near the eastern abutment of the river-spanning section of the new Shoemaker Bridge.

Local Streets

As shown previously in Figure 1-3, the Build Alternatives include modifications to nine local streets including West Shoreline Drive, Ocean Boulevard, Golden Shore Street/North Golden Avenue, Broadway Avenue, 3rd Street, 6th Street, 7th Street, 9th Street, 10th Street and Anaheim Street.

Shoreline Drive

At the eastern end of the new bridge, a new roundabout or controlled intersection will be provided to allow access to and from West Shoreline Drive and 7th Street. The existing NB and SB West Shoreline Drive are currently separated by Cesar E. Chavez Park and the SCE Seabright substation. The NB roadbed will be removed and integrated into Cesar E. Chavez Park. The existing SB roadbed, located adjacent to the LA River, will be reconfigured and widened to allow two-way traffic and access from the newly configured West Shoreline Drive to the substation. A new controlled intersection will be introduced on Shoreline Drive at the termini of Broadway Avenue. The loop ramp connector between NB West Shoreline Drive and Ocean Boulevard will be removed and converted into usable park space. The existing Golden Shore Bridge that crosses over West Shoreline Drive will be removed, and a new controlled intersection will be created at West Shoreline Drive and Golden Shore.

3rd Street

The existing 3rd Street alignment curves to the north through Cesar E. Chavez Park and merges onto NB West Shoreline Drive. The proposed realignment of 3rd Street would be revised to end at Golden Avenue, and the section of 3rd Street that curves into the park would be removed and converted into usable park space. The street will continue to be one-way in the westbound direction.

Ocean Boulevard

The loop ramp connecting NB West Shoreline Drive and Ocean Boulevard would be removed and converted into usable park space. The intersection of Ocean Boulevard and Golden Shore would be modified to accommodate two-way traffic on Golden Shore between Ocean Boulevard and West Broadway.

Golden Shore Street/Golden Avenue

Golden Shore Street is currently a two-way street from Queensway Drive to Ocean Boulevard. North of Ocean Boulevard, Golden Shore Street becomes North Golden Avenue and the roadway splits, providing connections to and from NB West Shoreline Drive and Broadway Avenue. The Project will eliminate the existing Golden Shore Bridge over West Shoreline Drive and reconstruct the street at a lower elevation to create a new controlled intersection at West Shoreline Drive. The connector ramps from SB West Shoreline Drive to Golden Shore Street and from NB Golden Shore Street to eastbound (EB) West Shoreline Drive will be removed. The intersection of Golden Shore Street and West Seaside Way will be eliminated. The Project will also eliminate the ramp connection from NB West Shoreline Drive and realign North Golden Avenue to provide connections to and from Broadway Avenue. Access from Broadway to North Golden Avenue will be right in and right out only.

West Seaside Way

West Seaside Way between Golden Shore Street and Queens Way will be reconfigured and the controlled intersection at Golden Shore Street will be eliminated. The street will continue to provide access to parking structures and local office buildings.

Broadway Avenue

The existing terminus of Broadway Avenue is uncontrolled and diverges from the left-hand side of SB West Shoreline Drive. The segment of Broadway Avenue from West Shoreline Drive to Maine Avenue, including its grade separation structure, will be removed. The connection will be replaced by a controlled intersection at West Shoreline Drive and Broadway Avenue. Broadway Avenue will be configured for two-way traffic from West Shoreline Drive to Magnolia Avenue. In the eastbound direction a right turn pocket will be provided on Broadway at the approach to Magnolia Avenue.

6th Street

The existing terminus of 6th Street is uncontrolled and diverges from the right-hand-side of SB West Shoreline Drive, on the Shoemaker Bridge. The existing grade separated structure will be removed and the segment of 6th Street from SB West Shoreline Drive to Golden Avenue will be reconfigured to provide access to the warehouse properties located at Topaz Court and Golden Avenue, and will not provide connectivity to West Shoreline Drive. 6th Street will be converted from one-way westbound to two-way traffic flow between Golden Avenue and Magnolia. Additionally, a new bikeway will extend from the new 6th Street terminus; providing connections to the LA River Trail and the newly proposed Shoemaker Bridge. In addition, a new roadway will extend from the existing 6th Street terminus to provide access to Drake Park. East of Magnolia, the Project will evaluate traffic calming and signal improvements on 6th Street as far east as Atlantic Avenue.

7th Street

The existing terminus of 7th Street is uncontrolled and merges on the right-hand-side of NB West Shoreline Drive, on the Shoemaker Bridge. The segment of 7th Street from Golden Avenue to West Shoreline Drive, including its grade separation structure, will be removed and reconstructed. The connection will be replaced by a roundabout or Y intersection at West Shoreline Drive. 7th Street will be reconfigured from one-way eastbound to two-way traffic between West Shoreline Drive and Magnolia and will feature two lanes in each direction. East of Magnolia, the Project will evaluate traffic calming and signal improvements on 7th Street as far east as Atlantic Avenue.

9th Street

The existing terminus of 9th Street is uncontrolled and merges on the right-hand-side of SB West Shoreline Drive, on the Shoemaker Bridge. The segment of 9th Street from Fashion Avenue to West Shoreline Drive, including its grade separation structure, will be removed. The connection will not be replaced. The Project will also evaluate traffic calming and signal improvements on 9th Street between Caspian Avenue and Anaheim Street.

10th Street

The existing terminus of 10th Street is uncontrolled and diverges from the right-hand-side of NB West Shoreline Drive, on the Shoemaker Bridge. The segment of 10th Street from West Shoreline Drive to Fashion Avenue, including its grade separation structure, will be removed. The connection will not be replaced.

Anaheim Street

The Project will evaluate traffic calming and signal improvements on Anaheim Street between West 9th Street and Atlantic Avenue.

Ramps/Connectors

The new ramps will be operated and maintained by Caltrans. This includes the new Shoemaker Bridge from Design Option A and B east of the LA River, the main span over the River to SR-710, the structure spanning the NB lanes of SR-710, and the roadbed connective to SR-710.

Alternative 3

Similar to Build Alternative 2, Build Alternative 3 includes the replacement of the ramp structures that connect to the downtown Long Beach roadway system and will evaluate both Design Options A and B at the east end of the proposed bridge. In addition, similar to Alternative 2, the bridge under Build Alternative 3 with Design Option B, will also include two turn lanes in the SB direction and on the west side of the river, the ramps will connect on the left-hand side of the freeway, at the same merge and diverge locations of the existing ramps. On the east side of the river, a roundabout or controlled intersection is provided at the ramp termini. The ramp termini are located at/near the eastern abutment of the river-spanning section of the new Shoemaker Bridge. Local street improvements described under Alternative 2, will also apply under Alternative 3. The only difference between Alternatives 2 and 3 is the removal of the existing Shoemaker Bridge. The same ramp/connectors proposed under Alternative 2 will apply under Alternative 3.

Depth of Disturbance

In the area of the proposed new bridge abutments, excavation will be approximately 15 feet below current surface and piles may extend to a depth of 150 feet. In the area between the LA River and Golden Avenue excavation will be approximately zero to five feet below current surface except where existing elevated roadways are being re-profiled or removed (6th Street, 7th Street, and Shoreline Drive), where excavation will be up to 23 feet deep. Between Golden Avenue and Magnolia Avenue excavation will be approximately zero to three feet below current surface except along portions of Broadway, 6th Street, and 7th Street where excavation will be approximately 12 feet below current surface (street re-profiling). East of Magnolia Avenue there will be spot locations within the streets with one to three feet of excavation below the current street surface. On Golden Shore on each side of Shoreline Drive (where the grade separation is being removed) there will be up to 23 feet of excavation below the current surface. In the median of SR-710 where the new Shoemaker Bridge will join the freeway there will be approximately 3 to 8 feet of excavation below the current surface.

PALEONTOLOGICAL RESOURCES AND SENSITIVITY

Significance of Paleontological Resources

Paleontologic resources are the fossilized remains, imprints, or traces of past life preserved in the geologic record. This can include bones, teeth, soft tissues, shells, plant material, microscopic organism, footprints, trackways, and burrows. Fossils are the only record of the history of life on this planet. Despite the frequency of sedimentary rock in the geologic record, and the number of organisms that have lived throughout the planet's history, only a very small number of remains have been preserved in the fossil record. Fossils are important scientific resources, allowing the study of:

- The evolutionary history of extinct organisms, including their lifestyle, interrelationships, distribution, speciation, extinction, and relation to modern groups.
- The taphonomic agents responsible for fossil preservation, including biases in the fossil record.
- Ancient environments in which these organisms lived, and the distribution and change in these environments and their organisms through time.
- The temporal relationships of rock deposits from one area to another, and the timing of geologic events.

According to Caltrans (2011), there are two generally recognized types of paleontological significance:

National- A National Natural Landmark eligible paleontological resource is an area of national significance (as defined under 36 Code of Federal Regulations 62) that contains an outstanding example of fossil evidence of the development of life on earth. This is the only codified definition of paleontological significance.

Scientific- Definitions of a scientifically significant paleontological resource can vary by jurisdictional agency and paleontological practitioner.

Because of the rarity of fossils, and because the organisms the fossils represent usually no longer exist, paleontologic resources are considered non-renewable and are often afforded federal, state, and local protection. Caltrans (2012) uses the following tripartite scale to determine the paleontological sensitivity of a rock unit:

High Potential
Rock units which, based on previous studies, contain or are likely to contain significant vertebrate, significant invertebrate, or significant plant fossils. These units include, but are not limited to, sedimentary formations that contain significant nonrenewable paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. These units may also include some volcanic and low-grade metamorphic rock units. Fossiliferous deposits with very limited geographic extent or an uncommon origin (e.g., tar pits and caves) are given special consideration and ranked as highly sensitive. High sensitivity includes the potential for containing: 1) abundant vertebrate fossils; 2) a few significant fossils (large or small vertebrate, invertebrate, or plant fossils) that may provide new and significant taxonomic, phylogenetic, ecologic, and/or stratigraphic data; 3) areas that may contain datable organic remains older than Recent, including *Neotoma* (sp.) middens; or 4) areas that may contain unique new vertebrate deposits, traces, and/or trackways. Areas with a high potential for containing significant paleontological resources require monitoring and mitigation.

Low Potential
This category includes sedimentary rock units that: 1) are potentially fossiliferous, but have not yielded significant fossils in the past; 2) have not yet yielded fossils, but possess a potential for containing fossil remains; or 3) contain common and/or widespread invertebrate fossils if the taxonomy, phylogeny, and ecology of the species contained in the rock are well understood. Sedimentary rocks expected to contain vertebrate fossils are not placed in this category because vertebrates are generally rare and found in more localized stratum. Rock units designated as low potential generally do not require monitoring and mitigation.

No Potential
Rock units of intrusive igneous origin, most extrusive igneous rocks, and moderately to highly metamorphosed rocks are classified as having no potential for containing significant paleontological resources. For projects encountering only these types of rock units, paleontological resources can generally be eliminated as a concern when the Preliminary Environmental Analysis Report (PEAR) is prepared and no further action taken.

Laws and Regulations

A number of federal and state statutes specifically address paleontological resources, their treatment, and funding for mitigation as a part of federally and state authorized projects:

- 23 United States Code (USC) 1.9(a) requires that the use of federal-aid funds must be in conformity with federal and state law. 23 USC 305 authorizes the appropriation and use of federal highway funds for paleontological salvage as necessary by the highway department of any state.
- 23 USC 305 authorizes funds appropriated by the highway department of any State to be used for paleontological salvage

- Under California law, paleontological resources are protected by the California Environmental Quality Act (CEQA)
- Section 5097.5 of the California Public Resources Code protects historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological sites, or any other archaeological, paleontological, or historical feature that is situated on land owned by, or in the jurisdiction of, the State of California, or any city, county, district, authority, or public corporation, or any agency thereof.

PROJECT SETTING

California is divided into 11 geomorphic provinces, each naturally defined by unique geologic and geomorphic characteristics. The Project is located in the northwestern portion of the Peninsular Ranges geomorphic province. The Peninsular Ranges province is distinguished by northwest trending mountain ranges and valleys following faults branching from the San Andreas Fault. The Peninsular Ranges are bound to the east by the Colorado Desert and extend north to the San Bernardino – Riverside County line (Norris and Webb, 1976), west into the submarine continental shelf, and south to the California state line.
The Project is within the Los Angeles Basin, an actively subsiding basin bound by the Santa Monica and San Gabriel Mountains to the north, the Santa Ana Mountains to the east, and the Palos Verdes Hills to the south (Yerkes, et al., 1965). Rapid deposition of deep sediment fill has resulted from the subsidence (Yerkes et al., 1965; Yeats, 1978), with sediment in the area of Long Beach reaching 14,000 feet in depth (Randell, et al., 1983). This deep sediment fill has also resulted in the accumulation of notable fossil resources (Miller, 1971) and petroleum resources (Bilodeaux, et al., 2007), including the local Long Beach Oil Field. The Project is located in the coastal zone, a heavily altered area of Long Beach, with little natural landscape remaining (Randell, et al., 1983).

PERSONNEL

This report was completed by Benjamin Scherzer, M.S., Paleontologist with Duke Cultural Resources Management (DUKE CRM). Mr. Scherzer has worked in all phases of paleontology (archival research, field survey, excavation, laboratory analysis, construction monitoring) since 2006. Mr. Scherzer is a certified paleontologist for Orange and Riverside Counties and qualifies as a Principal Paleontologist according to the Caltrans Standard Environmental Reference (SER) preparer qualifications (2012). Mr. Scherzer holds a M.S. degree in Earth Sciences with an emphasis in vertebrate paleontology from Montana State University, Bozeman, and a Bachelor of Arts degree in Geosciences and Math from Earlham College, Indiana. Mr. Scherzer has worked throughout southern California, Nevada, South Dakota, Utah, and Wyoming. The report was peer reviewed by DUKE CRM President Curt Duke, M.A, RPA.

RECORDS SEARCH AND LITERATURE REVIEW

Geologic Units

The geology in the vicinity of the Project has been mapped by Saucedo, et al. (2003) at a scale of 1:100,000. A review of this map indicated that the Project is located on four geologic units: artificial fill (*af*), young alluvial fan and valley deposits (Qyf_a), unconsolidated shelf sediment (*Qms*), and old paralic deposits (Qop_s) (Saucedo,et al., 2003) (Appendix A, Geology Map).

Artificial fill (af) (Holocene)

Artificial fill (Holocene epoch: 11,700 years ago to present) is composed of fill resulting from human construction, mining, or quarrying activities (Saucedo, et al., 2003). These deposits underlie the southernmost portion of the Project (south of West Ocean Boulevard) and the southern portion of the Project west of the LA River (south of West 9th Street). Maximum depth of disturbance in these areas is expected to range between 3 and 23 feet b.g.s. Disturbance down to 5 feet b.g.s. will probably only impact the artificial fill at the surface, but deeper excavation has a high likelihood of encountering underlying older, Pleistocene-age deposits (discussed below).

Unconsolidated shelf sediment (Qms) (Holocene)
Unconsolidated shelf sediment (Holocene Epoch) is composed of mostly unconsolidated sand and silt on the continental shelf; within the Project limits, it underlies the modern LA River (Saucedo, et al., 2003).

Young alluvial fan and valley deposits (Qyf$_a$) (late Pleistocene to Holocene)
Young alluvial fan and valley deposits in the Project limits are composed of mostly poorly consolidated and poorly sorted sand (Saucedo, et al., 2003). These deposits are typically Holocene-age at the surface, and transition into older, Pleistocene-age (2. 5 million years to 11,700 years ago) deposits at depth. These deposits underlie the northwest portion of the Project limits (north of W 9th Street and west of Magnolia Avenue) and the central portion of the Project (east of Maine Avenue and north of 5th Street). Depth of disturbance in much of this area is expected to reach as deep as 5 feet b.g.s., which will probably impact only younger, Holocene-age sediment, but at 6th Street and 7th Street, excavation will be up to 23 feet b.g.s., and will likely encounter deeper, late Pleistocene-age deposits.

Old paralic deposits (Qop$_s$) (late to middle Pleistocene)
Old paralic deposits are composed of mostly poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach, estuarine and colluvial deposits of sandstone, now resting on emergent wave cut abrasion platforms (Saucedo, et al., 2003). These deposits underlie the northeastern portion of the Project (east of Magnolia Avenue), a portion of the project north of Shoemaker Bridge underlying Fairbanks Avenue and De Forest Avenue, and the majority of the southeast portion of the Project limits (south of 5th Street and north of West Ocean Boulevard). Maximum depth of disturbance in these areas is expected to reach as deep as 12 feet b.g.s., and would directly impact the old paralic deposits.

Fossil Localities

On January 5, 2016, the Natural History Museum of Los Angeles County (LACM) performed a paleontological records search to locate fossil localities within, and in the vicinity of, the Project limits (Appendix C). This records search produced two fossil localities directly within the Project boundaries, LACM 6896, in the southeastern-most portion of the Project limits near the intersection of Magnolia Avenue and Ocean Boulevard, that produced a specimen of fossil whale, cetacea, from pile driving activities at a depth of less than 100 feet below ground surface (b.g.s.); and LACM 1144, in the northeastern portion of the Project limits near the intersection of Lorna Vista Drive and Crystal Court, that produced fossil specimens of sea lion, *Zalophus*, camel, *Camelops*, and bison, *Bison*, from a depth of less than 48 feet b.g.s. (McLeod, 2016). The records search also produced several unspecified fossil localities in similar deposits near the Project limits (McLeod, 2016).

On March 24, 2017, B. Scherzer performed a search of the online University of California Museum of Paleontology collections (UCMP), the online Paleobiology Database (PBDB), and other published literature for fossil localities from similar deposits nearby (within 5 miles). Holocene deposits are too young to have accumulated and produced fossil material, and are assigned a low sensitivity, so the records searches focused on similar deposits of Pleistocene age. The searches produced two additional nearby fossil localities: San Pedro Bay produced mammoth remains, and Signal Hill produced abundant arthropods and molluscs. Due to the fossiliferous nature of the Pleistocene-age deposits (*Qop$_s$*), they are assigned a high potential. The natural Holocene-age deposits (*Qms*, *Qyf$_a$*) are assigned a low potential, and the Holocene-age artificial fill (*af*) is assigned no potential. However, the Holocene-age deposits may overlie older Pleistocene-age deposits at depth, which would have a high potential; in fact, LACM 6896 (whale) was recovered at depth under current artificial fill, and LACM 1144 (sea lion, camel, and bison) was recovered at depth under young alluvial fan and valley deposits (McLeod, 2016). Therefore, the Holocene-age deposits should be considered to transition into high potential with deep ground disturbing activity (Appendix A, Paleontological Sensitivity Map).

Table 1 - Geologic Units and Their Paleontological Potential

Age	Geologic Unit[1]	Fossils Present	Paleontological Sensitivity[2]
Holocene	Artificial fill (*af*)	None	No Potential
	Unconsolidated shelf sediments (*Qms*)	None	Low Potential
	Young alluvial fan and valley deposits (*Qyf*$_a$)	None	Low Potential
Pleistocene		Whale, sea lion, camel, bison, mammoth, gastropod, mollusc[3]	High Potential
	Old paralic deposits (*Qop*$_s$)		High Potential

[1] Saucedo, et al. (2003)
[2] Caltrans (2012)
[3] McLeod, 2016; PBDB

FIELD SURVEY

Benjamin Scherzer and Sarah Nava conducted an intensive vehicle field survey of the entire Project on April 26, 2017. Nearly all of the area within the Project limits is heavily developed, with abundant houses, businesses, roads, railroads, and industrial areas. In the heavily developed areas, exposed ground only occurred rarely, often as empty lots, and was covered by vegetation. Less heavily developed areas were found adjacent to the LA River, particularly in the area west of Golden Shore and north of West Ocean Boulevard. However, even in these areas, the ground had been disturbed and landscaped, leaving no visible exposed sediment or bedrock. No exposed bedrock or paleontological resources were observed during the field survey.

Figure 1: Empty lot at intersection of East Anaheim Street and Long Beach Boulevard. View to east.

Figure 2: Heavily developed portion of Project between East 6th Street and Locust Avenue. View to west.

RECOMMENDATIONS FOR A PALEONTOLOGICAL MITIGATION PLAN

The Project is anticipated to disturb sediments with high potential to contain scientifically significant, nonrenewable paleontological resources. Portions of the Project are located in areas identified as having high paleontological sensitivity at the surface and at depth. Two LACM fossil localities are documented within the Project boundaries, and several other fossil localities are known nearby from similar sediments. Based on the positive results (previously documented fossil localities in Project limits and high paleontological sensitivity of underlying sediments) of this PIR/PER study, it is recommended that a PMP be prepared and implemented.

PAL-1 Prior to completion of the final design, the City's Resident Engineer shall ensure that a PMP be prepared by a qualified paleontologist. The PMP will detail all the measures to be implemented in the event of paleontological discoveries. It will be prepared by a Principal Paleontologist, following the preparer qualifications of the Caltrans SER (Caltrans, 2012).

PAL-2 Prior to construction, the City's Resident Engineer shall obtain a signed agreement with a repository that meets Caltrans requirements.

PAL-3 Prior to construction, the City's Resident Engineer shall ensure a qualified paleontologist conduct paleontological awareness training for all ground disturbance personnel. This shall include paleontological background, regulations and requirements protecting fossils, monitoring procedures, communication protocols, and a method for documenting training.

PAL-4 During construction, the City's Resident Engineer shall ensure that a qualified paleontologist conducts paleontological monitoring in areas of old paralic deposits and where any ground disturbance may extend below surficial Holocene-age deposits**.**

PAL-5 During and post-construction, the City's Resident Engineer shall ensure that a qualified paleontologist implements field and laboratory methods that meet the requirements of the PMP for monitoring, reporting, collection, and curation of collected specimens.

PAL-6 Upon completion of earthmoving, the City's Resident Engineer shall ensure that a Paleontological Mitigation Report (PMR) discussing findings and analysis will be prepared, following the Caltrans SER, Chapter 8, by a Principal Paleontologist. The report will be included in the environmental project file and also submitted to the curation facility.

CONCLUSIONS

The Project is underlain by multiple geological units, some of which have a high potential to contain scientifically significant paleontological resources based on known fossil collecting localities and information from published paleontological and geological literature. The geologic units with a high potential are the old paralic deposits and deeper elements of the young alluvial fan and valley deposits. Old paralic deposits are present in the northeast portion of the Project limits (east of Magnolia Avenue), north of Shoemaker Bridge underlying Fairbanks Avenue and De Forest Avenue, and the southeast portion of the Project limits (south of east of 5th Street and north of West Ocean Boulevard). These are areas where maximum depth of disturbance is expected to reach as deep as 12 feet b.g.s and could impact undisturbed sediment at depth. Young alluvial fan and valley deposits underlie the northwest portion of the Project (north of West 9th Street and west of Magnolia Avenue) and the central portion of the Project limits (west of Maine Avenue and north of 5th Street). Depth of disturbance in much of this area is expected to reach as deep as 5 feet b.g.s., which will probably not impact Pleistocene-age sediment, but at 6th Street and 7th Street, excavation will be up to 23 feet b.g.s., and will likely encounter high-potential Pleistocene-age deposits. In addition, deposits of artificial fill in the southernmost portion of the Project limits (south of West Ocean Boulevard) and the southern portion of the Project limits west of the LA River (south of West 9th Street) may overlie Pleistocene-age deposits with a high potential as well. Maximum depth of disturbance in these areas is expected to range between 3 and 23 feet b.g.s.; deposits down to 5 feet b.g.s. will probably not impact Pleistocene-age sediment, but deeper excavation has a high likelihood of impacting high-potential Pleistocene-age deposits. Both documented LACM localities within the Project limits occur at depth under low potential Holocene-age sediment, providing evidence of the potential for high potential sediments with deep ground disturbance. The difference between Build Alternative 2 (Design Options A and B) and Build Alternative 3 (Design Options A and B) pertains to the treatment of the existing Shoemaker Bridge, which is not located on the deposits with high paleontological sensitivity. The areas which have a high potential to impact paleontological resources are located under local roads, whose treatment are the same in Build Alternative 2 (Design Options A and B) and Build Alternative 3 (Design Options A and B). As a result, these findings of high paleontological sensitivity apply to both Build Alternative 2 (Design Options A and B) and Build Alternative 3 (Design Options A and B).

In order to minimize impacts to potentially fossiliferous deposits, a PMP, following the Caltrans SER, Chapter 8, should be prepared by a Principal Paleontologist and include the following elements:

1) Mandatory preconstruction paleontological sensitivity training for earthmoving personnel.
2) Monitoring of any ground disturbance in old paralic deposits and deep ground disturbance that may reach past surficial Holocene-age deposits.
3) A signed repository agreement.
4) Field and laboratory methods proposed and consistent with repository requirements.
5) Required PMR upon completion of Project earthmoving.

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Yerkes, R. F.; McCulloh, T. H.; Schoellhamer, J. E.; and J.G. Vedder
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Appendix A

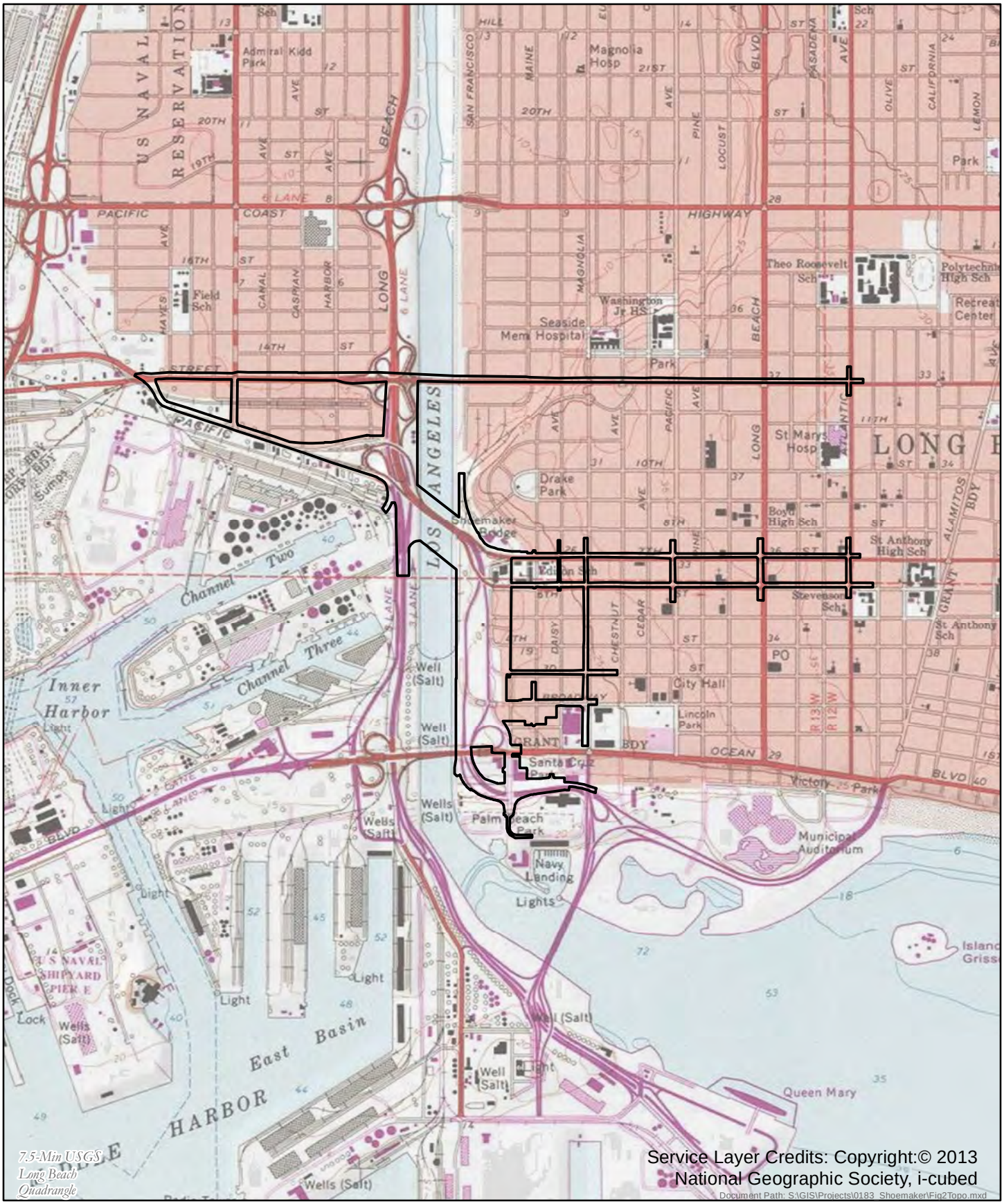
Project Maps

Map 1- Project Vicinity

Shoemaker Bridge Replacement Project
07-LA-710 PM 6.0/6.4
EA 27300/EFIS 0700021122
SCH No. 2016041007
City of Long Beach

0 20 40 Miles N

1 inch = 18 miles 1:1,150,000



Map 2- Project Location

Shoemaker Bridge Replacement Project
07-LA-710 PM 6.0/6.4
EA 27300/EFIS 0700021122
SCH No. 2016041007
City of Long Beach

Direct APE

0 2,000 4,000 Feet

1 inch = 2,000 feet 1:24,000

N

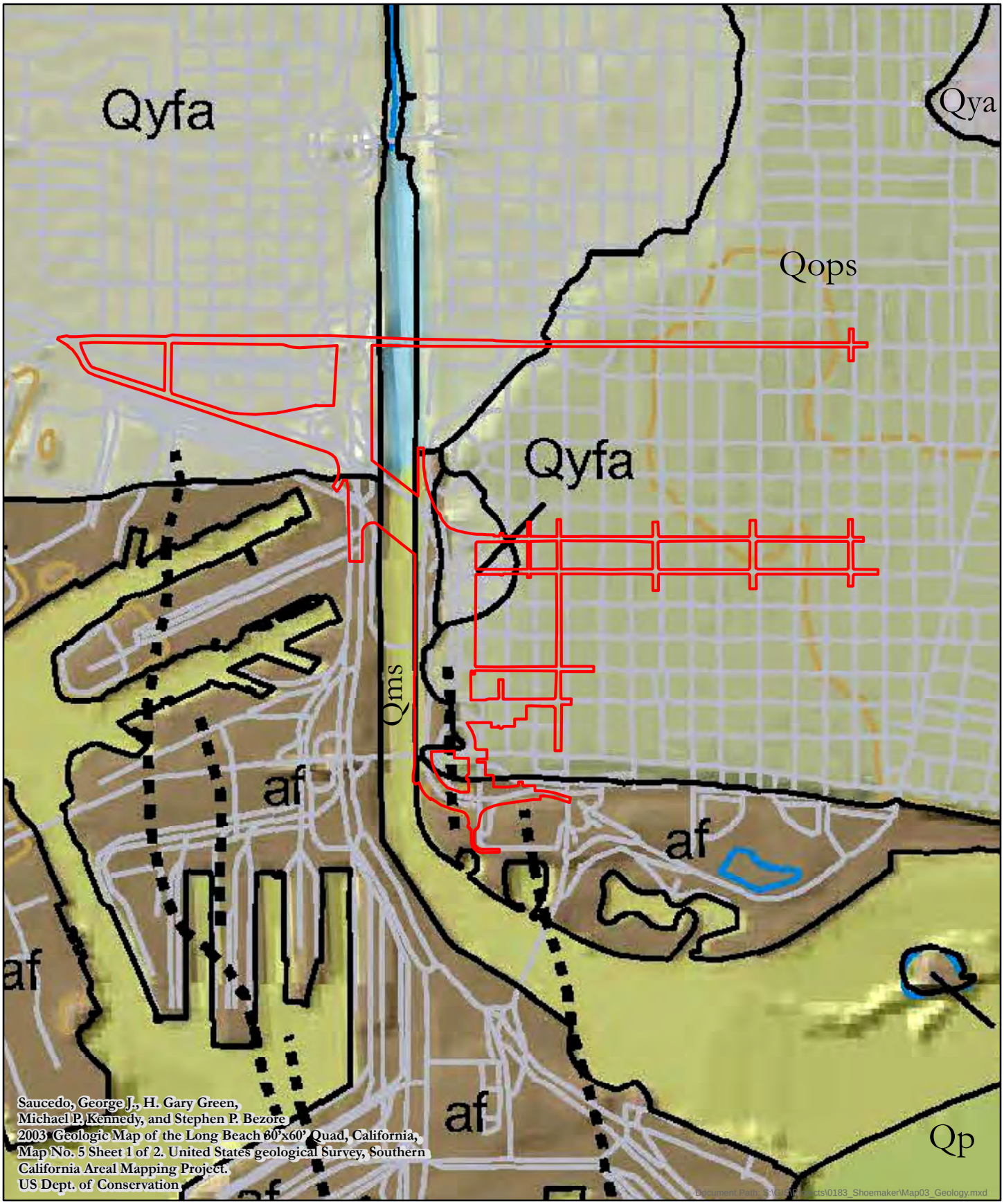
Map 3: Study Aerial Map
Shoemaker Bridge Replacement Project
07-LA-710 PM 6.0/6.4
EA 27300/EFIS 0700021122
SCH No. 2016041007

Project Area

0 1,500 3,000 Feet

1 inch = 2,000 feet 1:24,000

N



Map 4- Geology

Shoemaker Bridge Replacement Project
07-LA-710 PM 6.0/6.4
EA 27300/EFIS 0700021122
SCH No. 2016041007
City of Long Beach

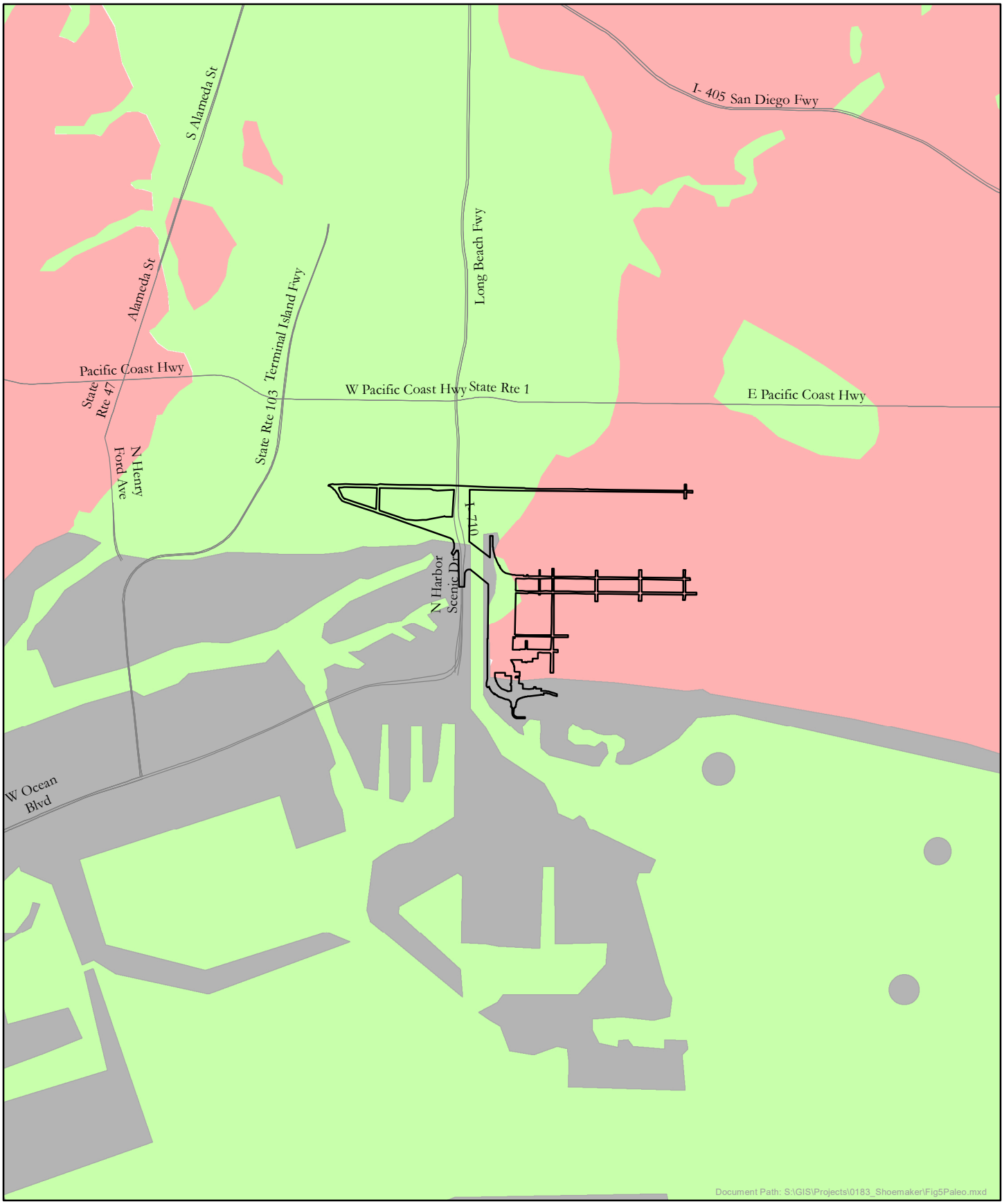
- Direct APE
- af – Artificial fill
- Qops – Pleistocene, Old paralic deposits, undivided, silt
- Qyfa – Holocene, Young alluvial fan and valley deposits, sand
- Qms – Holocene, Unconsolidated shelf sediment
- Qya – Holocene, Young alluvial flood plain deposits
- Qp – Pleistocene, sedimentary deposits, undivided

0 900 1,800 Feet

1 inch = 1,800 feet

1:21,600

N



Map 5- Paleontological Sensitivity

Shoemaker Bridge Replacement Project
07-LA-710 PM 6.0/6.4
EA 27300/EFIS 0700021122
SCH No. 2016041007
City of Long Beach

Project
Low Potential at Depth
High Potential at Depth
No Sensitivity

0 2,000 4,000 Feet
1 inch = 4,000 feet
1:48,000
N

Appendix B

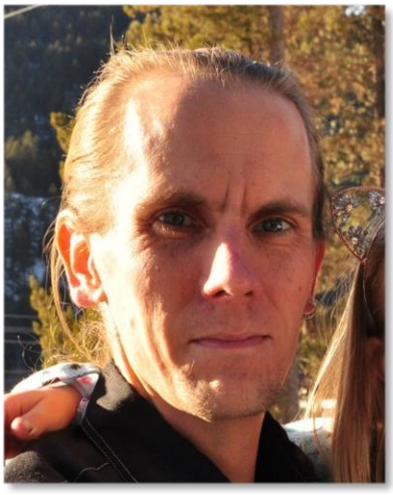
Resumes

DUKE CRM

18 Technology Dr., Ste. 103
Irvine, CA 92618
949-356-6660
www.dukecrm.com

Benjamin Scherzer

Paleontologist



Expertise

Paleontological Resources Management
Fossil excavation
Fossil preparation
Stratigraphy
Natural gas mudlogging
Directional drilling

Education

M.S., Earth Science, 2008, MSU, Bozeman, MT
B.A., Geology/Math, 2002, Earlham College, IN

Professional Registrations

Paleontologist, County of Orange
Paleontologist, County of Riverside

Professional Memberships

Society of Vertebrate Paleontology
Geological Society of America
Society for Sedimentary Geology
American Association of Petroleum Geologists, Pacific Section
South Coast Geological Society
Western Association of Vertebrate Paleontologists

Professional Experience

Paleontologist, DUKE CRM, 2014 to present.
Paleontologist, L&L Environmental, 2017 to 2018.
Stratigrapher, Archeological Resource Management Corporation, 2015 to 2018.
Paleontological Specialist II, San Diego Natural History Museum, 2013 to 2018.
Paleontological Specialist II, SWCA Environmental Consultants (Pasadena), 2012 to 2015.
Paleontologist, SWCA Environmental Consultants (Vernal, UT), 2011 to 2012.
Fossil Preparator, Carter County Museum, 2010 to 2011.
Physical Science Technician, Badlands National Park, 2010.
Mudlogger/Geologist, Pason Systems USA, 2006 to 2009.
Paleontological Field Assistant, ARCADIS US, 2006 to 2007.

Selected Project Experience

Marywood Residential, Orange, 2016-2017. Role: Paleontologist. Mr. Scherzer was responsible for training paleontological field monitors and provided direct paleontological monitoring as well. Mr. Scherzer also analyzed collected fossil material, produced the Paleontological Monitoring Report, and presented on the paleontological results at a national scientific conferences. Employer: DUKECRM.

Vila Borba, Chino Hills, 2014-present. Role: Paleontologist. Mr. Scherzer was responsible for training and overseeing paleontological field monitors and provided direct paleontological monitoring as well. Mr. Scherzer also analyzed collected fossil material, produced the paleontological portion of the Final Monitoring Report, and presented on the paleontological results at two national scientific conferences. Mr. Scherzer also provided faunal and lithic analysis for archeological field excavation. Employer: DUKECRM.

Skyridge Residential, Mission Viejo, 2014-present. Role: Paleontologist. Mr. Scherzer was responsible for training paleontological field monitors and provided direct paleontological monitoring as well. Mr. Scherzer led a six-person excavation of a whale fossil excavation over the course of ten days, which involved communication with third-party paleontologists and local museums. Mr. Scherzer also analyzed the collected fossil material, conducted a field survey of the site, conducted associated geologic field surveys, and presented the results of the paleontological mitigation at a national scientific conference. Mr. Scherzer also assisted with archeological field excavation and composed the natural setting summary. Employer: DUKECRM.

San Jacinto General Plan and Update, 2019-present. Mr. Scherzer produced the paleontological portion of the general plan. Employer: DUKECRM.

Sweeny Road, Lompoc, 2018-present. Mr. Scherzer assisted in producing the proposal for a commercial building development. Employer: DUKECRM.

Lake Forest Civic Center, Lake Forest, 2018-present. Mr. Scherzer was responsible for training and overseeing multiple fossil preparators for several dozen large fossil marine mammal and fish specimens. Employer: DUKECRM.

Atlanta Avenue Widening, Huntington Beach, 2018-present. Mr. Scherzer produced the Paleontological Resource Impact Mitigation Program. Employer: DUKECRM.

I-5 Widening, Aliso Creek, 2018-present. Mr. Scherzer produced the Supplemental Paleontological Identification and Evaluation Report. Employer: DUKECRM.

Jack Rabbit Trail- SCS2089, 2018-present. Mr. Scherzer produced the Paleontological Resource Impact Mitigation Program. Employer: DUKECRM.

Sierra Crest II, Fontana, 2018. Mr. Scherzer oversaw paleontological field monitoring and produced the final monitoring report. Employer: DUKECRM.

Diamond Valley Estates LLC, Hemet, 2017-present. Mr. Scherzer produced the Paleontological Resource Assessments. Employer: DUKECRM.

Union St Two-Way Protected Bikeway, 2018-2019. Mr. Scherzer drafted the Paleontological Identification and Evaluation Report. Employer: DUKECRM.

Vanderham Monitoring, Jurupa Valley, 2017-2018. Mr. Scherzer oversaw field paleontological monitoring and led the excavation of fossil camelid remains. Employer: DUKECRM.

Ave S-8 and 40th St Roundabout, Palmdale, 2017-present. Mr. Scherzer oversaw production of the HPSR, ASR, and PIR/PER. Employer: DUKECRM.

Gold Flora Farms, Desert Hot Springs, 2017-present. Mr. Scherzer contributed to the Combined Archeological and Paleontological Mitigation Plan and oversaw field paleontological monitoring. Employer: DUKECRM.

I-5 HOV Truck Lanes, Santa Clarita, 2017-2018. Mr. Scherzer produced the Paleontological Mitigation Report. Employer: DUKECRM.

Brasada Homes, San Dimas, 2017-2018. Mr. Scherzer provided paleontological monitoring for mass grading for housing development. Employer: L&L Environmental.

Apple Valley TTM, Apple Valley 2017-present. Mr. Scherzer produced the Paleontological Technical Report. Employer: DUKECRM.

Golden Avenue Bridge Replacement and Rehabilitation Project, Placentia, 2017-2018. Mr. Scherzer produced the Paleontological Identification and Evaluation Report. Employer: DUKECRM.

Indus Light Industrial Building Project, Chino Hills, 2017-2018. Mr. Scherzer produced the Paleontological Resources Monitoring Impact Report and oversaw paleontological field monitoring. Employer: DUKECRM.

Murrieta's Hospitality Commons, Murrieta, 2017-present. Mr. Scherzer produced the Paleontological Resources Monitoring Plan and oversaw field paleontological monitoring. Employer: DUKECRM.

6th Street Viaduct, Los Angeles, 2017-present. Mr. Scherzer oversaw field paleontological monitoring, and provided paleontological and archeological field monitoring for trenching and drillings for viaduct construction. Employer: DUKECRM.

Soto Street Widening Project, Los Angeles, 2017-present. Mr. Scherzer contributed to the Cultural and Paleontological Resource Assessment. Employer: DUKECRM.

SR-110 Improvement Project, Los Angeles, 2017-present. Mr. Scherzer produced the Paleontological Memo. Employer: DUKECRM.

Oak Parc Project, Moreno Valley, 2017. Mr. Scherzer was the field paleontologist for mass grading for housing development. Employer: San Diego Natural History Museum.

Santa Paula East Area 1, Santa Paula, 2017. Mr. Scherzer was the field paleontologist for mass grading for housing development. Employer: San Diego Natural History Museum.

Diamond Valley, Hemet, 2017-2018. Mr. Scherzer produced the Paleontological Resource Analysis. Employer: DUKECRM.

SBCTA On-Call, Rialto, 2017-2018. Mr. Scherzer was a field monitor for excavation and grading for construction of highway entrance and exit ramps. Employer: DUKECRM.

Rite Aid, Phelan, 2017-present. Mr. Scherzer was a paleontological and archeological field monitor for trenching for commercial development. Employer: DUKECRM.

I-15 TEL, Riverside and San Bernardino Counties, 2017-2018. Mr. Scherzer produced the Paleontological Mitigation Plan. Employer: DUKECRM.

Lewis Street, Anaheim, 2017. Role: Paleontologist. Mr. Scherzer produced the Paleontological Resource Impact Mitigation Program. Employer: DUKECRM.

The Crossings, Chino Hills, 2016-present. Role: Paleontologist. Mr. Scherzer was a paleontological field monitor for mass grading and trenching for residential housing development. Employer: DUKECRM.

Fairfield Ranch, Chino Hills, 2016-present. Role: Paleontologist. Mr. Scherzer was an archeological and paleontological field monitor for mass grading for commercial development, analyzed the collected archeological and fossil material, and produced the Archeological and Paleontological Monitoring Report. Employer: DUKECRM.

Reata Glen, Mission Viejo, 2016-2018. Role: Stratigrapher. Mr. Scherzer measured the stratigraphy exposed in excavation and mass grading for housing development, and assisted as a paleontological field monitor. Employer: Archeological Resource Management Corporation.

Los Patrones Parkway, Mission Viejo, 2016-2018. Role: Stratigrapher. Mr. Scherzer measured the stratigraphy exposed in roadway mass grading. Employer: Archeological Resource Management Corporation.

Greenville-Banning Channel, Costa Mesa, 2016-2017. Role: Paleontologist. Mr. Scherzer produced the paleontological portion of the Mitigation Procedures, performed a field survey of the project area, and produced the field survey results. Employer: DUKE CRM.

Trumark-Higgins Ranch, Chino Hills, 2015-present. Role: Paleontologist. Mr. Scherzer produced the Paleontological Resource Impact Mitigation Program, led paleontological training of workers, and provided paleontological field monitoring. Employer: DUKE CRM

Rancho Mission Viejo, Mission Viejo, 2015-2018. Role: Stratigrapher. Mr. Scherzer measured the stratigraphy exposed in the excavation of Area 2.3, and assisted as a paleontological field monitor. Employer: Archeological Resource Management Corporation.

Santa Margarita Water District Tesoro Reservoirs, Mission Viejo, Mission Viejo, 2015. Role: Stratigrapher. Mr. Scherzer mapped the stratigraphy exposed in the excavation for water reservoirs and produced the stratigraphic section for the final report. Employer: Archeological Resource Management Corporation.

Lakeside Temescal Valley, Temescal Valley, 2014-present. Role: Paleontologist. Mr. Scherzer produced the Paleontological Resource Assessment and was the geological advisor for cultural resource excavation. Employer: DUKE CRM.

Serrano Ridge, Temescal Valley, 2014. Role: Paleontologist. Mr. Scherzer produced the Paleontological Resource Impact Mitigation Program, led paleontological training of workers, was field monitor during mass excavation, and produced the Paleontological Monitoring Report.. Employer: DUKE CRM.

RP-1 Outfall Relocation, Ontario, 2014. Role: Paleontologist. Mr. Scherzer led paleontological training of workers, was the field monitor for mass excavation, and produced the paleontological monitoring results. Employer: DUKE CRM.

Lago Los Serranos, Chino Hills, 2014-present. Role: Paleontologist. Mr. Scherzer was the paleontological field monitor for excavation and mass grading and produced the Final Monitoring Report. Employer: DUKE CRM.

Baker WTP, Lake Forest, 2014. Role: Paleontologist. Mr. Scherzer was a paleontological field monitor for water treatment plant excavation and trained paleontological field monitors. Employer: DUKE CRM.

Highgrove, TTM 28957, Highgrove, 2015. Role: Paleontologist. Mr. Scherzer produced the Paleontological Resource Assessment. Employer: DUKE CRM.

Rice Avenue / 5th Street Grade Separation Project, Oxnard, 2015. Role: Paleontologist. Mr. Scherzer produced the Paleontological Identification Report. Employer: DUKE CRM.

California Street Off-ramp Relocation, Ventura, 2014-present. Role: Paleontologist. Mr. Scherzer produced the Paleontological Identification Report. Employer: DUKE CRM.

Forest Boundary, Temescal Valley, 2014. Role: Paleontologist. Mr. Scherzer produced the Paleontological Resource Assessment. Employer: DUKE CRM.

Proposed State Route 60/Interstate 605 (SR-60/I-605) Interchange Improvement. 2014. Role: Paleontologist. Mr. Scherzer conducted a field survey and produced the Paleontological Identification Report. Employer: DUKE CRM.

Willow Heights, Diamond Bar, 2014. Role: Paleontologist. Mr. Scherzer was a paleontological field monitor for mass excavation. Employer: San Diego Natural History Museum.

Thomas Ranch, Norco, 2014. Role: Project Paleontologist. Mr. Scherzer was the paleontological field monitor for water line excavation. Employer: DUKE CRM.

Sol y Mar, Ranchos Palos Verdes, 2013-2014. Role: Paleontologist. Mr. Scherzer was a paleontological field monitor for excavation and mass grading. Employer: San Diego Natural History Museum.

Mojave Solar Power, Hinkley, 2013. Role: Field Paleontologist. Mr. Scherzer was a paleontological field monitor for solar field construction. Employer: SWCA Environmental Consultants

Rio Grande and Columbia 3, Rosamond, 2013. Role: Field Paleontologist. Mr. Scherzer was a paleontological field monitor for solar field construction. Employer: SWCA Environmental Consultants

Victor Phelan, Phelan, 2014. Role: Field Paleontologist. Mr. Scherzer was a paleontological field monitor for tie line vault pit excavation and conduit trenching and excavation. Employer: SWCA Environmental Consultants.

Genesis Solar Energy, Blythe, 2012-2013. Role: Field Paleontologist. Mr. Scherzer was a paleontological field monitor for solar field construction and transmission line installation. Employer: SWCA Environmental Consultants.

Blackstone, Brea, 2012. Role: Field Paleontologist. Mr. Scherzer was the paleontological field monitor for water reservoir excavation. Employer: SWCA Environmental Consultants.

SR-79 Widening, Winchester, 2012. Role: Field Paleontologist. Mr. Scherzer monitored right-of-way clearing, water line excavation, cultural resource trenching, and mass excavation and grading for Phase I highway widening. Employer: SWCA Environmental Consultants.

ON Line Transmission, Las Vegas, NV, 2012. Role: Field Paleontologist. Mr. Scherzer was a paleontological field monitor for solar field construction and transmission line installation. Employer: SWCA Environmental Consultants.

Anadarko Uintah Basin Midstream and Paleo, Uintah County, UT, 2011-2012. Role: Field Paleontologist. Mr. Scherzer was a paleontological field monitor for right-of-way clearing, pipeline trenching, well pad construction and expansion, and pre-construction fossil surveys. Employer: SWCA Environmental Consultants.

Newfield Paleontological and Archeological Services, Duchesne County, UT. 2011-2012. Role: Field Paleontologist. Mr. Scherzer conducted pre-construction fossil surveys. Employer: SWCA Environmental Consultants

Other Projects
Vantage Point, 2018-present
Tina-Pacific Neighborhood DP, 2018-present
Canyon Hills, 2018
Majestic, 2018
Ocean Place, Seal Beach, 2018-present
Continental Villages, Moreno Valley, 2018-present
6th Street Viaduct Mission-Myers Roundabout, Los Angeles, 2018-present
McMillan, Corona, 2018-present
Malibu PCH, Ventura County, 2017
Lugonia Groves TTM, Redlands, 2017
Cactus Basin, Rialto, 2017
Pleasant Valley Turn Lanes, Oxnard, 2017
Pauba Road & Cumorah Court Project, Temecula, 2017
National Trails Highway (APN 0467-101-12), Helendale, 2017
La Mirada Creek Park, La Mirada, 2017
Laguna Canyon Road, Orange County, 2017
Rancho Belago, Moreno Valley, 2017
Asuza Greens, Asuza, 2017
Bay Bridge, Newport Beach, 2017
Blackstar Financial, Desert Hot Springs, 2017
Camp Pendleton, San Diego County, 2017
East Lake Specific Plan, Lake Elsinore, 2017
Highgrove, Highgrove, 2016
Rancho Mirage Resignaling, Rancho Mirage, 2016
RUSD Transportation CNG, Rialto, 2016
San Jacinto Downtown SP, San Jacinto, 2016
Sycamore-Penasquitos, San Diego County, 2016
Tracy Hills, Tracy, 2016
Vantage Point Church, Corona, 2016
Space Center Mira Loma, Mira Loma, 2015-present.
Blythe Solar Project, Blythe, 2015
Quarry Creek, Oceanside, 2015
1-5 HOV Lane Extension, Dana Point – San Clemente, 2015
Rancho Mirage Resignaling, Rancho Mirage, 2015-present
Rite Aid, Corona, 2015-present
Jefferson Street, Riverside, 2015
Sycamore to Peñasquitos 230 kV Transmission Line, San Diego, 2015
Evanston Inn, Pasadena, 2015
Village of Terrassa, Corona, 2015
Tracy Hills Specific Plan, Tracy, 2015-present
New Model Colony East Storm Drains, Ontario, 2014
Olive View Medical Center, Sylmar, 2014
Serrano Summit, Lake Forest, 2014
Santa Rosa Road Widening, Camarillo, 2014-present
Rialto Unified School District: Compressed Natural Gas and Transportation Yard, Rialto, 2014-2017
Wyle Lab Property, Norco, 2014-2017
Worsch Way, San Diego, 2014
Pacific Highlands, San Diego, 2014
SDCWA Pipeline, San Marcos, 2014
SDG&E On-call, Carlsbad, 2014

TL694A, Vista, 2014
Solar Star, Lancaster, 2014
Alameda Corridor East, San Gabriel, 2013
Birch Hills, Brea, 2014
PG&E Line 109, San Francisco, 2012
Gasco Environmental Services, Uintah County, UT, 2012
Seep Ridge Road Mining, Duchesne County, UT, 2012
Central Basin Paleontological Block Survey, Duchesne County, UT, 2011

Publication and Professional Papers

Scherzer, B. 2017. A possible physeteroid (cetacea: odontoceti) from the Yorba member of the Puente Formation, Orange County, California: Western Association of Vertebrate Paleontology Annual Meeting: Program with Abstracts, PaleoBios, v. 34 (supplemental), p. 11.

Scherzer, B. 2016. An archaic baleen whale (Cetacea: Mysticeti) from the Vaqueros Formation, and other fossil material from the Skyridge Project, Orange County, California: 76th Annual Meeting, Society of Vertebrate Paleontology, abstracts of papers, Journal of Vertebrate Paleontology.

Scherzer, B. 2015. Miocene teleost fish from Chino Hills: preliminary results from the Vila Borba Project, San Bernardino County, California: 2015 Pacific Section AAPG, Joint Annual Meeting, May 3-5, 2015, Oxnard, CA.

Scherzer, B. 2015. Miocene teleost fish from Chino Hills: preliminary results from the Vila Borba Project, San Bernardino County, California: Western Association of Vertebrate Paleontology Annual Meeting, PaleoBios, v. 32, no. 1, p. 4.

Scherzer, B., and R. Benton. 2011. An evaluation of sixteen years of paleontological visitor site reports in Badlands National Park, South Dakota: Proceedings of the 9th Conference on Fossil Resources, Brigham Young University Geology Studies, v. 49(A), p. 31.

Scherzer, B.A. 2010. Italy and Taphonomy: A.P.P.I., vol. 2, no. 3, p. 9.

Scherzer, B. A., and D. J. Varricchio. 2010. Taphonomy of a juvenile lambeosaurine bonebed from the Two Medicine Formation (Campanian) of Montana: PALAIOS, v. 25, p. 780-795.

Scherzer, B., and D. Varricchio. 2008. A debris flow-hosted bonebed of juvenile lambeosaurines in the Two Medicine Formation of Montana: 68th Annual Meeting, Society of Vertebrate Paleontology, abstracts of papers, Journal of Vertebrate Paleontology, v. 28, no. 3, p. 137A.

Hannibal, J. T., Scherzer, B. A., and Saja, D. B. 2007. The Euclid Bluestone of northeastern Ohio: quarrying history, petrology, and sedimentology, in Shaffer, N. R., and DeChurch, D. A., eds., Proceedings of the 40th Forum on the Geology of Industrial Minerals, May 2–7, 2004, Bloomington, Indiana: Indiana Geological Survey Occasional Paper 67, p. 70-81.

Scherzer, B. 2006. Taphonomy of the Sun River Bonebed: Second Annual Earth Science Student Colloquium, Montana State University, Bozeman, MT.

Scherzer, B., and D. Varricchio. 2005. Taphonomy of a juvenile lambeosaur bonebed in the Two Medicine Formation of Montana: 65th annual meeting, Society of Vertebrate Paleontology; abstracts of papers, Journal of Vertebrate Paleontology, v. 25, no. 3, p. 110A.

Varricchio, D., Jackson, F., Scherzer, B., and J. Shelton. 2005. Don't have a cow man! It's only actualistic taphonomy on the Yellowstone River of Montana: 65th annual meeting, Society of Vertebrate Paleontology; abstracts of papers, Journal of Vertebrate Paleontology, v. 25, no. 3, p. 126A.

Hannibal, J. T., B. A. Scherzer, and D. B. Saja. 2004. The Euclid bluestone of northeastern Ohio: quarrying history, petrology, and sedimentology: 40th Forum on the Geology of Industrial Minerals, Program with Abstracts, p. 35.

Appendix C

LACM Paleontological Records Search Results

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