



PALEONTOLOGICAL RESOURCES ASSESSMENT

NEWPORT BANNING RANCH NEWPORT BEACH, CALIFORNIA

Prepared for

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Planning Department
3300 Newport Boulevard
Newport Beach, California 92663

Orange County, California
USGS Newport Beach, California Quadrangle

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EXECUTIVE SUMMARY

The Newport Banning Ranch Project would be mostly constructed on the mesa in the eastern portion of the site. Construction would involve grading of building pads, streets and parking lots, and associated trenching for storm drains and utilities. Additionally, because of the erosion and receding of the bluffs, slope modification, stabilization, and revegetation would be part of the construction plan. All of these activities would affect existing and unknown paleontological resources present at the surface and/or buried below the mesa. Because of the nature of this type of construction, the presence of paleontological resources and the possibility of the presence of unrecorded paleontological resources, the State of California and other governmental agencies require a paleontological review consistent with the requirements of the California Environmental Quality Act (CEQA) and other legislation. BonTerra Consulting conducted a Phase II paleontological study, which consisted of a records search, literature review, and limited field reconnaissance in order to evaluate the sensitivity of the substrate underlying the proposed development for the presence of fossil resources and to make recommendations to mitigate the effects of the Project on those resources.

The Phase II study established that three lithologic units underlying the proposed development have been mapped. These units are all relatively young, late Pleistocene to Holocene in age, and consist of Quaternary San Pedro Sand, Quaternary Palos Verdes Sand (Qpv), and Quaternary younger alluvium (Qa). The records search of the Paleontological collections of the Natural History Museum of Los Angeles County Museum (LACM), Departments of Vertebrate Paleontology and Invertebrate Paleontology revealed the presence of previously recorded fossil sites in two mapped units underlying the site. Therefore, the San Pedro Sand and Palos Verdes Sand are considered to have high paleontological sensitivity, while the younger alluvium is of low paleontological sensitivity.

MITIGATION

To ensure that impacts to the paleontological resources would be mitigated to a less than significant level, the following mitigation measures are recommended:

1. Prior to the issuance of the first grading permit and/or action that would allow for Project site disturbance, a paleontological survey shall be conducted to record all paleontological resources present at the surface for those portions of the Project site where grading would occur that will affect Quaternary San Pedro Sand and Quaternary Palos Verdes Sand. A qualified Paleontologist shall make collections of exposed fossils from lithologic units of high paleontologic significance, especially in areas where access to fossil sites is not permitted because of slope modification. All vertebrate and representative samples of megainvertebrates and plant fossils shall be collected. Productive sites yielding vertebrates should be excavated, and approximately 2,000 lbs of rock samples shall be collected to process for microvertebrate fossil remains. Dry screening of fossil marine shell horizons in the Quaternary terrace deposits and San Pedro Sand with $\frac{1}{8}$ -inch archaeological field screens shall be conducted to recover rare types of fossil marine mollusks, bony fish, sharks, reptiles, birds, and marine and terrestrial mammals. All fossil sites shall be tied to detailed measured sections showing sedimentary structures and relationships with over- and underlying rock units.
 - a. For San Pedro Sand, prior to the issuance of the first grading permit and/or action that would permit Project site disturbance, a qualified Paleontologist shall prepare a detailed mitigation plan to sample the existing paleontological sites that would be affected by slope modification. The plan shall be developed in consultation with a local museum (e.g., the LACM or the San

Diego Natural History Museum) in order to describe the size of the sample, methods of collection and processing, stratigraphic information, and other pertinent information. A bulk sample of at least 100 lbs per fossil site shall be processed through fine screens, and all identifiable fossils shall be sorted from the concentrate. Detailed measured geologic sections placing the fossil sites in a stratigraphic sequence must be made. Bulk sampling that is collected from matrix or sediment to recover rare invertebrates, marine vertebrates, and terrestrial vertebrates must also be part of the mitigation plan.

- b. For Quaternary marine terrace deposits (Palos Verdes Sand), prior to the issuance of the first grading permit and/or action that would permit Project site disturbance, a detailed mitigation plan must be developed to sample the existing paleontological sites that would be affected by slope modification. This shall be conducted in consultation with a local museum (e.g., the LACM or the San Diego Natural History Museum) to describe the size of the sample, methods of collection and processing, stratigraphic information, and other pertinent information. A bulk sample of at least 100 lbs per fossil site shall be processed through fine screens, and all identifiable fossils shall be sorted from the concentrate. Detailed measured geologic sections placing the fossil sites in a stratigraphic sequence shall be made. Bulk sampling, collecting, water screening, or dry screening of sediments that contain rare invertebrates, marine vertebrates, and terrestrial vertebrates shall be part of the mitigation plan.
- c. A qualified Paleontologist shall be notified and retained when earth-moving activities are anticipated to impact undisturbed deposits in the San Pedro Sand and Palos Verdes Sand. The designated Paleontologist shall be present during construction activities on a full-time basis to assess whether scientifically important fossils are exposed. Part-time monitoring is recommended in Younger Alluvium. If any scientifically important, large fossil remains are uncovered during earth-moving activities, the Paleontological Monitor shall divert heavy equipment away from the fossil site until s/he has had an opportunity to examine the remains. If warranted, a rock sample shall be collected for processing. The Monitor shall be equipped to allow for the rapid removal of fossil remains and/or matrix (earth), and thus reduce the potential for any construction delays. At the Monitor's discretion, the Grading Contractor may assist in the removal of the fossil remains and rock sample to reduce any delay in construction.
- d. All fossils shall be documented in a detailed Paleontological Resources Impact Mitigation Report. Fossils recovered from the field or by processing shall be prepared; identified; and, along with accompanying field notes, maps and photographs, accessioned into the collections of a designated, accredited museum such as the LACM, or the San Diego Natural History Museum.
- e. Because of slope modification and restoration of the bluff area, most, if not all, the fossil-bearing exposures of the San Pedro Sand and Quaternary marine terrace deposits would be destroyed. If feasible, a few stratigraphic sections with fossil-bearing horizons shall be preserved in perpetuity for educational and scientific purposes.

Nothing in this mitigation measure precludes the retention of a single cross-trained observer qualified to monitor for both archaeological and paleontological resources.

Following these specific recommendations and protocols would reduce the adverse effects of the proposed Project on paleontological resources to a less than significant level.

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SECTION 1.0 INTRODUCTION

This report addresses the proposed Newport Banning Ranch development in the Newport Beach area of Orange County, California (Figure 1). This paleontological report presents archival information gathered by Mark A. Roeder, Orange County Certified Paleontologist at BonTerra Consulting to meet California Environmental Quality Act (CEQA) and other environmental requirements with respect to paleontological resources. The purpose of this report is to (1) provide a paleontological assessment of scientifically important fossil resources occurring within the Project boundaries; (2) specify procedures to be employed for preconstruction sampling and documentation, and for later construction monitoring; and (3) describe the methods to be used for collecting and curating any scientifically important fossils that may be discovered during the course of work.

The proposed Newport Banning Ranch Project consists of development of the mesa or bluff top of the approximate 401-acre site. The construction would include grading or earthmoving activities for pads for residential buildings, parking lots, right-of-ways for roads, and associated trenching for storm drains and utilities to a depth of approximately 25 feet. In addition to the grading, the faces of the bluffs are proposed for modification and revegetation. Except for the bluff areas and the larger drainages, the mesa and wetlands are essentially flat-lying. The site is underlain by three sedimentary deposits or rock units of Quaternary age (Late Pleistocene to Holocene) that accumulated in the Los Angeles basin.

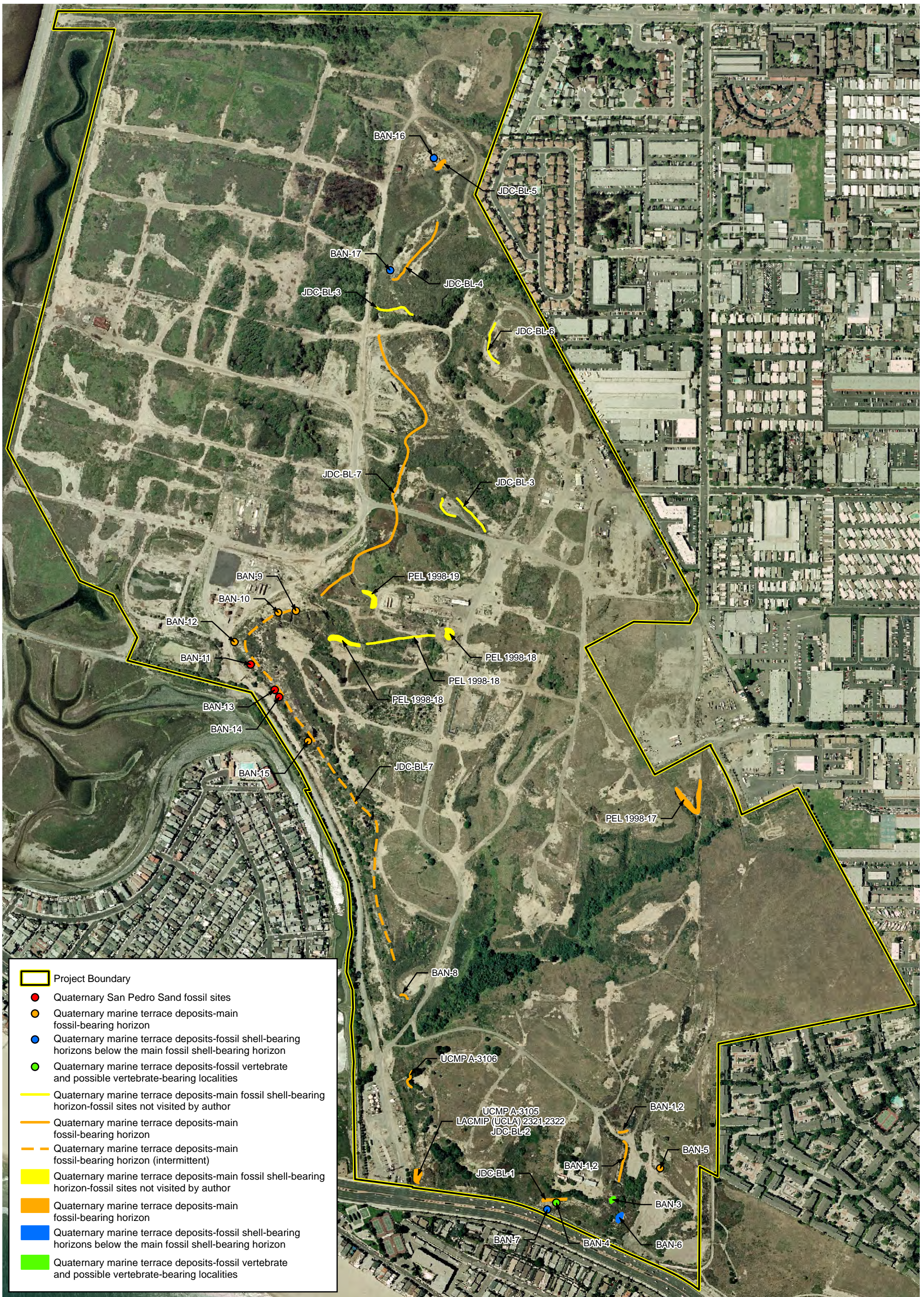
1.1 PALEONTOLOGICAL RESOURCES

A rock unit's paleontological resources consist of any preserved evidence of once-living organisms in the rock. This pertains to fossils preserved either as impressions of soft or hard parts; mineralized remains of hard parts; tracks, burrows, or other trace fossils; coprolites; seeds or pollen; and other microfossils. These organisms may have been terrestrial, aquatic, or aerial in life habit.

Fossils are an important resource to science as they are useful in demonstrating and documenting the evolution of particular groups of organisms. Fossil remains enable geologists to reconstruct the past environment in which the organisms lived and hence the environment during the deposition of the rock unit. Fossils are also extremely useful in determining the age of the rock in which they are preserved. Paleontological resources include fossil remains, fossil localities, and formations that have produced previously recorded fossil material in nearby areas. The paleontological resource is a limited, nonrenewable, sensitive, scientific, and educational resource afforded protection under federal laws and regulations designed to preserve environmental quality. In California, paleontological resources are offered protection under CEQA and other similar legislation.

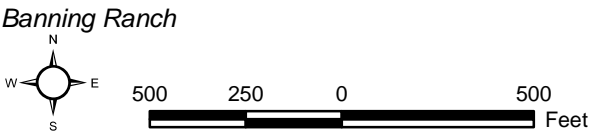
1.2 METHODS

Record searches of the paleontological collections of regional museums were conducted to evaluate whether previous records of formal fossil locality exist on, or within a one mile radius of the Project. Record and literature searches of the paleontological collections and archives of vertebrate and invertebrate departments of the Los Angeles County Museum (LACM) were conducted to determine if any previously recorded fossil localities were in the study area of this Project. Geologic and paleontological literature was reviewed including reports, papers, and maps that cover the limits of the Project. A limited paleontological field reconnaissance of the Project area was conducted by Mark A. Roeder and David A. Alexander.



Map of Banning Ranch Showing Locations of Fossil Sites

Figure 1



Earlier Cooper (1980) and later Langenwaller (1998) conducted field surveys and comprehensive literature and record searches for the study area; the results were incorporated into a paleontological assessment. Based on the presence of numerous previously recorded paleontological sites in and near the Project site and on literature concerning the underlying geology of the proposed Project site, preconstruction field surveys are recommended. Also, the known paleontological resources on the site should be sampled and documented. It is also recommended that all earthmoving activity is closely monitored for paleontological resources.

SECTION 2.0 UNDERLYING GEOLOGY

The geology of the study area has been summarized in Poland et al. (1956), (Morton and Miller 1981), GMU Geotechnical, Inc. (2008), Rogers (1966), and Vedder (1975). The Newport Banning Ranch site is underlain by Late Pleistocene to Holocene sedimentary deposits (Figure 1). There are three distinct stratigraphic units present within the Newport Banning Ranch site. The Quaternary sedimentary units are the San Pedro Sand (Qsp), marine terrace deposits (Qtm), and river alluvium (Qal). The San Pedro Sand and Quaternary marine terrace deposits are best exposed in cliffs, slopes, and drainages beneath the elevated mesa area of the site. Very young surficial (Qcol) colluvium and artificial fill (af) cover portions of all three basic rock units.

2.1 SURFICIAL DEPOSITS

2.1.1 Quaternary Younger Alluvium (Qal)

Present in the wetland area in the northern portion of the study area, this rock unit consists of gravel, sand, and clay associated with the flood plain of the Santa Ana River. Quaternary younger alluvium overlies a late Pleistocene channel of the lower Santa Ana River west of Newport Mesa at a depth of 100 feet (GMU Geotechnical, Inc. 2008). Even though the age of these sedimentary deposits increase with depth, they are less than 10,000 years in age, and do not usually yield fossils.

2.2 OLDER SURFICIAL DEPOSITS

2.2.1 San Pedro Sand (Qsp)

Although for the most part the San Pedro Sand has not been recognized in Orange County, the best exposures of this rock unit lie in Harbor Hill, San Pedro and Palos Verdes Hills, in Los Angeles County (Kennedy 1975, Langenwaller 1975, Woodring et al. 1946). The term “San Pedro beds” was coined by Dall (1898:335) for “the extensive beds of unconsolidated Pleistocene sand replete with molluscan shells in very perfect condition, best exhibited at Harbor Hill, at the head of San Pedro Harbor, California”. Arnold and Arnold (1902) divided their “San Pedro series” into an upper rock unit (now the Palos Verdes Sand, which in part equals the Newport Banning Ranch Quaternary marine terrace deposit) and a lower unit (the present day San Pedro Sand). They set the type section to match what is represented at Deadman Island. The next year, Arnold (1903) cited the type region to be the San Pedro waterfront. Later, Tiege (1926) separated the “upper San Pedro series” and named it the Palos Verdes formation, and retained “San Pedro” for the lower beds.

Woodring et al. (1946) formalized the name “San Pedro sand” for these deposits. The term San Pedro Sand is used for these deposits in the Palos Verdes Hills, but has not gained as much acceptance for similar deposits in the Wilmington, Long Beach, and Signal Hill area of extreme southern Los Angeles County (Poland et al., 1956).

2.2.2 Marine Terrace Deposits (Qtm) (includes Palos Verdes Sand)

Along the western edge of the bluff and in larger drainages overlying rocks of the San Pedro Sand are sediments that comprise the Quaternary marine terrace deposits. The most notable interval within sedimentary formation is the fossil- and shell-bearing horizons that are present over the entire length of the outcrop along the bluff edge and in larger drainages. Elsewhere, these horizons have been named the Palos Verdes Sand (Kennedy 1975, Tieje 1926, Woodring et al. 1946).

As mentioned in the Palos Verdes Hills and San Pedro area in the San Pedro Sand section, Palos Verdes Sand referred to the upper portion of the “San Pedro series” (Arnold and Arnold 1902), which was later named the “Palos Verdes formation” by Tieje (1926). Later, these rocks were referred to as the Palos Verdes Sand (Woodring et al. 1946), and this rock unit only contained marine sand and gravels that occurred on the lowest emergent terrace in the Palos Verdes Hills of Los Angeles County, California. This name has been applied to similar deposits on the lowest emergent terrace in the Los Angeles Basin from Pacific Palisades to Newport Beach (Kennedy 1975). Usually fossils occur in distinct shell-bearing horizons.

SECTION 3.0 EVALUATION OF PALEONTOLOGIC RESOURCES

In order to assess the paleontological resources of the Newport Banning Ranch Project, available maps, reports, and papers that pertain to the geology and paleontology of the lithologic units underlying the proposed pipeline route were examined for documentation of fossil occurrences. The excavations for the Newport Banning Ranch Project on the mesa are understood to be between a depth of at least 6 feet to approximately 25 feet. This large-scale excavation would require mitigation.

3.1 POTENTIAL IMPACTS

Paleontological resources, including fossil remains and associated scientific data, fossil sites and fossiliferous rocks, could be affected by the direct and indirect environmental impacts accompanying the excavation activities for the construction of building pads, roads, and parking lots and slope modification.

Direct impacts would result from the ground-disturbing activities associated with construction and landscaping. If scientifically important paleontological resources are identified with the boundaries of the Project site, excavation and construction could result in the loss of paleontological resources, including scientifically important fossil remains, associated geologic data, fossil sites, and fossiliferous rocks. Although construction would be a short-term activity, the loss of fossil resources would be a permanent impact.

Easier access to fossil sites and the accompanying potential for unauthorized fossil collection by construction personnel, “rock hounds”, and other amateur and commercial fossil collectors would not disturb fossiliferous rocks to a significant degree, but could result in the loss of additional fossil remains, associated scientific data, and fossil sites.

The level (high, low, unknown, or none) of potential significance of these adverse impacts in a particular area is based on the paleontological sensitivity of the formation underlying the area and the potential for disturbing fossil localities and remains therein. The adverse impacts on any fossil locality containing identifiable remains, as well as on the fossiliferous bed that produced them, depends on the paleontological sensitivity of the formation in which the locality and bed occur, the extent of the impact, and the occurrence of other comparable remains nearby.

Additionally, the feasibility of reducing impacts by scientific data collection must also be considered.

3.2 ASSESSMENT CRITERIA

The paleontological sensitivity of a formation or unnamed sedimentary unit, described as high, low, unknown or none, is the measurement most conducive to assessing the sensitivity of the paleontological resources within the study area. The paleontological sensitivity of a formation reflects its potential productivity and the importance of the fossils it has produced in the area. The procedures used in this study to evaluate the paleontological resources of rock units are similar to those used by Wagner (1990, 1995) and the Society of Vertebrate Paleontology (1995).

The potential productivity of a formation is measured as high, low, unknown, or none based upon the densities of fossil specimens or localities within or near the Project site. Exposures of a particular formation within the site would most likely yield fossils similar in number and kind to those previously recorded from the formation in the surrounding area, and may contain a similar density of fossil sites. The criteria for establishing the potential productivity of a formation exposed within the Project site are described below:

- **High potential:** formation contains a high density of fossils sites or has produced numerous remains locally and is very likely to yield additional remains.
- **Low potential:** poorly exposed or studied formation that contains a very low density of recorded fossil localities and has produced few remains locally. Further investigation could establish that it contains comparatively numerous localities and common fossil remains.
- **Unknown potential:** formation for which no data or insufficient data is available about the immediate vicinity to allow an accurate assessment of its potential for yielding important fossil remains within the site.
- **No potential:** unfossiliferous igneous and metamorphic rock units with no potential for yielding any fossil remains or Recent to sub-Recent sedimentary deposits that are too young to yield organic fossil remains greater than 10,000 years old.

To evaluate the paleontological sensitivity for each formation exposed within the site, the following procedures were utilized:

- The productivity of each formation was assessed based upon the densities of fossil localities and remains it has produced locally.
- The importance of the fossil remains recovered from each formation was assessed.
- The importance of fossil remains that might be recovered from a formation if different techniques were used to collect the fossils was assessed. The criterion is implemented due to the effectiveness of screen-washing large volumes of matrix followed by heavy liquid separation in extracting small fossil specimens where no fossils were previously observed.

Based on the above criteria, the surficial Quaternary deposits on the parcel are ranked by the sensitivity rating (see Table 1).

TABLE 1
PALEONTOLOGICAL SENSITIVITY OF THE LITHOLOGIC UNITS
UNDERLYING THE NEWPORT BANNING RANCH PROJECT SITE

Lithologic Unit	Sensitivity
Quaternary younger alluvium	Low
Quaternary Marine Terrace Deposits	High
Quaternary San Pedro Sand	High

SECTION 4.0 PALEONTOLOGICAL RESOURCE ASSESSMENT

The following is a description and evaluation of the resources found in each lithologic unit that is mapped on the Newport Banning Ranch site.

4.1 QSP-SAN PEDRO SAND

Underlying the marine terrace deposits are sediments of the San Pedro Sand (GMU Geotechnical, Inc. 2008). This rock unit is present at the base of the western edge of the mesa and in large drainages. The San Pedro Sand consists of gray to dark gray to reddish-yellow (rust)-stained siltstone and clayey siltstone with friable, interbedded fine to gravelly coarse-grained sandstones. Based on sedimentary structures and variable lithologies, this rock unit represents a wide range of depositional environments. These environments range from near-shore, shallow marine to lagoonal, to back-bay tidal flat (GMU Geotechnical, Inc. 2008). The upper contact of the San Pedro Sand with the overlying marine terrace deposit in most exposures is an angular unconformity.

In the San Pedro area, the San Pedro Sand has yielded crustaceans (Rathbun, 1926); marine mollusks (clams and snails) (Arnold 1903, Arnold 1906, Arnold and Arnold 1902), Valentine 1961, Valentine and Meade 1961, and Woodring et al. 1946); bonyfish and sharks (Fitch 1967); amphibians (Langenwalter 1975); and birds (Langenwalter 1975, Roeder, unpublished data). Large late Pleistocene extinct mammals found here include *Bison*, *Mammuthus* (mammoth), *Paramylodon* (sloth), *Equus* (horse), and *Capromeryx* (very small antelope) (Langenwalter 1975, Miller 1971, Scott and Cox 2008). In addition to the large extinct mammals, extant pond turtle, rabbits, rodents, and marine mammals (Langenwalter 1975, Miller 1971) also occur.

Recent amino acid dating of marine mollusks from the San Pedro Sand in the Palos Verdes Hills has yielded dates of 330,000 years before present (Ponti 1989, Scott and Cox 2008).

The record search revealed no previously recorded paleontological sites either on the site or in adjacent the area (McLeod 2009).

Although not identified in previous paleontological resources surveys (Cooper 1980, Langenwalter 1998), during the course of the limited field reconnaissance, three sites were found (BAN-11,13,14) in rocks mapped as San Pedro Sand. These sites were fossil shell-bearing horizons. The fossil sites represent the first recognized fossils from the San Pedro Sand in Orange County.

4.1.1 Quaternary Terrace Deposits (Qtm) (including Palos Verdes Sand)

Underlying the younger alluvium and just below the top of the bluff in larger drainages, road cuts, large excavations, and overlying rocks of the San Pedro Sand are sediments that comprise the marine terrace deposits (Qtm). The most notable intervals within the sedimentary formation are fossil- and shell-bearing horizons that are present over the entire length of the

outcrop along the bluff edge and in larger drainages. Elsewhere, these horizons have been named the Palos Verdes Sand (Kennedy 1975, Tieje 1926, Woodring et al. 1946).

In the Newport Beach and Costa Mesa area, the Palos Verdes Sand horizon of the Quaternary marine terraces deposits has been exposed in natural outcrops and man-made excavations. A number of fossil shell-bearing horizons have been found (Bruff 1945; Cooper 1978; Kanakoff and Emerson 1959; Peska, 1975, 1976, 1984; Powell et al. 2004). Unfortunately, most of these sites have been destroyed (Fitch 1966).

In the northern and southern portion of the study area, underlying the young alluvium are primarily marine sands of the Quaternary marine terrace deposits Palos Verdes Formation (Tieje 1926). The rock unit consists of greenish-gray, fine- to medium-grained sand with traces of silt and clay, and is located on the lowest emergent terrace in the Los Angeles Basin from Newport Beach to Pacific Palisades.

In the past, construction has exposed a number of fossil outcrops in this rock unit. Although primarily known for its fossil mollusks (Kennedy 1975), the Palos Verdes Sand has yielded remains of sharks, bony fish (Fitch 1970), birds, and marine mammals (Langenwaller 1975). In addition to the marine fossils, a number of large, extinct, Ice Age land mammals such as mammoth, mastodon, bison, horse, and camel (Jefferson 1991b, Langenwaller 1975, Miller 1971) were found. Usually fossils occur in distinct shell-bearing horizons. The Palos Verdes Sand is estimated to be at least 120,000 years old (Fanale and Schaeffer 1965) and represents a time when coastal waters off Southern California were several degrees warmer than today (Fitch 1970, Kennedy 1975).

Elsewhere in the Newport Beach and Costa Mesa area, the Palos Verdes Sand horizon of the Quaternary marine terraces deposits has been exposed in natural outcrops and man-made excavations. A number of fossil shell-bearing horizons have been found (Bruff 1946; Kanakoff and Emerson 1959; Peska 1976, 1984; Powell et al. 2004). Unfortunately, most of the Palos Verdes Sand exposures in the Los Angeles and Orange County area that were studied in the past have been destroyed during the construction of housing projects, shopping centers, and road and freeway construction (Fitch 1966, Long 1993).

Although the records search (McLeod 2009) reveal no previously recorded fossil sites on the parcel, properties adjacent to the Newport Banning Ranch site have a number of known paleontological sites. During grading of the lower parking lot at Hoag Memorial Hospital, a fossil horse (*Equus*) (McLeod 2009) and a variety of marine shells were collected (LACMIP 4007) from a shell horizon (Palos Verdes Sand) in the Quaternary marine terrace deposits (Lander and Roeder 1997). Langenwaller (1998) noted a number of Palos Verdes Sand sites in the Quaternary marine terrace deposits of the adjacent Newport Banning Ranch. Some of these sites are Museum of Paleontology, University of California, Berkeley (UCMP) and Natural History Museum of Los Angeles County Invertebrate Paleontology sites (Bruff 1946). The intersection of 19th Street and Anaheim Avenue (LACM 3267) in the City of Costa Mesa produced a specimen of a fossil elephant (McLeod 2009). UCMP V-93124 (Long 1993) and LACM 4219, located along State Route 55 (SR-55) near Santa Isabel Avenue, yielded a wealth of fossils during construction of the freeway. Over 200 species of marine invertebrates (Mount 1981; Peska 1975), 41 species of marine fishes (Long 1993), pond turtle, birds, and 7 kinds of mammals (marine and terrestrial), including Camel and Bison, were discovered (Long 1993, McLeod 2009).

The main fossil shell-bearing horizon, which varies from six inches to two feet in thickness, identified by Bruff (1946) and in later paleontological resources assessments by Cooper (1980) and more recently by Langenwaller (1998), is present just below the top of the bluff in road cuts and other excavations and in drainages from along the western edge of the mesa. From the

literature and records search, this horizon has been assigned the following field and **institutional numbers** from north to south: JDC-BL-5, JDC-BL-4, JDC-BL-6, JDC-BL-7, JDC-BL-6, JDC-BL-3, PEL 1998-19, PEL 1998-18, PEL 1998-17, **UCMP A-3106**, JDC-BL-2, **LACMIP (UCLA 2321/2)**, **UCMP A-3105**, JDC-BL-1, BAN 5, 8, 9, 10, 12 and 15. (Figure 1). During the limited field survey, BonTerra Consulting found this horizon in the southeastern corner of the site (BAN-1 and 2). In looking closer to the stratigraphy of the Quaternary marine terrace deposits, several fossil shell-bearing horizons were found that were 10 to 20 feet stratigraphically below the main shell horizon (BAN-6, 7, 16, and 17). These horizons had a different mix of invertebrate (marine clams and snails) species and may have been deposited in slightly different marine environments. Also, there were two localities (BAN-3 and 4) that appear to be mudstone-filled lagoonal channels. One of them (BAN-3) yielded fossil oyster shells, freshwater snails, large mammal bone fragment, and small bones of small mammals on the surface. It is recommended that collection and water screening is completed using bulk sample matrix with fine mesh screens to recover the bones of small vertebrates. Also, a tibia fragment of a *Bison* or a large, extinct Ice Age mammal was collected in a very disturbed area of the site. Though the locality could not be pinpointed, about 10 years ago, a fossil whale skull was uncovered during geotechnical trenching on the site. It is recommended that this specimen be relocated and collected. Fossil whale skulls and skeletons are rare in Late Pleistocene deposits in Southern California (Demere 2009, personal communication).

Some of the Quaternary marine terrace deposits in part may be non-marine. In similar deposits in the City of Huntington Beach, large, extinct Ice Age mammals such as mammoth, horse, and bison were found (de Barros and Roeder 2001, 2009; Wake and Roeder, in press). Additionally, pond deposits dated at 40,000 years before present yielded more than 2,000 fossils specimens from the Quaternary marine terrace deposits. Virtually all of the specimens were recovered as a result of processing (waterscreening) one ton of fossiliferous rock recovered from one fossil site. Fossils recovered included pollen and spores of 30 kinds of plants and trees; shells from 4 kinds of freshwater ostracods; 8 kinds of land and freshwater snails and 1 slug; a freshwater clam, bones of 2 species of freshwater/marine fish, 1 variety of freshwater fish, bones of 3 kinds of amphibians; bones of 12 kinds of reptiles; bones of 2 kinds of birds; and bones and teeth of 10 kinds of small mammals (Wake and Roeder, in press.). These types of fossil sites that produce small vertebrates in abundance are rare (Jefferson 1991a).

Unfortunately, most of the Palos Verdes Sand exposures in the Los Angeles and Orange County area that were studied in the past have been destroyed during the construction of housing projects, shopping centers, roads and freeways (Fitch 1966).

4.1.2 Quaternary Younger Alluvium (Qa)

The records and literature searches revealed no fossils are known from Quaternary younger alluvium on or adjacent to the site.

SECTION 5.0 SUMMARY

The usual mitigation measure included in a paleontological resources assessment is to provide paleontological monitoring during earthmoving activities associated with construction. Most properties do not have paleontological resources exposed at the surface, and fossils are usually found during the earthmoving activities as grading exposes the overlying geology. Newport Banning Ranch in many ways is unique; paleontological resources are exposed in natural outcrops, borrow areas, and drainages over most of the site. The first fossils were found in the San Pedro Sand in Orange County. Several shell-bearing horizons were found during the limited field survey. Most of the site had a prominent two-foot-thick shell-bearing horizon in the Quaternary marine terrace deposits (elsewhere called the Palos Verdes Sand), which can be

traced from the northern to the southern end of the site. Additionally there are several shell-bearing horizons below the main shell bed.

SECTION 6.0 RECOMMENDED MITIGATION MEASURES

The procedures recommended below would mitigate to a less than significant level adverse impacts on the known paleontological resources that would occur as a result of the earthmoving activities (e.g., construction activities of Newport Banning Ranch and slope stabilization). These procedures would allow for the recovery and preservation of some highly significant fossil remains and associated scientific data that might otherwise have been lost as a result of indiscriminate earthmoving activities associated with construction. The recommended level of mitigation effort in particular areas reflects the paleontological importance of the underlying rock unit, the type and magnitude of the impact, and the potential for loss of fossil specimens and associated geologic data due to earthmoving activities and unauthorized fossil collections.

When appropriate mitigation measures are initiated, earthmoving activities could prove beneficial by exposing fresh rock and allowing the collection of fossil remains and associated data that otherwise might not have been collected, particularly with regard to sediments from which no remains had been previously recorded. Mitigation programs containing measures similar to those presented below have resulted in the recovery of abundant fossil remains in beds from which few or no remains had been previously reported. Moreover, these programs have usually caused little or no delay in construction.

This mitigation plan follows federal, State, and County agency mitigation requirements for protecting paleontological resources on lands under their respective jurisdictions and is based on the results of the archival and literature search. Its implementation would reduce adverse construction-related impacts on paleontological resources to a less than significant level. The following measures constitute the mitigation program:

MM-1 Prior to the issuance of the first grading permit and/or action that would permit Project site disturbance, the Contractor shall provide written evidence to the City of Newport Beach Planning Department that the Contractor has retained a qualified Paleontologist to observe grading activities and to conduct salvage excavation of paleontological resources as necessary. The Paleontologist shall be present at the pre-grading conference; shall establish procedures for paleontological resources surveillance; and shall establish, in cooperation with the City, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of the fossils as appropriate.

Any earth-moving activity associated with development, slope modification, or slope stabilization that requires moving large volumes of earth shall be monitored according to the paleontological sensitivity of the rock units that underlie the affected area. All vertebrate fossils and representative samples of megainvertebrates and plant fossils shall be collected. Productive sites that yield vertebrates should be excavated, and approximately 2,000 pounds (lbs) of rock samples should be collected to be processed for microvertebrate fossil remains.

If any scientifically important large fossil remains are uncovered during earth-moving activities, the Paleontologist shall divert heavy equipment away from the fossil site until s/he has had an opportunity to examine the remains. If warranted, a rock sample will be collected for processing. The Paleontologist shall be equipped to rapidly remove fossil remains and/or matrix (earth), and thus reduce the potential for any construction delays.

If scientifically important fossil remains are observed and if safety restrictions permit, the Construction Contractor shall allow the Paleontologist to safely salvage the discovery. At the Paleontologist's discretion, the Grading Contractor may assist in the removal of the fossil remains and rock sample to reduce any construction delays.

All fossils shall be documented in a detailed Paleontological Resource Impact Mitigation Report. Fossils recovered from the field or by processing shall be prepared; identified; and, along with accompanying field notes, maps and photographs, accessioned into the collections of a designated, accredited museum such as the Natural History Museum of Los Angeles County (LACM) or the San Diego Natural History Museum.

Because of slope modification, fossil-bearing exposures of the Quaternary marine deposits may be destroyed. If feasible, a few stratigraphic sections with fossil-bearing horizons shall be preserved for educational and scientific purposes.

MM-2

Prior to the issuance of the first grading permit and/or action that would allow for Project site disturbance, a paleontological survey shall be conducted to record all paleontological resources present at the surface for those portions of the Project site where grading would occur that will affect Quaternary San Pedro Sand and Quaternary Palos Verdes Sand. A qualified Paleontologist shall make collections of exposed fossils from lithologic units of high paleontologic significance, especially in areas where access to fossil sites is not permitted because of slope modification. All vertebrate and representative samples of megainvertebrates and plant fossils shall be collected. Productive sites yielding vertebrates should be excavated, and approximately 2,000 lbs of rock samples shall be collected to process for microvertebrate fossil remains. Dry screening of fossil marine shell horizons in the Quaternary terrace deposits and San Pedro Sand with $\frac{1}{8}$ -inch archaeological field screens shall be conducted to recover rare types of fossil marine mollusks, bony fish, sharks, reptiles, birds, and marine and terrestrial mammals. All fossil sites shall be tied to detailed measured sections showing sedimentary structures and relationships with over- and underlying rock units.

- a. For San Pedro Sand, prior to the issuance of the first grading permit and/or action that would permit Project site disturbance, a qualified Paleontologist shall prepare a detailed mitigation plan to sample the existing paleontological sites that would be affected by slope modification. The plan shall be developed in consultation with a local museum (e.g., the LACM or the San Diego Natural History Museum) in order to describe the size of the sample, methods of collection and processing, stratigraphic information, and other pertinent information. A bulk sample of at least 100 lbs per fossil site shall be processed through fine screens, and all identifiable fossils shall be sorted from the concentrate. Detailed measured geologic sections placing the fossil sites in a stratigraphic sequence must be made. Bulk sampling that is collected from matrix or sediment to recover rare invertebrates, marine vertebrates, and terrestrial vertebrates must also be part of the mitigation plan.
- b. For Quaternary marine terrace deposits (Palos Verdes Sand), prior to the issuance of the first grading permit and/or action that would permit Project site disturbance, a detailed mitigation plan must be developed to sample the existing paleontological sites that would be affected by slope modification.

This shall be conducted in consultation with a local museum (e.g., the LACM or the San Diego Natural History Museum) to describe the size of the sample, methods of collection and processing, stratigraphic information, and other pertinent information. A bulk sample of at least 100 lbs per fossil site shall be processed through fine screens, and all identifiable fossils shall be sorted from the concentrate. Detailed measured geologic sections placing the fossil sites in a stratigraphic sequence shall be made. Bulk sampling, collecting, water screening, or dry screening of sediments that contain rare invertebrates, marine vertebrates, and terrestrial vertebrates shall be part of the mitigation plan.

- c. A qualified Paleontologist shall be notified and retained when earth-moving activities are anticipated to impact undisturbed deposits in the San Pedro Sand and Palos Verdes Sand. The designated Paleontologist shall be present during construction activities on a full-time basis to assess whether scientifically important fossils are exposed. Part-time monitoring is recommended in Younger Alluvium. If any scientifically important, large fossil remains are uncovered during earth-moving activities, the Paleontological Monitor shall divert heavy equipment away from the fossil site until s/he has had an opportunity to examine the remains. If warranted, a rock sample shall be collected for processing. The Monitor shall be equipped to allow for the rapid removal of fossil remains and/or matrix (earth), and thus reduce the potential for any construction delays. At the Monitor's discretion, the Grading Contractor may assist in the removal of the fossil remains and rock sample to reduce any delay in construction.
- d. All fossils shall be documented in a detailed Paleontological Resources Impact Mitigation Report. Fossils recovered from the field or by processing shall be prepared; identified; and, along with accompanying field notes, maps and photographs, accessioned into the collections of a designated, accredited museum such as the LACM, or the San Diego Natural History Museum.
- e. Because of slope modification and restoration of the bluff area, most, if not all, the fossil-bearing exposures of the San Pedro Sand and Quaternary marine terrace deposits would be destroyed. If feasible, a few stratigraphic sections with fossil-bearing horizons shall be preserved in perpetuity for educational and scientific purposes.

Nothing in this mitigation measure precludes the retention of a single cross-trained observer qualified to monitor for both archaeological and paleontological resources.

Following these specific recommendations and protocols would reduce the adverse effects of the proposed Project on paleontological resources to a less than significant level.

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