

Appendix G-2



**PALEONTOLOGICAL TECHNICAL STUDY:
CALATLANTIC HOMES
RANCHO LA HABRA – LA HABRA PROJECT
CITY OF LA HABRA, ORANGE COUNTY, CALIFORNIA**

Prepared for:

CARLSON STRATEGIC LAND SOLUTIONS

Peter K. Carlson, President
27134A Paseo Espada, Suite 323
San Juan Capistrano, CA 92675

CC:

CALATLANTIC HOMES

15360 Barranca Parkway
Irvine, CA 92618

Prepared by:

PALEO SOLUTIONS, INC.

911 S. Primrose Ave., Unit N
Monrovia, CA 91016
geraldine@paleosolutions.com
(562) 818-7713

Geraldine Aron – Principal Investigator

Courtney Richards – Report Author

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1.0 EXECUTIVE SUMMARY

This report presents the results of the paleontological technical study conducted by Paleo Solutions, Inc. (Paleo Solutions) for Carlson Strategic Land Solutions (SLS) for the Rancho La Habra – La Habra Project (Project) being proposed by CalAtlantic Homes. This work was required by the City of La Habra to meet their requirements as the lead agency under the California Environmental Quality Act (CEQA). All paleontological work was completed in compliance with CEQA and Orange County guidelines.

The Project site is located on 151 acres in the City of La Habra within the northern portion of Orange County. Specifically, it is located on the Westridge Golf Course, which is east of Beach Boulevard, west of Idaho Street, and south of Imperial Highway, in the City of La Habra, Orange County, California. CalAtlantic Homes is proposing to construct a community consisting of four new residential neighborhoods linked by trails, sidewalks, and private open space areas. It would include a maximum of 422 homes, including 277 single-family homes and 145 multi-family residences, either 20,000 square feet of retail and restaurant uses or an additional 49 multi-family dwelling units. Construction would involve grading, detention basin excavation, landscaping, and infrastructure improvements such as storm drains, water, sewer, and streets.

The paleontological study for the Rancho La Habra – La Habra Project included a geologic map review, literature search, institutional records search, reconnaissance survey, and analysis of the paleontological potential of geologic units within the Project site. Geologic mapping of the Project site indicates that the site is primarily underlain by Quaternary (Holocene) alluvium and early Pleistocene San Pedro Formation with minor exposures of Pleistocene La Habra Formation. According to the records searches, one previously recorded fossil locality from the San Pedro Formation was within, or immediately adjacent to the Project site. Additionally, numerous fossil resources are recorded from the La Habra Formation within the City of La Habra and surrounding areas. Vertebrate fossils and shells have also been recorded from the San Pedro Formation in Orange and Los Angeles counties. In addition, three new localities containing fossilized shell were observed in the San Pedro Formation during the paleontological reconnaissance survey. While the newly recorded localities were ultimately determined to be non-significant, they demonstrate that the sediments within the Project site are conducive to fossil preservation. Based on the results of this paleontological technical study, both the La Habra and San Pedro Formations are considered to have high potential to produce significant paleontological resources. Quaternary alluvium has a low potential to contain paleontological resources at the surface and a moderate/unknown potential at depths greater than five feet.

Due to the high and moderate/unknown paleontological potential of geologic units within the Project site, mitigation of potential adverse impacts resulting from construction-related ground disturbance is recommended. Full-time monitoring is recommended during all earthmoving activities impacting native sediments of the La Habra and San Pedro Formations. Additionally, periodic paleontological spot checks should be conducted when excavation exceeds depths of five feet into areas mapped as Quaternary alluvium to determine if older, paleontologically sensitive sediments are present. If present, monitoring should be implemented. Prior to the start of construction a paleontological resources monitoring plan should be prepared and implemented. The plan should include specific locations and construction activities requiring monitoring, procedures to follow for monitoring and fossil discovery, and a curation agreement with the John D. Cooper Archaeology and Paleontology Center.

TABLE 1. CALATLANTIC HOMES RANCHO LA HABRA– LA HABRA PROJECT SUMMARY

Project Name	CalAtlantic Homes Rancho La Habra – La Habra Project					
Project Description	CalAtlantic Homes is proposing to construct a community consisting of four new residential neighborhoods linked by trails, sidewalks, and private open space areas. It would include a maximum of 422 homes, including 277 single-family homes and 145 multi-family residence, either a maximum of 20,000 square feet of retail and restaurant uses or 49 multi-family dwelling units. Construction would involve grading, detention basin excavation, landscaping, and infrastructure improvements such as storm drains, water, sewer, and streets.					
Project Area	The Project site is located in the City of La Habra within the northern portion of Orange County. Specifically, it is located on the Westridge Golf Course, which is east of Beach Boulevard, west of Idaho Street, and south of Imperial Highway, in the City of La Habra, Orange County, California.					
Total Acreage	~151 acres					
Location (PLSS) and Land Owner	Quarter-Quarter	Section	Township	Range	Land Ownership	
	Unsectioned	NA	NA	NA	Private	
Topographic Map(s)	USGS La Habra 7.5'					
Geologic Map(s)	Geologic map of the Whittier and La Habra quadrangles, CA (Dibblee and Ehrenspeck, 2001)					
Mapped Geologic Formation(s) and Age	Formation & Map Symbol	Age		Paleontological Sensitivity		
	Quaternary alluvium (Qa)	Holocene		Low		
	La Habra Formation (Qlh)	Pleistocene		High		
	San Pedro Formation (Qsp)	Pleistocene		High		
Surveyor(s)	Barbara Webster					
Date Surveyed	April 15, 2015					
Formations Surveyed	Quaternary alluvium, La Habra Formation, San Pedro Formation					
Previously Documented Fossil Localities	Locality LACM 3861 produced a specimen of fossil diving duck, <i>Chendytes milleri</i> , within, or immediately adjacent to the southeastern site boundary from the San Pedro Formation.					
Paleontological Results	Three new fossil localities were recorded in the San Pedro Formation during the paleontological survey (20150415BJW.01, 20150415BJW.02, and 201500415BJW.03). Localities 20150415BJW.01 and 20150415BJW.02 consisted of isolated bivalve shell fragments found as float. Locality 20150415BJW.03 consisted of shells embedded in an ex-situ boulder used in the construction of a man made dam. Localities determined to be non-significant due to the fact that the fossils had been transported from the original location of deposition and thus lacked critical provenance information. Additionally, the fossil shells were generally poorly preserved, making identifications to a low taxonomic order, such as genus or species, unlikely. No fossils were collected.					
Disposition of Fossils	Not applicable; no fossils collected.					
Recommendation(s)	It is recommended that full-time monitoring be performed during all earthmoving activities impacting native sediments of the La Habra and San Pedro Formations. Additionally, periodic paleontological spot checks should be conducted when excavation exceeds depths of five feet into areas mapped as Quaternary alluvium to determine if older, paleontologically sensitive sediments are present. If present, monitoring should be implemented. Prior to the start of construction a paleontological resources monitoring plan should be prepared and implemented. The plan should include specific locations and construction activities requiring monitoring, procedures to follow for monitoring and fossil discovery, and a curation agreement with the John D. Cooper Archaeology and Paleontology Center.					

2.0 INTRODUCTION

This report presents the results of the paleontological technical study conducted by Paleo Solutions for SLS for the Rancho La Habra – La Habra Project being proposed by CalAtlantic Homes. All work was completed in compliance with CEQA and Orange County guidelines.

2.1 PROJECT LOCATION

2.1.1 Regional Location

The Project site is located in the City of La Habra within the northern portion of Orange County (Figure 1). The City of Fullerton is located to the south and the City of La Mirada, within Los Angeles County, is located to the west. Major cross-streets include Beach Boulevard to the west and Imperial Highway to the north. Beach Boulevard provides regional access to Interstate 5, approximately 4.5 miles to the south. Imperial Highway also provides regional access to State Route 57, approximately 5 miles to the east.

2.1.2 Project Vicinity

The Project site is located east of Beach Boulevard, west of Idaho Street, and south of Imperial Highway, in the City of La Habra, Orange County, California. The street address for the Westridge Golf Course is 1400 South La Habra Hills Drive, La Habra, CA. Direct access to the Westridge Golf Course property is from La Habra Hills Drive (Figure 2).

2.2 PROJECT DESCRIPTION

CalAtlantic Homes (applicant) proposes to construct on the approximately 151-acre Westridge Golf Course property in the City of La Habra, 422 homes, including 277 single-family homes and 145 multi-family residences, either a maximum of 20,000 square feet of retail and restaurant uses or an additional 49 multi-family dwelling units adjacent to Beach Boulevard and the existing Westridge Plaza, and open space, trails, and public parks.

The proposed community consists of four new residential neighborhoods, referred to as Planning Areas, linked by trails and private open space areas. The fifth Planning Area is an approximately 2.6-acre building pad located along Beach Boulevard designed to accommodate either 20,000 square feet of retail and restaurant uses, or an additional 49 multi-family dwelling units. The sixth Planning Area consists of areas proposed for public parkland, including the conversion of the existing clubhouse to a City-owned Community Center, public streets, and public open space areas. The slope separating the existing Westridge neighborhood from the golf course is part of the 151-acre project site; however, the Westridge neighborhood has an easement and obligation to maintain the approximately 19.4-acre vegetated slope. This area constitutes the seventh Planning Area.

Access to the proposed Project site would be provided at three locations. The primary entrance is proposed from Beach Boulevard on the west side of the Project Site by adding a fourth leg to an existing three leg signalized intersection on Beach Boulevard with the Hillsborough Apartment complex. The eastern entry to the community would add a fourth leg to an existing three leg signalized intersection on Idaho Street at Sandlewood Avenue. The third entry to the proposed development is from the north from La Habra Hills Drive, which is the existing entry to the

Westridge Golf Course. Access to all of the residential neighborhoods would be gated and all internal streets private. La Habra Hills Drive would be a public street (non-gated) extending south to the proposed Community Center and public park. Farther to the south, La Habra Hills Drive would extend to the Westridge neighborhood to continue to provide access to that community.

The seven Planning Areas (PA) are described further as follows:

- PA 1: Approximately 10.5 acres located along Beach Boulevard consisting of 145 multi-family dwelling units, ranging in size from 1,600 square feet to 2,000 square feet, with a maximum density of 18 dwelling units per acre.
- PA 2: Approximately 32.7 acres located in the western portion of the site consisting of 118 single-family detached dwellings ranging in size from approximately 2,500 square feet to almost 3,000 square feet on minimum 3,840 square foot lots, for an overall density of approximately 3.6 dwelling units per acre.
- PA 3: Approximately 17.0 acres located in the northern portion of the site consisting of 77 single-family detached dwellings ranging in size from approximately 2,375 to 2,675 square feet on minimum 3,290 square foot lots, for an overall density of approximately 4.7 dwelling units per acre.
- PA 4: Approximately 23.3 acres located in the eastern portion of the site consisting of 82 single-family detached dwellings ranging in size from just over 3,000 square feet to approximately 3,600 square feet on minimum 4,950 square foot lots, for an overall density of approximately 3.5 dwelling units per acre.
- PA 5: Approximately 2.6 acres located along Beach Boulevard adjacent to the existing Westridge Plaza consisting of either 20,000 square feet of retail and/or restaurant uses, or 49 multi-family dwelling units with a maximum density of 18 dwelling units per acre.
- PA 6: Approximately 45.3 acres of public parkland, streets, and open space.
- PA 7: Approximately 19.4 acres of existing vegetated slope within the project limits, but currently maintained by the Westridge Home Owner's Association.

Prior to construction of the golf course, the Project site was an oil field. During grading of the golf course, approximately 300,000 cubic yards of soil containing total petroleum hydrocarbons (TPH) were placed in several locations below the golf course. Therefore, onsite grading would require the removal of all previously placed fill material until either bedrock or suitable material is reached. A minimum of 20 feet of additional fill, clear of TPH, would be placed over the TPH soil and compacted to over 90% to comply with residential development standards.

Earthwork on the Project site is proposed to be balanced, meaning the overall cut and fill quantities generally equal each other, which accounts for earthwork shrinkage and spoils from constructing footings and utility trenches. Limited amounts of import and export would be necessary as described below. Clearing of vegetation and construction materials that cannot be crushed on site would be exported to an approved landfill or recycling center. Import of "select" backfill material for retaining wall construction is anticipated; however, on-site sources of suitable soil material and crushed concrete from the project site would be the primary source of backfill, minimizing the

need for additional import. Total earthwork is approximately 3,400,000 cubic yards. Several retaining walls, designed as Mechanically Stabilized Earth (MSE) walls, are proposed throughout the Project site. The walls range in height up to 23 feet, with the tallest wall occurring on Lot 274, which is located within the multi-family building site, north of the project entry from Beach Boulevard. MSE walls are not vertical walls, but rather canted back at a slight angle. The walls rely on geo-grid, which extends back into the hillside behind the wall, and gravity for stability. MSE walls include planting pockets that will be planted with landscape material consistent with the design guidelines included in the Specific Plan in order to minimize visual impacts and enhance the aesthetic character of the walls.

The Rancho La Habra Specific Plan provides for a variety of public park and recreation amenities totaling 42.3 acres within PA 6.

Parking for the Community Center and Park would be provided in a location similar to the current golf course parking, however, La Habra Hills Drive would be realigned to the west of the parking lot to provide parking adjacent to the Community Center. In total, approximately 255 parking spaces would be available for the Community Center and public park uses.

Grading and infrastructure development for the entire Project site would occur in one phase. Total earthwork is approximately 3,400,000 cubic yards and grading would occur over an approximately 11- to 12-month period. Infrastructure improvements, including storm drains, water and sewer mains, and streets would be installed over an approximately nine to twelve-month period following grading. Buildout of the entire Project site is anticipated to occur over 4 years, ending in 2023.

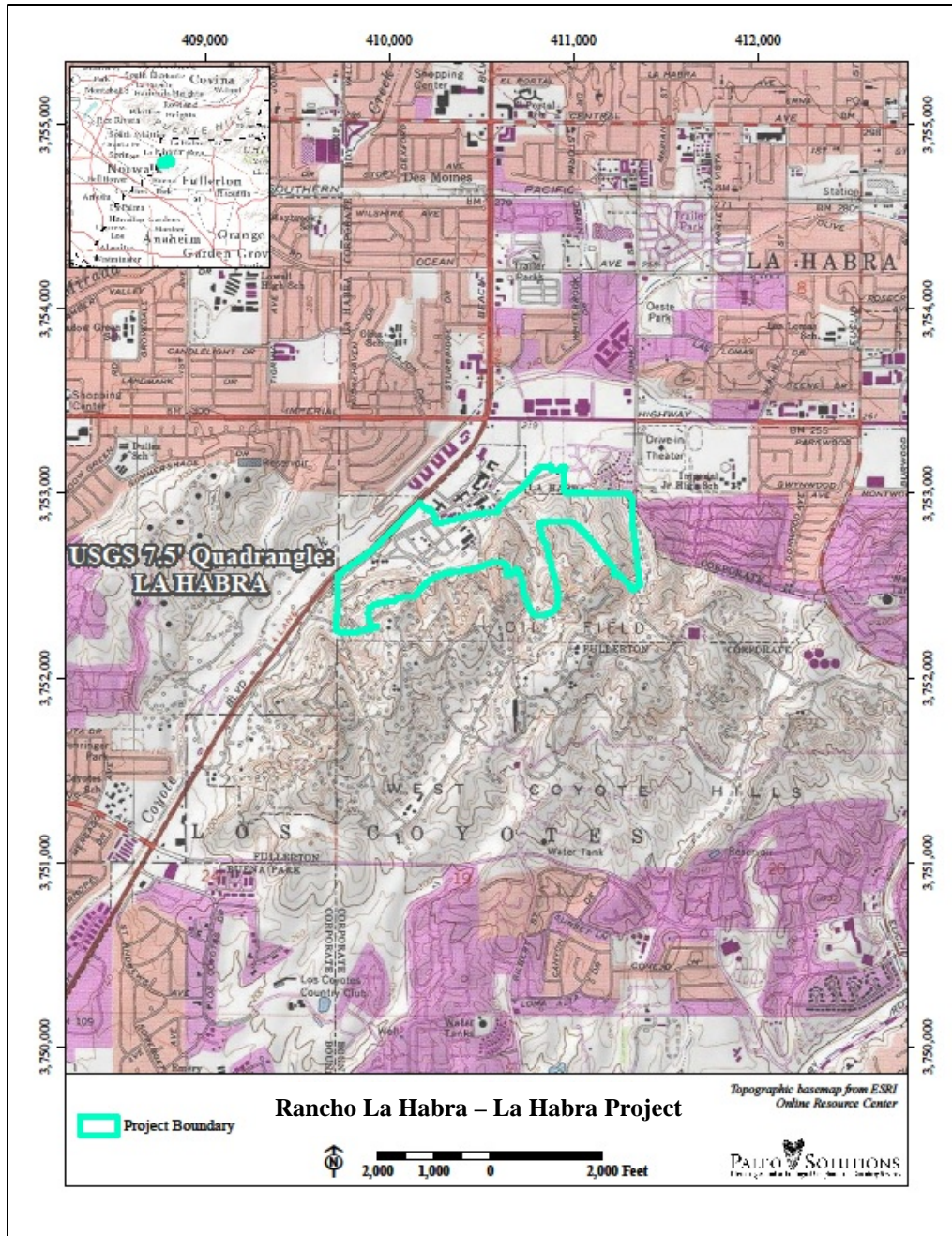


Figure 2. Project overview map.

3.0 DEFINITION AND SIGNIFICANCE OF PALEONTOLOGICAL RESOURCES

As defined by Murphey and Daitch (2007): “Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only fossils themselves, but also the associated rocks or organic matter and the physical characteristics of the fossils’ associated sedimentary matrix.

The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced. Fossils are important scientific and educational resources because they are used to:

- Study the phylogenetic relationships amongst extinct organisms, as well as their relationships to modern groups;
- Elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- Reconstruct ancient environments, climate change, and paleoecological relationships;
- Provide a measure of relative geologic dating that forms the basis for biochronology and biostratigraphy, and which is an independent and corroborating line of evidence for isotopic dating;
- Study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- Study patterns and processes of evolution, extinction, and speciation; and
- Identify past and potential future human-caused effects to global environments and climates.

Fossil resources vary widely in their relative abundance and distribution and not all are regarded as significant. Vertebrate fossils, whether preserved remains or track ways, are classed as significant by most state and federal agencies and professional groups (and are specifically protected under the California Public Resources Code). In some cases, fossils of plants or invertebrate animals are also considered significant and can provide important information about ancient local environments. According to BLM IM 2009-011 a “Significant Paleontological Resource” is defined as: Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. Assessment of significance is also subject to the California Environmental Quality Act (CEQA) criterion that the resource constitutes a “unique paleontological resource or site.” A significant paleontological resource is considered to be of scientific interest if it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on

earth, or has an identified educational or recreational value. Paleontological resources that may be considered not to have scientific significance include those that lack provenience or context, lack physical integrity due to decay or natural erosion, or that are overly redundant or are otherwise not useful for research. Vertebrate fossil remains and traces include bone, scales, scutes, skin impressions, burrows, tracks, tail drag marks, vertebrate coprolites (feces), gastroliths (stomach stones), or other physical evidence of past vertebrate life or activities (BLM, 2008).

The full significance of fossil specimens or fossil assemblages cannot be accurately predicted before they are collected, and in many cases, before they are prepared in the laboratory and compared with previously collected material. Pre-construction assessment of significance associated with an area or formation must be made based on previous finds, characteristics of the sediments, and other methods that can be used to determine paleoenvironmental conditions.

A separate issue is the potential of a given geographic area or geologic unit to preserve fossils. Information that can contribute to assessment of this potential includes:

- The existence of known fossil localities or documented absence of fossils nearby and in the same geologic unit (e.g. “Formation” or one of its subunits);
- Observation of fossils within the project vicinity;
- The nature of sedimentary deposits in the area of interest, compared with those of similar deposits known elsewhere (size of particles, clasts and sedimentary structures conducive or non-conductive to fossil inclusion) that may favor or disfavor inclusion of fossils; and
- Sedimentology details, and known geologic history, of the sedimentary unit of interest in terms of the environments in which the sediments were deposited, and assessment of the favorability of those environments for the probable preservation of fossils.

4.0 LAWS, ORDINANCES, REGULATIONS AND STANDARDS

This section of the report presents the federal, state, and local regulatory requirements pertaining to paleontological resources that will apply to this Project.

4.1 STATE AND LOCAL REGULATORY SETTING

4.1.1 California Environmental Quality Act (CEQA)

The procedures, types of activities, persons, and public agencies required to comply with the California Environmental Quality Act (CEQA) are defined in the Guidelines for Implementation of CEQA (State CEQA Guidelines), as amended on March 18, 2010 (Title 14, Section 15000 et seq. of the California Code of Regulations [i.e., 14 CCR Section 15000 et seq.] and further amended January 4th, 2013. One of the questions listed in the CEQA Environmental Checklist is: “Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?” (State CEQA Guidelines Section 15064.5 and Appendix G, Section V, Part C).

4.1.2 State of California Public Resources Code

The State of California Public Resources Code (Chapter 1.7), Sections 5097.5 and 30244, includes additional state level requirements for the assessment and management of paleontological

resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, define the removal of paleontological “sites” or “features” from state lands as a misdemeanor, and prohibit the removal of any paleontological “site” or “feature” from State land without permission of the jurisdictional agency. These protections apply only to State of California land, and thus apply only to portions of the project, if any, which occur on State land.

4.1.3 Orange County Guidelines

The Orange County General Plan (2011) Resources Element contains explicit guidelines for paleontological resources in the Cultural Resources portion of the document. Additionally, Orange County has a paleontological certification program to identify qualified paleontologists for work within the County (see Appendices A, B). Two goals and four objectives address paleontological resources. Cultural Resources Goal 1 requires the County to raise the awareness and appreciation of Orange County's cultural and historic heritage. To achieve this, Objective 1.1 requires that the County facilitate and participate in activities that inform people about the social, cultural, economic, and scientific values of Orange County's heritage. Objective 1.2 requires that the County work through the Orange County Historical Commission in the areas of history, paleontology, archaeology, and historical preservation.

Goal 2 states that the County shall encourage through a resource management effort the preservation of the county's cultural and historic heritage. Objective 2.1 states that the County shall promote the preservation and use of buildings, sites, structures, objects, and districts of importance in Orange County through the administration of planning, environmental, and resource management programs. Objective 2.2 requires that the County take all reasonable and proper steps to achieve the preservation of archaeological and paleontological remains, or their recovery and analysis to preserve cultural, scientific, and educational values. The following policies addressing archaeological, paleontological, and historical resources shall be implemented at appropriate stage(s) of planning, coordinated with the processing of a project application, as follows:

- Identification of resources shall be completed at the earliest stage of project planning and review such as general plan amendment or zone change.
- Evaluation of resources shall be completed at intermediate stages of project planning and review such as site plan review, subdivision map approval, or at an earlier stage of project review.
- Final preservation actions shall be completed at final stages of project planning and review such as grading, demolition, or at an earlier stage of project review.

Additionally, Orange County has a well-defined set of guidelines regarding paleontological resources, their disposition, and distribution throughout the County (Cooper et al., 2010).

5.0 METHODS

The paleontological study for the Rancho La Habra – La Habra Project included a geologic map review, literature search, institutional records search, and reconnaissance survey. The goal of this report is to identify the level of paleontological potential of the Project site, and make recommendations for the mitigation of adverse effects on paleontological resources that may occur

as a result from the proposed construction. Barbara Webster conducted the paleontological reconnaissance survey. Courtney Richards, M.S. performed the background research and authored this report. Geraldine Aron, M.S., Certified Orange County Paleontologist, oversaw all aspects of the Project as the Paleontological Principal Investigator. GIS maps were prepared by Barbara Webster.

Paleo Solutions reviewed geologic mapping of the La Habra Quadrangle by T.W. Dibblee, Jr. and H. E. Ehrenspeck (2001). The literature reviewed included published and unpublished scientific papers. A paleontological records search was conducted at the Natural History Museum of Los Angeles County (LACM). Dr. Samuel McLeod performed the search. The search included fossil localities occurring within the Project site and a one-mile radius. The results of the records search (dated April 27, 2015) are attached as Appendix C. Additional searches of available online databases, including the PaleoBiology Database (PBDB) and University of California Museum of Paleontology database (UCMP), were conducted by Paleo Solutions staff.

On April 15, 2015, Paleo Solutions personnel performed a paleontological reconnaissance survey. Since the site is on private property, survey access was coordinated with Westridge Golf Course management personnel. The purpose of the reconnaissance survey was to locate any fossil localities within the Project site and to determine the paleontological sensitivity of the geologic deposits that may be impacted during Project construction. The majority of the Project site is a developed golf course covered by artificial fill material and golf green, which has no potential for paleontological resources. Therefore, the pedestrian examination was restricted sections of the Project site that retained their natural topography and vegetation. When possible, the survey consisted of parallel transects spaced 15 meters apart. Transect intervals varied in areas with steep slopes or thick vegetation, but were spaced as close to 15 meters as permitted by site conditions. Site conditions and discoveries were recorded in a Paleontological Survey Logs that was submitted to PSI supervisors. The following field data were recorded for all fossil localities: field number, date of discovery, geographic coordinates, elevation, formation, stratigraphic position, lithologic description of sediment in which the specimen(s) was preserved, type(s) of fossils and type(s) of element(s), photograph(s), and recorder(s). Geographic coordinates and elevations were obtained using a high resolution Global Positioning System (GPS) device. No fossils were collected during the survey.

The results of the paleontological geologic map review, literature and museum records searches, and reconnaissance survey were used to complete a paleontological sensitivity analysis using the Society of Vertebrate Paleontology (SVP) (2010) standard procedural guidelines.

6.0 GEOLOGY AND PALEONTOLOGY

In general, the entire western margin of North America is very rich paleontologically. This is because the border of the North American continent is active tectonically, thus creating various marine embayments that received large amounts of sediment from the adjacent land mass. Each such embayment can have a sequence of stacked marine and terrestrial sediments containing the fossils documenting its natural history, and the completeness of the record can vary among different embayments (U.S. Geological Survey [USGS], 2007).

The Project site is situated in the Peninsular Ranges Geomorphic Province, which is comprised of northwest trending mountain ranges and valleys (Wagner, 2002). Specifically, it is located in the eastern portion of the Los Angeles Basin. The Los Angeles Basin is a relatively important site for geological and paleontological studies of the western margin of North America because the stratigraphic sequence of its sediments is very complete; there are few gaps in a nearly continuous sequence of deposits from the Early Miocene (~ 23 million years old [Ma]) to the latest part of the Pleistocene (~ 11,000 years old) (U.S. Geological Survey [USGS], 2007).

6.1 MAPPED GEOLOGY

High resolution (1:24,000 scale) geologic mapping of the Project site by Dibblee and Ehrenspeck (2001) indicate that the site is primarily underlain by Quaternary (Holocene) alluvium and early Pleistocene San Pedro Formation with minor exposures of Pleistocene La Habra Formation. The geotechnical report prepared in conjunction with the Project (LGC Geotechnical, Inc., 2015) utilized lower resolution (1:100,000 scale) mapping by Morton (2004), which does not include La Habra Formation within the Project boundaries. LGC Geotechnical, Inc. (2015) also reviewed previous geotechnical studies and noted that landslide deposits of San Pedro material had previously been encountered, most of which was removed during previous grading, and the extent of structural and non-structural artificial fill. For the purposes of the paleontological study, the bedrock units underlying the fill material are of the most importance, thus the high resolution mapping by Dibblee and Ehrenspeck (2001) were used to complete the study. The geographic distributions of the geologic units in the Project site, as mapped by Dibblee and Ehrenspeck (2001), are illustrated in Figure 3.

6.1.1 Quaternary Alluvium (Qa)

Quaternary alluvial deposits are Holocene in age (11,700 years old or less). These deposits are composed of undissected alluvial gravel, sand and silt (Dibblee and Ehrenspeck, 2001) derived from adjacent slopes and the nearby Coyote Creek. Younger alluvial fan deposits are generally not paleontologically sensitive due to their young age; however, they may shallowly cover older units of higher paleontological importance (McLeod, 2015).

6.1.2 La Habra Formation (Qlh)

Sediments of the terrestrial La Habra Formation were deposited during the Pleistocene (2.59 million to 11.7 thousand years ago). The Formation is weakly indurated and is composed of tan to light grey, vaguely bedded sandstone and pebble conglomerate. South of the Puente hills, it also includes abundant shale pebbles (Dibblee and Ehrenspeck, 2001).

6.1.3 San Pedro Formation (Qsp)

The San Pedro Formation was deposited during the early Pleistocene (2.59 million to 781 thousand years old) in a shallow marine environment. Sediments consist of weakly indurated, tan to light grey, slightly bedded sandstone. The Formation is locally pebbly and is known to contain fossil mollusks (Dibblee and Ehrenspeck, 2001).

6.2 PALEONTOLOGICAL RECORDS SEARCH RESULTS

Paleo Solutions requested a paleontological search of records maintained by the Natural History Museum of Los Angeles County (LACM; Appendix C). Searches of the University of California Museum of Paleontology (UCMP) online database and PaleoBiology Database (PBDB) and literature were also conducted. The records and literature reviews indicate that there is one recorded locality (LACM 3861) within or immediately adjacent to the site boundaries in the San Pedro Formation in the southeastern portion of the Project. Additional fossils are known nearby from the same geologic units that occur within in the Project site (McLeod, 2015, Jefferson, 1991, 2003; UCMP, 2015; PBDB, 2015; Scientific Resource Surveys Inc., 1989).

The La Habra Formation has produced a diverse Ice Age fossil assemblage in Southern California. Within the City of La Habra, fossil specimens of sloth, mammoth, mastodon, horse, camel, deer, pronghorn, and California turkey have been recovered from along Imperial Highway. In the nearby cities of Fullerton, La Mirada and Buena Park, La Habra Formation fossils include megafauna including sloth, coyote, fox, bear, bison, dire wolf, mastodon, mammoth, horse, camel, tapir, peccary, cat, deer, and pronghorn, as well as microvertebrates such as rodents, rabbits, amphibians, reptiles, birds, and fish (Appendix D; Jefferson 1991, 2003; PBDB, 2015; Scientific Resource Surveys Inc., 1989).

Locality LACM 3861 produced a specimen of fossil diving duck, *Chendytes milleri*, within or immediately adjacent to the Project (McLeod, 2015; Scientific Resource Surveys Inc., 1989). While no other fossil localities were reported from the San Pedro Formation in the City of La Habra, numerous localities are known from surrounding cities in Orange County, and throughout Los Angeles County. Recovered vertebrate fossils include extinct species of horse, bison, mammoth, dire wolf, saber-tooth cat, American lion, camel, ground sloth, pronghorn, and birds (including the type specimen of the flightless sea duck *Chendytes lawi*), and extant species of gray whale, dolphin, sea lion, deer, rodents, rabbits, birds, snakes, turtles, amphibians, sharks, and fish (Appendix E; McLeod, 2015; UCMP 2015; PBDB, 2015; Jefferson 1991). Abundant invertebrate fossils including bivalves, gastropods, tusk shells, sand dollars, and crabs have also been collected from the Formation (UCMP, 2015; PBDB, 2015; Scientific Resource Surveys Inc., 1989; Hoskins, 1954 as cited in Powell and Stevens, 2000).



Figure 3. Geologic map.

7.0 RECONNAISSANCE SURVEY RESULTS

Disturbances related to construction of the Westridge Golf Course covers much of the Project site and includes previously graded and filled areas; golf green; irrigation pipes; concrete drainage ditches; and landscaping. Only undisturbed areas that retained their natural topography and vegetation were surveyed (Figures 4-5).

Sediments were visible in approximately 60% of the surveyed area; however, bedrock was only present in 2%. Native outcrops of the San Pedro Formation were observed in the hilly areas to the west of the Project site (Figure 6). Observed bedrock of the La Habra Formation was limited to a small (less than two foot square) exposure on the east side of the site. In general, sediments consisted of grey to tan sandy silt and accessory pebbles, with a higher concentration of well-rounded cobbles and pebbles (up to 30%) observed in sediments on the east boundary of the Project site.

Three new fossil localities were recorded during the paleontological survey. Locality 20150415BJW.01 was observed as float (not in-situ) in sediments of the San Pedro Formation on the surface of a drainage adjacent to a golf cart track in the northeast portion of the site. The locality consists of a single bivalve shell fragment (Figure 7). Surrounding sediments consist of moderately sorted, unconsolidated, tan, fine-grained sandy silt with accessory pebbles.

A second bivalve shell fragment (20150415BJW.02) (Figure 8) was recorded from the San Pedro Formation along the southern boundary of the site. It was discovered as float in moderately sorted, silty sediments on a steep hillside covered by dense brush.

The final locality, 20150415BJW.03, was observed in boulder of San Pedro Formation used in the construction of a man made dam on a drainage adjacent to a golf cart track. The original source of the boulder is unknown, but was likely found locally. The locality consists of a bivalve shell deposit (25+ shells) embedded in a well-indurated, very fine- to fine-grained sandy siltstone matrix (Figure 9).

The three newly recorded localities from the San Pedro Formation were determined to be non-significant due to the fact that the fossils had been transported from the original location of deposition and thus lacked critical provenance information. Additionally, the fossil shells were generally poorly preserved, making identifications to a low taxonomic order, such as genus or species, unlikely.

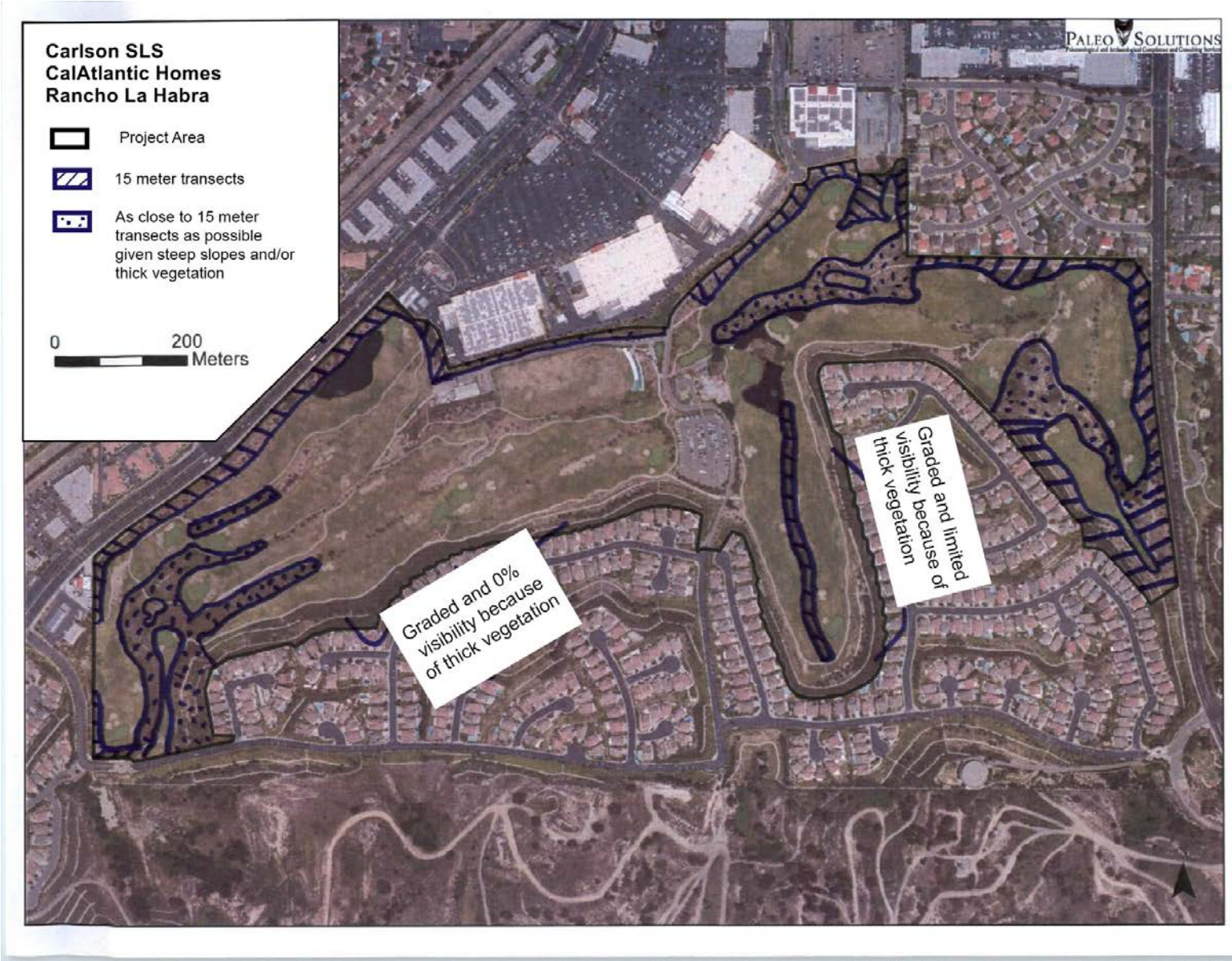


Figure 4. Survey coverage map.



Figure 5. Overview: Golf course & heavily vegetated, undisturbed hill slopes (view to east).



Figure 6. Siltstone of the San Pedro Formation in hillside (view to southeast).



Figure 7. 20150415BJW.01 shell fragment (scale in inches).



Figure 8. 20150415BJW.02 shell fragment (scale in inches).

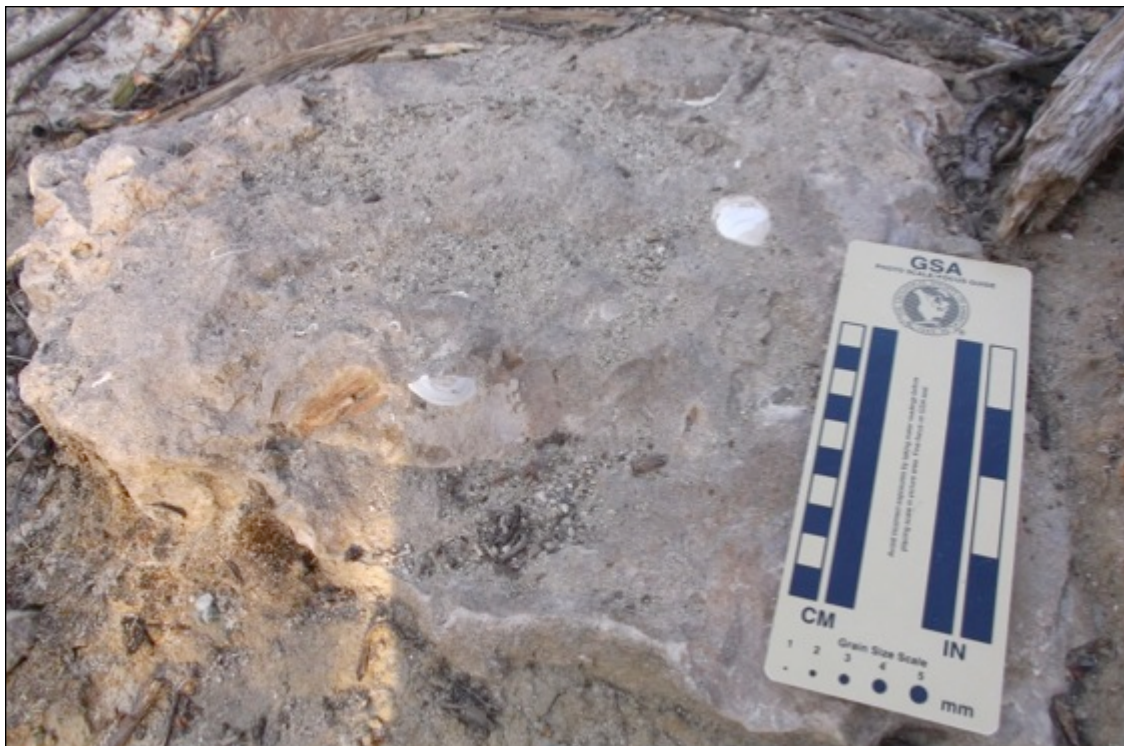


Figure 9. 20150415BJW.03 shells embedded in ex situ boulder (view to east).

8.0 RESOURCE ASSESSMENT

Based on the results of the geologic map review, literature and museum records searches, and reconnaissance survey, the paleontological potential of the geologic units within the Project site were ranked using the Society of Vertebrate Paleontology (SVP) (2010) standard procedural guidelines.

8.1 PALEONTOLOGICAL POTENTIAL CLASSIFICATION CRITERIA

According to the Society of Vertebrate Paleontology (2010):

“A Significant Fossiliferous Deposit is a rock unit or formation which contains significant nonrenewable paleontologic resources, here defined as comprising one or more identifiable vertebrate fossils, large or small, and any associated invertebrate and plant fossils, traces and other data that provide taphonomic, taxonomic, phylogenetic, ecologic, and stratigraphic information.”

In its “Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources,” SVP (2010) recognizes four categories of paleontological potential for rock units: high, moderate/unknown (undetermined), low, and no potential:

High Potential

Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant

paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e.g., ashes or tephra), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.). Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.

Moderate/Unknown Potential

Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

Low Potential

Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e.g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.

No Potential

Some rock units have no potential to contain significant paleontological resources, for instance high- grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection nor impact mitigation measures relative to paleontological resources.

8.2 SENSITIVITY OF GEOLOGICAL UNITS

According to the records searches conducted by LACM and Paleo Solutions staff, one previously recorded fossil locality from the San Pedro Formation was within, or immediately adjacent to the Project site. Additionally, numerous fossil resources were recorded from the La Habra Formation within the City of La Habra and surrounding areas. Vertebrate fossils and shells have also been recorded from the San Pedro Formation in Orange and Los Angeles counties (McLeod, 2015;

Jefferson, 1991, 2003; UCMP, 2015; PBDB, 2015). In addition, three new localities containing fossilized shell were observed in the San Pedro Formation during the paleontological reconnaissance survey conducted by Paleo Solutions. While the newly recorded localities were ultimately determined to be non-significant, they demonstrate that the sediments within the Project site are conducive to fossil preservation. Based on the results of this paleontological technical study, both the La Habra and San Pedro Formations are considered to have high potential to produce significant paleontological resources utilizing SVP (2010) procedural guidelines.

Fossils are generally unknown from younger Quaternary alluvial deposits due to their young age. It should be noted, however, that while this unit typically does not contain significant vertebrate fossils at the surface, it often overlies deeper, previously undisturbed, older alluvium or other potentially fossil-bearing sedimentary surficial deposits or bedrock units where the probability increases for finding significant vertebrate fossil remains (McLeod, 2015). Therefore, Holocene units have low paleontological potential within the initial five feet, and increase to moderate/unknown paleontological potential below five feet in depth below the ground surface based on SVP (2010) procedural guidelines.

9.0 IMPACTS TO PALEONTOLOGICAL RESOURCES

Ground disturbance in geologic units and geographic areas known to contain scientifically significant fossils may produce adverse impacts to nonrenewable paleontological resources (State CEQA Guidelines, 14 CCR Sections 15064.5[3] and 15023; State CEQA Guidelines Appendix G, Section V, Part C).

Direct impacts to paleontological resources concern the physical destruction of fossils, usually by human-caused ground disturbance. Indirect impacts to paleontological resources typically concern the loss of resources to theft and vandalism resulting from increased public access to paleontologically sensitive areas. Cumulative impacts to paleontological resources concern the incremental loss of these nonrenewable resources to society as a whole.

Based on SVP (2010) procedural guidelines applied to the results of the literature review, records search, and survey completed for this study, bedrock of both the La Habra and San Pedro formations have high potential for paleontological resources in the vicinity of the Project site. Previously disturbed areas and areas mapped as Quaternary alluvium have no and low potential, respectively, for paleontological resources at the surface, but may shallowly overlie paleontologically sensitive bedrock. Therefore, grading and other earthmoving activities may potentially result in significant direct impacts to paleontological resources throughout the entirety of the Project site.

10.0 RECOMMENDATIONS

Due to the high paleontological potential of the La Habra and San Pedro formations, and the moderate/unknown potential of Quaternary alluvium to produce significant paleontological resources at depth, mitigation of potential adverse impacts resulting from construction-related ground disturbance is recommended. It is recommended that full-time monitoring be performed during all earthmoving activities impacting native sediments of the La Habra and San Pedro Formations to reduce potential impacts to a less than significant level. Additionally, periodic

paleontological spot checks should be conducted when excavation exceeds depths of five feet into areas mapped as Quaternary alluvium to determine if older, paleontologically sensitive sediments are present. If present, monitoring should be implemented. Prior to the start of construction a paleontological resources monitoring plan should be prepared and implemented. The plan should include specific locations and construction activities requiring monitoring, procedures to follow for monitoring and fossil discovery, and a curation agreement with the John D. Cooper Archaeology and Paleontology Center.

11.0 REFERENCES

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12.0 APPENDIX A

COUNTY OF ORANGE QUALIFICATIONS FOR CERTIFICATION OF ARCHAEOLOGICAL AND PALEONTOLOGICAL PROFESSIONALS

**COUNTY OF ORANGE
QUALIFICATIONS FOR CERTIFICATION OF
ARCHAEOLOGICAL AND PALEONTOLOGICAL PROFESSIONALS**

I. Archaeology - *Minimum Qualifications*

A. Graduate degree in archaeology, or in anthropology or a closely related field with a specialization in archaeology, plus at least one year professional level experience (surveys, excavations, or other archaeological work pertinent to environmental review requirements), major components for which the individual had principal responsibility.

or

BA or BS degree in archaeology, or in anthropology or a closely related field with a specialization in archaeology, plus at least three years professional level experience (surveys, excavations, or other archaeological work pertinent to environmental review requirements), major components for which the individual had principal responsibility.

or

Membership in professional archeological society such as Register of Professional Archeologists (RPA).

B. At least one year of local Southern California archaeological experience.

C. Demonstrated ability to carry research studies and reports to completion in a timely manner.

II. Paleontology - *Minimum Qualifications*

A. Graduate degree in paleontology, or in geology or a closely related field with a specialization in paleontology, plus at least one year of profession level experience (surveys, salvage, or other paleontological work pertinent to environmental review requirements), major components for which the individual had principal responsibility.

or

BA or BS degree in paleontology or in geology or a closely related field with specialization in paleontology, plus at least three years professional level experience (surveys, salvage, or other paleontological work pertinent to environmental review requirements), major components of which the individual had principal responsibility.

or

Membership in professional paleontological society such as The Paleontological Society (PS).

B. At least one year of local Southern California paleontological experience.

C. Demonstrated ability to carry research studies and reports to completion in a timely manner.

III. Qualifications are evaluated based on submittal of resume and letter of application, as administered and reviewed by OC Public Works (OCPW) which may seek additional review by qualified organization, individuals or other entities.

Submit resume and letter to: Doug Friedman, OCPW, 300 N Flower Street, Santa Ana, CA 92703

E-Mail: Doug.Friedman@ocpw.ocgov.com Phone Number: (714) 667-8841

13.0 APPENDIX B

ORANGE COUNTY CERTIFIED PALEONTOLOGIST LIST

CERTIFIED PALEONTOLOGISTS FOR UNINCORPORATED ORANGE COUNTY 2014

Last	Title	First	Company	Address	City	State	Zip	Phone	Fax/E-mail
Aron	Ms.	Geraldine	Paleo Solutions Inc.	911 S. Primrose Ave, Unit J	Monrovia	CA	91016	(562) 818-7713	FAX: (626) 359-0712
Ashby	Mr.	James	Mission Geoscience, Inc.	2082 Michelson Drive, Suite 400	Irvine	CA	92612-1214	(949) 955-9086	(949) 955-9088
Barnes	Dr.	Lawrence	Los Angeles County Museum of Natural History	900 Exposition Blvd.	Los Angeles	CA	90007	(213) 763-2466	FAX: (213) 746-7431
Clay	Mr.	Stewart		9511 W. Harle	Anaheim	CA	92804	(714) 991-9556	(714) 991-9556
Conkling	Mr.	Steven	LSA Associates	20 Executive Park Suite 200	Irvine	CA	92614	(949) 553-0666	(714) 459-5467
Corsetti	Ms.	Cara	SWCA Environmental Consultants	23392 Madero, Suite L	Mission Viejo	CA	92702	(949)770-8042	(949) 458-9058
DeBusk	Ms.	Jessica	Applied EarthWorks, Inc.	133 N San Gabriel Blvd, Suite 201	Pasadena	CA	91107	(626) 578-0119	jdebusk@appliedearthworks.com
Finger	Dr.	Kenneth	Michael Brandman & Associates	15901 Redhill Ave., Suite 200	Tustin	CA	92780-7318	(714) 258-8100	FAX: (714) 258-8900
Fisk	Dr.	Lanny	PaleoResource Consultants	550 High St, Ste 108	Auburn	CA	95603	(530) 885-9696	FAX: (530) 887-2274 Lanny@PaleoResource.com
Gust	Ms.	Sherri Marie	Cogstone Resource Management	1801 Parkcourt Place, Bldg. B, Suite 102	Santa Ana	CA	92701	(714) 245-0264	(714) 973-9258
Kennedy	Dr.	George	Brian F. Smith and Associates	14010 Poway Road, Suite A	Poway	CA	92064	(858) 484-0915	info@bfsa-ca.com
Kelly	Ms.	Jennifer	Paleo Solutions Inc.	911 S. Primrose Ave, Unit J	Monrovia	CA	91016	(562) 818-7713	FAX: (626) 359-0712
Lander	Dr.	Bruce	Paleo Environmental Associates	2248 Winrock Ave.	Altadena	CA	91001	(626) 797-9895	(626) 797-9895
Langenwalter	Mr.	Paul	Heritage Resources Consultants	P.O. Box 1674	La Mirada	CA	90637-1674	(562) 943-4813	
Lipps	Dr.	Jere	J. D. Cooper Archeology and Paleontology Center		Santa Ana	CA		(714) 647-2108	jlipps@fullerton.edu
Minch	Dr.	John	John Minch & Associates Inc.	26623 Sierra Vista	Mission Viejo	CA	92692	(949) 367-1000	(949) 367-0117
Murphey	Dr.	Paul	San Diego Natural History Museum	P.O. Box 121390	San Diego	CA	92112-1390	(619) 232-3821	FAX: (619)255-0312

Carlson Strategic Land Solutions
 CalAtlantic Homes' Rancho La Habra – La Habra Project

Park	Mr.	Stephen K.	University of California, Riverside	Dept. of Earth Sciences	Riverside	CA	92521	(909) 787-5028	magneto@ucrmt.ucr.edu
Rieboldt	Dr.	Sarah	LSA Associates	20 Executive Park, Ste 200	Irvine	CA	92614	(949) 553-0666 X 313	sarah.rieboldt@lsa-assoc.com
Rivin	Ms.	Meredith	CSUF - John D. Cooper Center	Geo Sciences Dept., MH-254, 800 N State College Blvd.	Fullerton	CA	92834	(714) 647-2103	mrivin@fullerton.edu
Roeder	Mr.	Mark	Chambers Group	5 Hutton Centre Drive, Ste 750	Santa Ana	CA	92707	(949) 261-5414	FAX (714) 545-2255
Scherzer	Mr.	Benjamin	Duke Cultural Resources Management, LLC	22 Sorocco	Rancho Santa Margarita	CA	92688	(406) 209-4959	bascherzer@gmail.com
Smith	Mr.	Brooks	LSA Associates Inc.	20 Executive Park Suite 200	Irvine	CA	92614	(949) 553-0666	(949) 975-1077
Snyder	Ms.	Della	SWCA Env. Consultants	150 South Arroyo Pkwy, Second Floor	Pasadena	CA	91105	(626) 240-0587	FAX (626) 240-0607
Springer	Ms.	Kathleen	San Bernadino County Museum	2024 Orange Tree Lane	Redlands	CA	92374	(909) 307-2669 x 242	k.springer@sbcmt.sbcounty.gov
Stevens	Mr.	David	Independent	993 Linden Place	Costa Mesa	CA	92691	(949) 722-8335	daverdon@att.net
Stewart	Mr.	Joe	PCR	One Venture, Suite 150	Irvine	CA	92618	(949) 753-7001	FAX: (949) 753-7002
Stoney	Mr.	Gary	Stoney-Miller Consultants Inc.	14 Hughes, B-101	Irvine	CA	92618	(949) 380-4886	FAX (949) 455-9371
Velechovsky	Mr.	Milos	Archaeological Resources Mgmt. Corp	1114 N. Gilbert	Anaheim	CA	92801	(714) 491-9702	armcorp@earthlink.net
Whistler	Mr.	David	Los Angeles County Museum of Natural History	900 Exposition Blvd.	Los Angeles	CA	90007	(213) 763-9466	(818) 780-5452

14.0 APPENDIX C

NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY RECORDS SEARCH RESULTS



Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007
tel 213.763.DINO
www.nhm.org

Vertebrate Paleontology Section
Telephone: (213) 763-3325
Fax: (213) 746-7431
e-mail: smcleod@nhm.org

27 April 2015

Paleo Solutions, Inc.
911 South Primrose Avenue, Unit J
Monrovia, CA 91016

Attn: Courtney Richards, Supervisor / Assistant Project Manager

re: Paleontological resources for the proposed VCS Environmental Standard Pacific Westridge
Project, in the City of La Habra, Orange County, project area

Dear Courtney:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed VCS Environmental Standard Pacific Westridge Project, in the City of La Habra, Orange County, project area as outlined on the portion of the La Habra USGS topographic quadrangle map that Paul Nesbit sent to me via e-mail on 30 March 2015. We have one vertebrate fossil locality that lies within or adjacent to the proposed project area boundaries and we have additional vertebrate fossil localities nearby from the same sedimentary deposits that occur in the proposed project area.

Most of the proposed project area has surface exposures of the marine late Pleistocene San Pedro Sand, although in the southern portion the proposed project area may impinge on exposures of the younger late Pleistocene La Habra Formation. In the lower lying northwestern portion of the proposed project area the surface deposits consist of younger Quaternary Alluvium, derived from the adjacent slopes and from the adjacent Coyote Creek. These younger Quaternary deposits typically do not contain significant vertebrate fossils in the uppermost layers, but they are underlain by older sedimentary deposits that may well contain significant fossil vertebrate remains.

Our vertebrate fossil locality LACM 3861 occurs either within or adjacent to the proposed project area boundaries in the southeastern portion. Locality LACM 3861 produced a

Inspiring wonder, discovery and responsibility for our natural and cultural worlds.

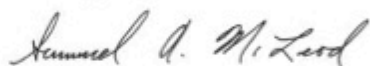
specimen of the fossil diving duck, *Chendytes milleri*. Our next closest vertebrate fossil localities from the San Pedro Sand are LACM 3536-3537 and 5011-5012, all south to south-southwest of the proposed project area between Rosecrans Avenue and Beach Boulevard, that produced fossil specimens of salmon shark, *Lamna*, bony fish, Osteichthyes, and whales, Cetacea.

Our closest vertebrate fossil locality from the La Habra Formation is LACM 3538, north of the western portion of the proposed project area along Imperial Highway west of Beach Boulevard. Locality LACM 3538 produced a fossil mammoth, *Mammuthus*, specimen mentioned by Yerkes (1972. Geology of the Eastern Los Angeles Basin, Southern California. U.S. Geol. Surv. Prof. Paper, 420C. pg. 25). Immediately west along Imperial Highway from locality LACM 3538 we also have locality LACM 1052, nominally from the La Habra Formation but probably also from the San Pedro Sand, that produced a suite of fossil vertebrates including white shark, *Carcharodon arnoldi*, turkey, *Meleagris californica*, ground sloth, *Paramylodon*, mastodon, *Mammut*, mammoth, *Mammuthus*, horses, *Plesippus* and *Equus*, camel, *Camelops*, deer, *Odocoileus*, and pronghorn antelope, *Antilocapra americana*, at a depth of about 40 feet below the surface. The specimen of the fossil turkey *Meleagris californica* from locality LACM 1052 is noteworthy because it was published in the scientific literature by H. Howard in 1936 and by D.W. Steadman in 1980.

Shallow excavations in the younger Quaternary Alluvium exposed in the northwestern portion of the proposed project area are unlikely to encounter significant vertebrate fossils. Deeper excavations there that extend down into older Quaternary deposits, as well as any excavations in the exposures of the San Pedro Sand or the La Habra Formation in the proposed project area, however, may well uncover significant fossil vertebrate remains. Any substantial excavations in the proposed project area, therefore, should be closely monitored to quickly and professionally collect any specimens without impeding development. Sediment samples should also be collected from the sedimentary deposits in the proposed project area and processed to determine their small fossil potential. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,



Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice

15.0 APPENDIX D

VERTEBRATE FOSSILS FROM THE LA HABRA FORMATION OF SOUTHERN CALIFORNIA

Formation	Common Name	Taxon	City, County	References
La Habra Formation	Harlan's ground sloth	<i>Paramylodon cf. harlani</i>	La Habra, Orange County	Jefferson, 1991; McLeod, 2015
	Columbian mammoth	<i>Mammuthus columbi</i>		
	mammoth	<i>Mammuthus sp.</i>		
	American mastodon	<i>Mammut cf. americanum</i>		
	horse	<i>Equus sp.</i>		
	horse	<i>Plesippus sp.</i>		
	camel	cf. <i>Camelops sp.</i>		
	deer	<i>Odocoileus sp.</i>		
	pronghorn	<i>Antilocapra americana</i>		
	California turkey	<i>Meleagris californica</i>		
	white shark	<i>Carcharodon arnoldi</i>		
La Habra Formation	giant ground sloth	<i>Megalonyx sp.</i>	Fullerton, Orange County	Jefferson, 1991; Jefferson, 2003; PBDB, 2015
	coyote	<i>Canis cf. latrans</i>		
	fox	cf. <i>Urocyon sp.</i>		
	American mastodon	<i>Mammut americanum</i>		
	imperial mammoth	<i>Mammuthus cf. imperator</i>		
	western horse	<i>Equus cf. occidentalis</i>		
	tapir	<i>Tapirus merriami</i>		
	peccary	cf. Tayassuidae		
	western camel	<i>Camelops hesternus</i>		
	early llama	<i>Palaeolama aff. mirifica</i>		
	mule deer	<i>Odocoileus hemionus</i>		
	lynx	<i>Lynx sp.</i>		
	ring-tailed cat	<i>Bassariscus cf. astutus</i>		
	red deer	<i>Cervus elaphus</i>		
	pronghorn	Antilocapridae		
	cow	Bovidae		
	ungulate	Ungulata		
	skunk	<i>Mephitis sp.</i>		
	broad-footed mole	<i>Scapanus cf. latimanus</i>		
	brush rabbit	<i>Sylvilagus bachmani</i>		
	hare	<i>Lepus sp.</i>		
	California ground squirrel	<i>Spermophilus beecheyi</i>		
	Botta's pocket gopher	<i>Thomomys bottae</i>		
	deer mouse	<i>Peromyscus sp.</i>		
	cotton rat	<i>Sigmodon sp.</i>		
	desert woodrat	<i>Neotoma lepida</i>		
California vole	<i>Microtus californicus</i>			
arroyo chub	<i>Gila orcutti</i>			
toad	<i>Bufo nestor</i>			

Formation	Common Name	Taxon	City, County	References
La Habra Formation	western toad	<i>Bufo boreas</i>	Fullerton, Orange County	Jefferson, 1991; Jefferson, 2003; PBDB, 2015
	northern red-legged frog	<i>Rana aurora</i>		
	tree frog	<i>Hyla</i> sp.		
	Pacific newt	<i>Taricha</i> sp.		
	western pond turtle	<i>Clemmys marmorata</i>		
	red-eared slider	<i>Pseudemys scripta</i>		
	California alligator lizard	<i>Gerrhonotus multicarinatus</i>		
	desert night lizard	<i>Xantusia vigilis</i>		
	desert spiny lizard	<i>Sceloporus magister</i>		
	western fence lizard	<i>Sceloporus occidentalis</i>		
	common side-blotched lizard	<i>Uta stansburiana</i>		
	coast horned lizard	<i>Phrynosoma coronatum</i>		
	horned lizard	<i>Phrynosoma</i> sp.		
	western skink	<i>Eumeces skiltonianus</i>		
	whiptail lizard	<i>Cnemidophorus</i> sp.		
	night snake	<i>Hypsiglena torquata</i>		
	racer snake	<i>Coluber</i> sp.		
	western lyre snake	<i>Trimorphodon biscutatus</i>		
	California whipsnake	<i>Masticophis lateralis</i>		
	gopher snake	<i>Pituophis melanoleucus catenifer</i>		
	eastern kingsnake	<i>Lampropeltis getulus</i>		
	western rattlesnake	<i>Crotalus viridis</i>		
	grebe	<i>Podiceps</i> sp.		
	grebe	<i>Podylimbus</i> sp.		
	American White Pelican	<i>Pelicanus erythrorhynchus</i>		
	cormorant	<i>Phalacrocorax</i> sp.		
	white goose	<i>Chen</i> sp.		
	Canada goose	<i>Branta canadensis</i>		
	Brant goose	<i>Branta</i> cf. <i>bernicula</i>		
	northern pintail	<i>Anas acuta</i>		
	mallard	<i>Anas platyrhynchos</i>		
	gadwall	<i>Anas strepera</i>		
	common teal	<i>Anas crecca</i>		
	northern shoveler	<i>Anas clypeata</i>		
lesser scaup	<i>Aythya affinis</i>			
turkey vulture	<i>Cathartes aura</i>			
sharp-shinned hawk	<i>Accipiter striatus</i>			
red-tailed hawk	<i>Buteo jamaicensis</i>			
falcon	<i>Falco</i> sp.			
crested caracara	<i>Polyborus plancus</i>			

Formation	Common Name	Taxon	City, County	References
	California quail	<i>Callipepla californica</i>		
La Habra Formation	American coot	<i>Fulica Americana</i>	Fullerton, Orange County	Jefferson, 1991; Jefferson, 2003; PBDB, 2015
	coot	<i>Fulica sp.</i>		
	crane	<i>Grus sp.</i>		
	killdeer	<i>Charadrius vociferus</i>		
	barn owl	<i>Tyto alba</i>		
	turkey	<i>Meleagris sp.</i>		
	moorhen	<i>Gallinula sp.</i>		
	rail	<i>Rallus sp.</i>		
	three-spined stickleback	<i>Gasterosteus aculeatus</i>		
La Habra Formation	American black bear	<i>Ursus americanus</i>	La Mirada, Los Angeles County	Jefferson, 1991
	dire wolf	<i>Canis cf. dirus</i>		
	coyote	<i>Canis cf. latrans</i>		
	giant ground sloth	<i>Megalonyx sp.</i>		
	American mastodon	<i>Mammut americanum</i>		
	horse	<i>Equus sp.</i>		
	western camel	<i>Camelops cf. hesternus</i>		
	mule deer	<i>Odocoileus cf. hemionus</i>		
	bison	<i>Bison sp.</i>		
	bobcat	<i>Lynx cf. rufus</i>		
	gray fox	<i>Urocyon cf. cinereoargenteus</i>		
	earless seal	Phocidae		
	cottontail rabbit	<i>Sylvilagus sp.</i>		
	Botta's pocket gopher	<i>Thomomys bottae</i>		
	deer mouse	<i>Peromyscus sp.</i>		
	California vole	<i>Microtus cf. californicus</i>		
	pond frog	cf. <i>Rana sp.</i>		
	spotted turtle	<i>Clemmys sp.</i>		
	squamate	Squamata		
	duck	Anatidae		
quail	<i>Callipepla sp.</i>			
California turkey	<i>Meleagris californica</i>			
La Habra Formation	horse	<i>Equus sp.</i>	Whittier, Los Angeles County	Jefferson, 1991

16.0 APPENDIX E

VERTEBRATE FOSSILS FROM THE SAN PEDRO FORMATION OF SOUTHERN CALIFORNIA

Formation	Common Name	Taxon	County	References
San Pedro Formation	flightless sea duck	<i>Chendytes milleri</i>	Orange	Jefferson, 1991; McLeod, 2015
	mammoth	<i>Mammuthus</i> sp.		
San Pedro Formation	fur seal	Arctocephalinae indet.	Los Angeles	Jefferson, 1991; UCMP, 2015; PBDB, 2015; McLeod, 2015
	giant bison	<i>Bison</i> cf. <i>latifrons</i>		
	bison	<i>Bison</i> sp.		
	extinct camel	<i>Camelops</i> sp.		
	dire wolf	<i>Canis dirus</i>		
	whale	Cetacea		
	pronghorn	cf. <i>Capromeryx</i> sp.		
	oceanic dolphin	Delphinidae indet.		
	kangaroo rat	<i>Dipodomys</i> sp.		
	sea otter	<i>Enhydra lutris</i>		
	horse	<i>Equus</i> sp.		
	grey whale	<i>Eschrichtius</i> cf. <i>robustus</i>		
	cat	<i>Felis</i> sp.		
	black-tailed jackrabbit	<i>Lepus californicus</i>		
	hare	<i>Lepus</i> sp.		
	mammal	Mammalia		
	mammoth	<i>Mammuthus</i> sp.		
	giant ground sloth	<i>Megalonyx</i> sp.		
	California vole	<i>Microtus</i> cf. <i>californicus</i>		
	vole	<i>Microtus</i> sp.		
	baleen whale	Mysticeti indet.		
	dusky-footed woodrat	<i>Neotoma</i> cf. <i>fuscipes</i>		
	woodrat	<i>Neotoma</i> sp.		
	Shasta ground sloth	<i>Nothrotherium shastense</i>		
	mule deer	<i>Odocoileus</i> cf. <i>hemionus</i>		
	deer	<i>Odocoileus</i> sp.		
	American lion	<i>Panthera leo atrox</i>		
	deer mice	<i>Peromyscus</i> sp.		
	harbor seal	<i>Phoca</i> cf. <i>vitulina</i>		
	elephant	Proboscidea		
	cougar	<i>Puma concolor</i>		
	saber-tooth cat	<i>Smilodon</i> cf. <i>fatalis</i>		
	California ground squirrel	<i>Spermophilus beecheyi</i>		
brush rabbit	<i>Sylvilagus</i> cf. <i>bachmani</i>			
cottontail rabbit	<i>Sylvilagus</i> sp.			
Botta's pocket gopher	<i>Thomomys bottae</i>			
pocket gopher	<i>Thomomys</i> sp.			
California sea lion	<i>Zalophus californianus</i>			
colubrid snake	Colubridae			
western rattlesnake	<i>Crotalus viridis</i>			
eastern kingsnake	<i>Lampropeltis getulus</i>			
pine snake	<i>Pituophis melanoleucus</i>			
snake	Serpentes indet.			
scaled reptile	Squamata indet.			
northern pond turtle	<i>Actinemys marmorata</i>			
turtle	Chelonia			
sea turtle	Cheloniidae indet.			

Formation	Common Name	Taxon	County	References
San Pedro Formation	turtle	<i>Clemmys</i> sp.	Los Angeles	Jefferson, 1991; UCMP, 2015; PBDB, 2015; McLeod, 2015
	turtle	Emydinae indet.		
	amphibian	Amphibia		
	frog	Anura indet.		
	toad	<i>Bufo</i> sp.		
	pond frog	<i>Rana</i> sp.		
	newt	<i>Taricha</i> sp.		
	green-winged teal	<i>Anas carolinensis</i>		
	mallard	<i>Anas platyrhynchos</i>		
	dabbling duck	<i>Anas</i> sp.		
	duck	Anatidae		
	murrelet	<i>Brachyramphus</i> sp.		
	Canada goose	<i>Branta canadensis</i>		
	black brant	<i>Branta ? nigricans</i>		
	bufflehead	<i>Bucephala albeola</i>		
	turkey vulture	<i>Calhartes aura</i>		
	flightless sea duck	<i>Chendytes lawi</i>		
	speckled sanddab	<i>Citharichthys stigmaeus</i>		
	American eared grebe	<i>Colymbus nigricollis</i>		
	black vulture	<i>Coragyps</i> sp.		
	American kestrel	<i>Falco sparverius</i>		
	American coot	<i>Fulica americana</i>		
	northern fulmar	<i>Fulmarus glacialis</i>		
	black-throated loon	<i>Gavia arctica</i>		
	great northern loon	<i>Gavia immer</i>		
	harlequin duck	<i>Histrionicus ? histrionicus</i>		
	glaucous-winged gull	<i>Larus glaucescens</i>		
	bay goby	<i>Lepidogobias lepidus</i>		
	marbled godwit	<i>Limosa ? fedoa</i>		
	California quail	<i>Lophortyx californica</i>		
	surf scoter	<i>Melanitta perspicillata</i>		
	American white pelican	<i>Pelecanus</i> cf. <i>erythrorhynchus</i>		
	double-crested cormorant	<i>Phalacrocorax auritus</i>		
	Brandt's cormorant	<i>Phalacrocorax penicillatus</i>		
	cormorant	<i>Phalacrocorax</i> sp.		
	horned grebe	<i>Podiceps auritus</i>		
	Cassin's auklet	<i>Ptychoramphus aleuticus</i>		
	sooty shearwater	<i>Puffinus griseus</i>		
	black-vented shearwater	<i>Puffinus opisthomelas</i>		
	western meadowlark	<i>Sturnella neglecta</i>		
snipe	<i>Tontanus</i> sp.			
ray-finned fish	Actinopteri			
requiem shark	<i>Carcharhinus</i> sp.			
white shark	<i>Carcharodon</i> sp.			
houndshark	<i>Galeorhinus zopterus</i>			
white croaker	<i>Genyonemus lineatus</i>			
eagle ray	Myliobatinae indet.			
bat ray	<i>Myliobatis californicus</i>			
sevengill shark	<i>Notorhynchus</i> sp.			
bony fish	Osteichthyes indet.			

Formation	Common Name	Taxon	County	References
San Pedro Formation	midshipman fish	<i>Porichthys myiaster</i>	Los Angeles	Jefferson, 1991; UCMP, 2015; PBDB, 2015; McLeod, 2015
	toadfish	<i>Porichthys notatus</i>		
	skate	<i>Raja</i> sp.		
	shark	Selachii indet.		
	salmon shark	<i>Lamna</i> sp.		
	queen fish	<i>Seriphus politus</i>		
	Pacific angelshark	<i>Squatina californica</i>		
	ray-finned fish	Teleostei indet.		
	round stingray	<i>Urolophus ? halleri</i>		
	round ray	<i>Urolophus</i> sp.		
	shiner perch	<i>Cymataogaster aggregata</i>		
	stingray	<i>Dasyatis dipterus</i>		
	California sheephead	<i>Pimelometopom pulchrum</i>		