

2.2.4 Paleontology

This section evaluates potential impacts to paleontological resources that could result from operation of the Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative. Impacts to paleontological resources that could occur during project construction are discussed in Section 2.4, and cumulative impacts are discussed in Section 2.5.

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 projects.

- 16 United States Code (USC) 431-433 (the “Antiquities Act”) prohibits appropriating, excavating, injuring, or destroying any object of antiquity situated on federal land without the permission of the Secretary of the Department of Government having jurisdiction over the land. Fossils are considered “objects of antiquity” by the Bureau of Land Management, the National Park Service, the Forest Service, and other federal agencies.
- 16 United States Code (USC) 470aaa (the Paleontological Resources Preservation Act) prohibits the excavation, removal, or damage of any paleontological resources located on federal land under the jurisdiction of the Secretaries of the Interior or Agriculture without first obtaining an appropriate permit. The statute establishes criminal and civil penalties for fossil theft and vandalism on federal lands.
- 23 United States Code (USC) 305 authorizes the appropriation and use of federal highway funds for paleontological salvage as necessary by the highway department of any state, in compliance with 16 USC 431-433 above and state law.

Under California law, paleontological resources are protected by the California Environmental Quality Act (CEQA).

Affected Environment

The information in this section is derived from the proposed project’s Paleontological Evaluation Report (2008) and Paleontological Evaluation Report – Addendum (2011).

Tier I Corridor Alternatives

Marine and continental sedimentary deposits of Tertiary and Quaternary age are located near urban areas of Santa Cruz, Capitola, Soquel, and Aptos. Potentially fossiliferous rocks include strata ranging in age from Tertiary Miocene (i.e., Santa Margarita Sandstone and Santa Cruz Mudstone) to Holocene alluvial deposits. The Pliocene through Quaternary strata

along the project right-of-way (listed from oldest to youngest) are: Pliocene Purisima Formation, Plio-Pleistocene Aromas Sand, Pleistocene terrace deposits, and Quaternary alluvium.

The Pliocene Purisima Formation is the most widespread stratigraphic unit along the Pacific Coast of central California and underlies most of the Santa Cruz-Aptos area. The Pliocene Purisima Formation is almost continuously exposed in sea cliffs up to 100 feet high and is also exposed in deep canyons in the foothills above the urbanized terraces. The basal sandstone of the Purisima Formation has yielded a radiometric date of 6.7 ± 0.5 million years, suggesting a late Miocene age for the lowermost part of the formation. Most of the Purisima appears to be Pliocene in age based on invertebrate and vertebrate fossils.

Rocks and/or sediments of the Purisima Formation have produced fossilized remains of extinct species at various previously recorded fossil sites in the Santa Cruz area. During field surveys on April 10 through 12, 2007, abundant invertebrate fossils, fossil leaves, and trace fossils were found in Purisima Formation sediments at several localities and were observed in project right-of-way exposures. Trace fossils are geologic records of biological activity and may be impressions made in the rocks and/or sediments by an organism; for example, burrows, borings, or footprints. The presence of fossils in the formation indicates a high potential for similar fossil remains to be uncovered by excavation during project construction. The Purisima Formation is considered to have a high sensitivity to impacts resulting from ground disturbances.

Aromas Sand conformably overlies the Purisima Formation. Its age is most likely Pleistocene, although it has also been classified as Plio-Pleistocene. Fossil vertebrates and trace fossils have been previously reported in Aromas Sand. Casts of roots and burrows were discovered in fossil soils during the field surveys. The presence of fossil soils (i.e., paleosols) in the Aromas Sand indicates that scientifically important fossils may be discovered during project construction.

Prominent Pleistocene terrace deposits overlie both the Purisima Formation and Aromas Sand to form extensive coastal deposits in the Santa Cruz-Aptos area. The wave-cut terraces represent ancient shorelines, and the amounts of sediments deposited on these terraces are highly variable, ranging from a few feet to 200 feet thick. The youngest marine terrace, at approximately 100 feet above sea level, is from 90,000 to 120,000 radiocarbon years old.

Pleistocene marine and river terrace deposits in the Santa Cruz-Aptos area have produced marine invertebrates, vertebrates, and microfossils. Fossils were previously reported in published and unpublished geological and paleontological literature from Pleistocene terrace deposits in the vicinity of the project right-of-way. These terrace deposits are judged to have high sensitivity; however, no fossils were observed in terrace deposits during field surveys and they are not common.

Quaternary Alluvium refers to gravel, sand, silt, and clay deposited along the channels of streams and floodplains, such as Soquel, Aptos, and Valencia creeks. During the April 2007 field surveys, there were no indications that this stratigraphic unit contained fossils.

Quaternary Alluvium is considered to have low sensitivity for fossils because it has not been known to produce fossils in the past.

Identifiable fossil remains discovered in Pliocene Purisima Formation, Plio-Pleistocene Aromas Sand, and Pleistocene terrace deposits during project construction could represent geographic or temporal range extensions and new taxa or new fossil records for the Santa Cruz-Aptos area and/or for the State of California. The Aromas Sand in particular is judged to have high sensitivity to discover significant fossils due to the previous discovery of fossil vertebrates and trace fossils in the vicinity of the project right-of-way. However, the infrequent occurrence of fossils indicates a low probability of adverse impacts on paleontological resources from ground disturbances in this area. Additional fossil remains could contribute to more accurately determine the age, paleoclimate, and/or depositional environment of the sediments from which they are discovered. Finally, fossil remains recovered during project construction could provide a more comprehensive documentation of the diversity of animal and plant life that once existed in Santa Cruz County, allowing a more accurate reconstruction of the geologic and paleobiologic history of the central California coast and Monterey Bay.

Tier II Auxiliary Lane Alternative

Potentially fossiliferous rocks include strata ranging in age from Miocene (i.e., Santa Margarita Sandstone and Santa Cruz Mudstone) to Holocene alluvial deposits. These strata dip gently toward the southeast away from the uplifted granite and metamorphic rocks composing Ben Lomond Mountain. The older stratigraphic units (i.e., Santa Margarita Sandstone and Santa Cruz Mudstone), as well as the Plio-Pleistocene Aromas Sand, are not exposed within the Tier II Auxiliary Lane Alternative right-of-way; therefore, in all probability, they would not be impacted by excavation occurring during construction. Consequently, these formations are not of concern here. The Pliocene through Quaternary strata that would be affected by excavation during construction are described in the Tier I Affected Environment discussion above and include the Pliocene Purisima Formation, Pleistocene Terrace Deposits, and Quaternary alluvium.

Environmental Consequences

Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative There would no impacts to paleontological resources during operation of the Tier I Corridor Alternatives or the Tier II Auxiliary Lane Alternative because excavation is not expected to occur. Impacts could occur during the construction phase of the project, such as the permanent destruction of paleontological resources, and these impacts are discussed in Section 2.4.8 Paleontology.

No Build Alternative

The No Build Alternative would not result in ground-disturbing activities that could affect paleontological resources.

Avoidance, Minimization, and/or Mitigation Measures

Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative

No impacts to paleontological resources are anticipated during project operations. Measures to mitigate construction-period impacts, including the potential permanent destruction of paleontological resources, are discussed in Section 2.4.8 Paleontology.