3.2.4 Paleontology

3.2.4.1 Regulatory Setting

Paleontology is a natural science focused on the study of ancient animal and plant life as it is preserved in the geologic record as fossils. A number of federal statutes specifically address paleontological resources, their treatment, and funding for mitigation as a part of federally authorized or funded projects (e.g., Antiquities Act of 1906 [16 U.S.C. 431-433], Federal-Aid Highway Act of 1960 [23 U.S.C. 305]). Under California law, paleontological resources are protected by CEQA.

3.2.4.2 Affected Environment

This section is based on a Paleontological Identification Report/Paleontological Evaluation Report (PIR/PER) (August 2011) that was completed for the project.

A paleontological literature and records review was conducted, drawing from archival resources and relevant geologic and paleontological reports, both published and unpublished. For the purposes of the literature and records searches, a boundary of 1-mile was utilized. The University of California Museum of Paleontology, the Natural History Museum of Los Angeles County, and the San Diego Natural History Museum were all consulted for paleontological site records. A field survey was also conducted, which included a vehicular windshield survey (August 7, 2010) and a pedestrian survey (August 20, 2010).

Orange County lies within the Peninsular Ranges geophysical province. The western portion of Orange County is made up of two broad sloping plains – Downey and Tustin – formed from alluvium transported from the mountains by the Santa Ana River, Santiago Creek, and other local streams. The Downey Plain is formed specifically by the outwash of the Santa Ana River, Coyote Creek, Carbon Creek, and Santiago Creek. The Downey Plain is characterized by interbedded marine and nonmarine sedimentary rock units deposited during the Neogene. The elevation of the plain along the course of the project ranges from 22 to 30 ft. The existing I-405 in the project area is generally 3 to 7 ft above grade, with overpasses 25 to 30 ft above grade. The entire project lies within the Downey Plain.

The surficial stratigraphy of the project area has been mapped in greatest detail by Poland and Piper (1956) at a scale of 1:31,680; this mapping showed the surface geology of the entire project area as Qal (Quaternary alluvium) with some of the coastal regions to the south mapped as Qpu (Upper Pleistocene terrace cover including the Palos Verdes Sand and unnamed deposits). Erosional events that divided the terraces into mesas date to at least the Early

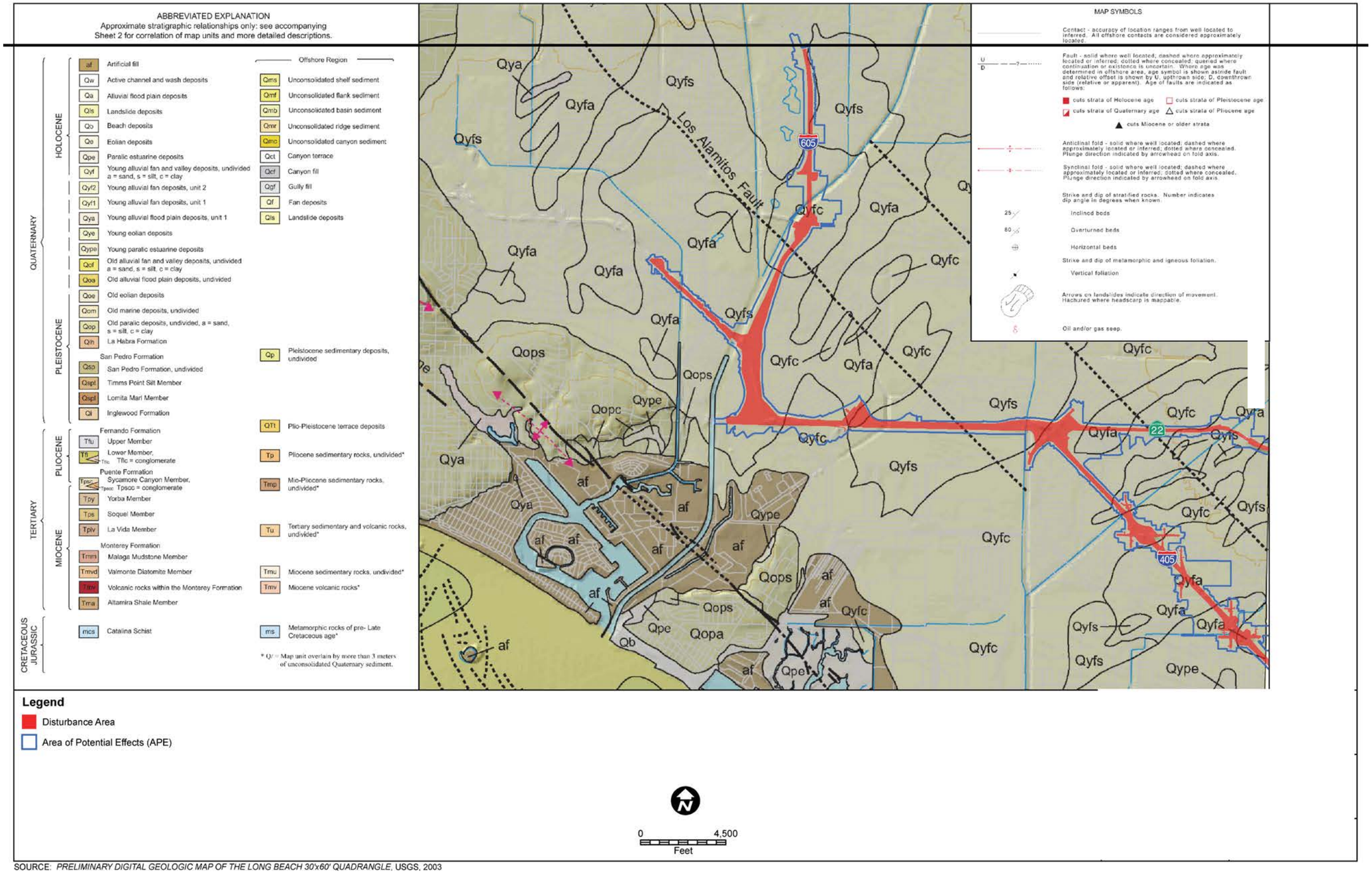
Holocene, and a radiocarbon date of 8,030 + 300 years has been reported from a depth of 40 ft in the Santa Ana Gap (Morton *et al.*,1976). The stratigraphy of the subsurface, as depicted by Poland *et al.* (1959), indicates that if a hole were drilled on I-405, Upper Pleistocene deposits would be encountered, followed by the San Pedro Formation (Pleistocene), the Pico Formation (Pliocene), and then the Puente Formation (late Miocene). These formations are shown in Figures 3.2.4-1 and 3.2.4-2.

What Poland *et al.* (1959) showed as the Puente Formation in the project area is now referred to as the Monterey Formation by more recent authors (Barron, 1975, 1976; Morton and Miller, 1981). The Monterey Formation in the Newport Bay area has produced significant paleontological resources (Stewart *et al.*, 2008); therefore, it has a highly rated sensitivity level. What Poland *et al.* (1959) mapped as the Pico Formation is now known as the Capistrano Formation (Barron, 1975a, b, 1976) or the Niguel and Capistrano formations (Morton and Miller, 1981) by more recent authors. The Capistrano Formation has produced abundant vertebrate fossils, and vertebrate fossils have been observed at multiple localities within the Niguel formation (Barnes and Raschke, 1991; Barnes *et al.*, 1984; Conkling, 1991; Ebling, 1962; Fierstine, 2008; Hilton and Grande, 2006; Miller, 1951; Stewart, 2000; Stewart and Raschke, 1999); therefore, the sensitivity of the Capistrano and Niguel formations is rated as high.

The San Pedro Formation (Early to Middle Pleistocene) also has produced significant paleontological resources (Lander 2006); therefore, it likewise has a high level of sensitivity assigned to it. Some Late Pleistocene deposits in the project area are referred to as Palos Verdes Sands (Bruff, 1946; DeLong, 1941; Kanakoff, 1953; Kanakoff and Emerson, 1959; Lance, 1948; Long, 1993). These also have been the source of significant paleontological resources (Howard 1949; Lance 1948; Long 1993) and must be assigned a high level of sensitivity.

3.2.4.3 Environmental Consequences

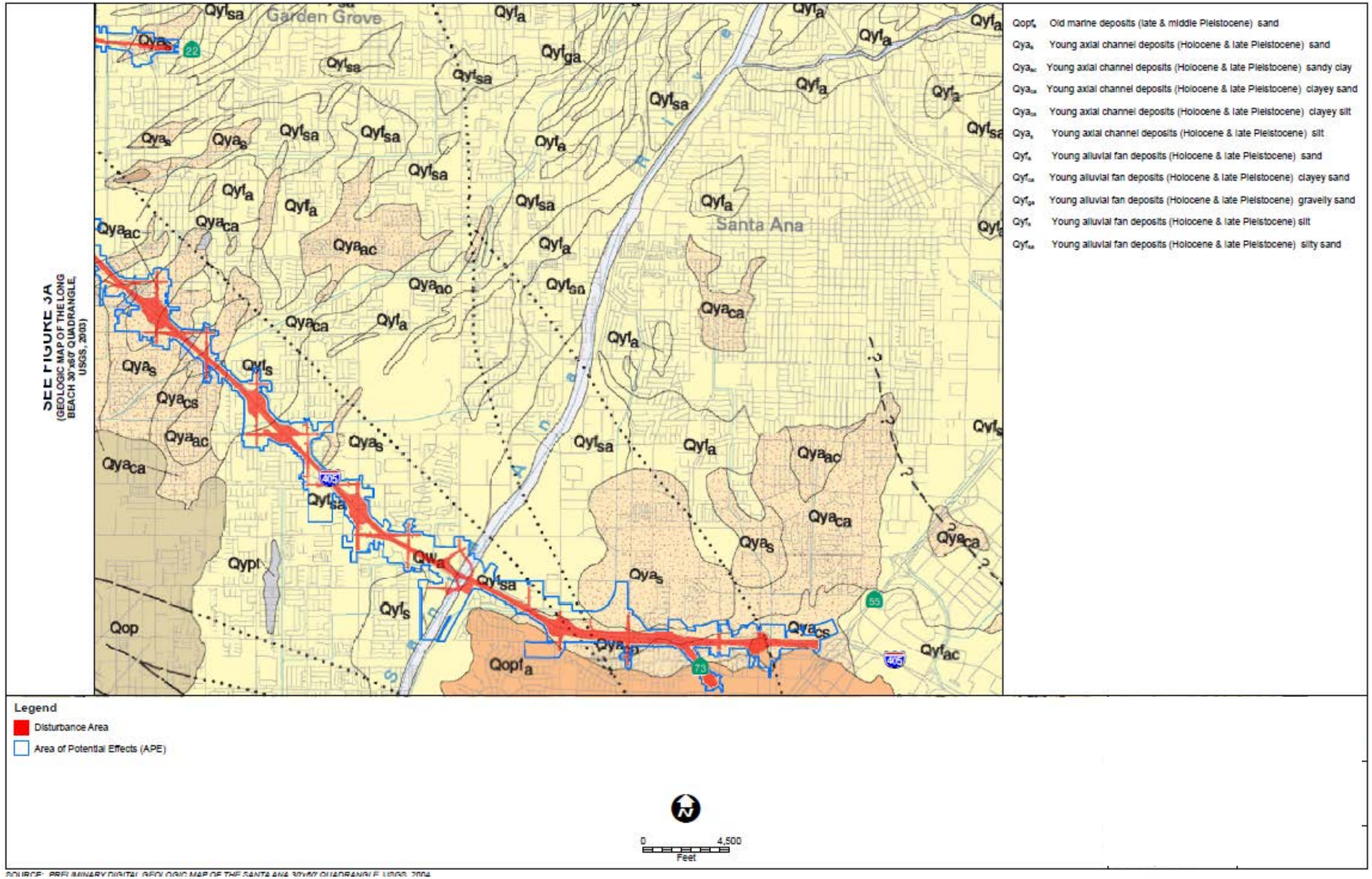
The following analysis of potential impacts to paleontological resources is applicable to all three build alternatives, with or without the associated variations. All of the build alternatives would encounter similar formational conditions, with the type and nature of associated impacts therefore also the same.



SOURCE: *PRELIMINARY DIGITAL GEOLOGIC MAP OF THE LONG BEACH 30'x60' QUADRANGLE*, USGS, 2003

Figure 3.2.4-1: Paleontological Sensitivities

This page intentionally left blank.



SOURCE: PRELIMINARY DIGITAL GEOLOGIC MAP OF THE SANTA ANA 30'X60' QUADRANGLE, USGS, 2004

Figure 3.2.4-2: Paleontological Sensitivities

This page intentionally left blank.

Direct impacts to paleontological resources are the effects that occur to fossiliferous sediments during construction. These effects include mass grading, cutting, tunneling, and boring. The direct impacts are the destruction of the fossil remains and the geographic, geologic, phylogenetic, and taphonomic information associated with them. These resources are considered nonrenewable because the organic remains preserved from any given time period are finite and are diminished through time due to natural and artificial processes.

Impacts to paleontological resources are rated in accordance to the sensitivity ratings of the rock units impacted. Below is a summary of the sensitivity of the formations most likely to be impacted by the proposed project.

- ***High Scientific Significance:*** Direct impacts to high-sensitivity rock units (unnamed Pleistocene sediments, Palos Verdes Sand, San Pedro Formation).
- ***Low Scientific Significance:*** Direct impacts to low-sensitivity rock units (alluvium at the surface).
- ***Zero Scientific Significance:*** Direct impacts to zero-sensitivity rock units (artificial fill).

Permanent Impacts

No Build Alternative

Because the No Build Alternative does not involve construction elements, there would be no excavation activities and no potential for encountering paleontological resources; therefore, there would be no permanent impacts to paleontological resources.

Build Alternatives

As discussed above, the proposed project would include earth-moving activities resulting in ground disturbance and modification to existing freeway and local street structures. Sediments in the project study area have the potential to contain vertebrate fossils; therefore, disturbance of sediments below grade has the potential to impact paleontological resources along the ROW. Geotechnical studies completed near some of the project structures noted plant fibers and peat layers in auguring samples (Group Delta Consultants 2009a, 2010b). These findings could indicate the presence of identifiable plant fossils. Marine fossils were also reported 30 to 50 ft below the surface at another structure (Group Delta Consultants 2009b). Because Pleistocene vertebrates have been found at 10 to 15 ft below ground level and deeper near the project, and because vertebrate fossils have been recovered from borings in the project vicinity, it is concluded that improvements proposed for the project are situated above paleontologically sensitive sediments; therefore, disturbance of sediments below grade has the potential to impact paleontological resources along most of the ROW. The main anticipated impacts would be where

there is auguring for overhead signage and where the overcrossings and railroad overheads are replaced, particularly in the foundations and auguring. The auguring can be up to 30 ft deep and 5 ft in diameter. Foundations extend 10 ft below the surface. During final design, a qualified paleontologist shall be retained to review the design plans, Final EIR/EIS, geotechnical data, and PIR/PER prepared for this project. The qualified paleontologist will consider available information on depth of disturbance proposed and depth of fill at each augering or foundation location.

To reduce direct impacts to any paleontological resources that may be present within the study area where excavation may take place, a Paleontological Mitigation Plan (PMP), as described in Measure PAL-1, will be prepared and implemented if construction activities will penetrate 5 ft or more into previously undisturbed sediments. With adoption of this measure, permanent impacts to paleontological resources as a result of the three build alternatives would not be adverse.

Temporary Impacts

No Build Alternative

Because the No Build Alternative does not involve construction elements, there would be no excavation activities and no potential for ground or structure disturbance or encountering paleontological resources; therefore, there would be no temporary impacts to paleontological resources.

Build Alternatives

Earth-moving activities associated with construction are the most common source of impacts to significant paleontological resources. All of the build alternatives would require ground disturbance and modification to existing freeway and local street structures. These construction activities could result in direct impacts to paleontological resources; these impacts would be permanent in nature and are addressed previously under Permanent Impacts (Build Alternatives).

3.2.4.4 Avoidance, Minimization, and/or Mitigation Measures

The following measure(s) include recommendations for avoidance of the resource area and impact mitigation measures during construction.

PAL-1: If auguring or foundation construction will penetrate 5 ft or more into undisturbed sediment, Caltrans shall ensure that a PMP is prepared and adhered to during construction of the portions that are identified as having high paleontological sensitivity. The PMP shall include, but not be limited to, the following instructions:

- A qualified principal paleontologist (MS or PhD in paleontology or geology familiar with paleontological procedures and techniques) will be retained to prepare a PMP following Caltrans SER if auguring or foundation construction will penetrate 5 ft or more into undisturbed sediment.
- The paleontologist will be present to consult with construction contractors at pre-grading meetings.
- Paleontological monitoring under the direction of the qualified principal paleontologist will be performed for subsurface construction activities involving sensitive geologic formations.
- When fossils are discovered, the paleontologist (or paleontological monitor) will recover them. Construction work in these areas will be halted or diverted to allow recovery of fossil remains in a timely manner.
- Fossil remains collected during the monitoring and salvage portion of the mitigation program will be prepared and cataloged.
- Prepared fossils, along with copies of all pertinent field notes, photos, and maps, will then be deposited in a scientific institution with paleontological collections.
- A final report will be completed that outlines the results of the mitigation program.

This page intentionally left blank.