

3.6 Geology and Soils

This section describes and evaluates potential impacts related to geology and soils conditions and hazards, including paleontological resources. The section contains: (1) a description of the existing regional and local conditions of the Project Site and the surrounding areas as it pertains to geology and soils as well as a description of the Adjusted Baseline Environmental Setting; (2) a summary of the federal, State, and local regulations related to geology and soils; and (3) an analysis of the potential impacts related to geology and soils associated with the implementation of the Proposed Project, as well as identification of potentially feasible mitigation measures that could mitigate the significant impacts.

Comments received in response to the NOP for the EIR regarding geology and soils can be found in Appendix B. Any applicable issues and concerns regarding potential impacts related to geology and soils that were raised in comments on the NOP are analyzed in this section.

The analysis included in this section was developed based on Project-specific construction and operational features; the *Paleontological Resources Assessment Report* prepared by ESA and dated July 2019 (Appendix I); and the site-specific existing conditions, including geotechnical hazards, identified in the *Preliminary Geotechnical Report* prepared by AECOM and dated September 14, 2018 (Appendix H).¹

3.6.1 Environmental Setting

Regional Setting

The Project Site is located in the northern Peninsular Ranges geomorphic province close to the boundary with the Transverse Ranges geomorphic province. The Transverse Ranges geomorphic province is characterized by east-west trending mountain ranges that include the Santa Monica Mountains. The southern boundary of the Transverse Ranges province is marked by the Malibu Coast, Santa Monica, Hollywood, Raymond, Sierra Madre, and Cucamonga faults.

The Peninsular Range province is characterized by northwest/southeast trending alignments of mountains and hills and intervening basins, reflecting the influence of northwest trending major faults and folds controlling the general geologic structural fabric of the region. This province extends northwesterly from Baja California into the Los Angeles Basin and westerly into the offshore area, including Santa Catalina, Santa Barbara, San Clemente and San Nicolas islands. It is bounded by the Colorado Desert along the San Jacinto Fault Zone on the east. The Los Angeles Basin is the northernmost part of the Peninsular Ranges province. The Project Site is located within the Los Angeles Basin, which is a broad sediment-filled trough that forms an alluvial plain of low relief. The basin was created by tectonic subsidence and subsequent deposition of sediments derived from ancestral streams from erosion along the flanks of the local mountains since the Pliocene time (approximately 2.6 million to 11,700 years ago). Within this portion of

¹ AECOM, *Preliminary Geotechnical Report*, September 14, 2018.

3.6.2 Adjusted Baseline Environmental Setting

Section 3.6, Geology and Soils, assumes the Adjusted Baseline as described in Section 3.0, Introduction to the Analysis. Construction of the HPSP Adjusted Baseline projects will be subject to City of Inglewood plan check and building inspection functions which ensures that projects in the City are constructed in accordance with current building code requirements.²⁵ Construction of these structures is not likely to have any effect on the geotechnical hazards present at the Project Site as geotechnical conditions tend to be site specific, particularly in areas with low topographic relief, as is the case for the Project Site. In addition, pursuant to the General Construction Permit overseen and enforced by the Los Angeles Regional Water Quality Control Board, construction of the NFL Stadium and associated improvements is required to implement best management practices (BMPs) to minimize the potential for erosion and, thus, will not have any material effect on the potential for erosion at the Project Site. There is no evidence that HPSP Adjusted Baseline projects would affect the baseline for analysis of paleontological resources. No paleontological resources have been discovered and documented during construction of the HPSP Adjusted Baseline projects that would provide additional information on the presence or sensitivity of these resources in the area.

3.6.3 Regulatory Setting

Federal

There are no federal regulations, plans, or policies applicable to geology and soils relevant to the Proposed Project.

State

Alquist-Priolo Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code section 2621) was enacted by the State of California in 1972 to address the hazard of surface faulting to structures for human occupancy. The Alquist-Priolo Earthquake Fault Zoning Act was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged homes, commercial buildings, and other structures. The primary purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings intended for human occupancy on the surface traces of active faults. The Alquist-Priolo Earthquake Fault Zoning Act is also intended to provide the citizens with increased safety and to minimize the loss of life during and immediately following earthquakes by facilitating seismic retrofitting to strengthen buildings against ground shaking.

The Alquist-Priolo Earthquake Fault Zoning Act requires the State Geologist to establish regulatory “earthquake fault zones” around the surface traces of active faults and to issue appropriate maps to assist cities and counties in planning, zoning, and building regulation functions. Maps are distributed to all affected cities and counties to assist them in regulating new construction and

²⁵ The California Building Code is updated on a triennial basis. The current code in effect is the 2016 CBC and the 2019 CBC is anticipated to become effective on January 1, 2020.

For geologic units with high potential, full-time monitoring is generally recommended during any Project-related ground disturbance. For geologic units with low potential, protection or salvage efforts will not generally be required. For geologic units with undetermined potential, field surveys by a qualified vertebrate paleontologist should be conducted to specifically determine the paleontological potential of the rock units present within the study area.

Geologic Map and Paleontological Literature Review

Geologic mapping by Dibblee and Minch³⁸ indicates that the Project Site is underlain with Pleistocene-age older alluvium (mapped as Qoa). However, as noted above, the *Preliminary Geotechnical Report* determined that the older alluvium was encountered at the Project Site at depths of 30 to 40 feet bgs and overlain by younger alluvium (mapped as Qa and dated within Holocene age – up to 11,700 years).³⁹ The *Preliminary Geotechnical Report* does not reconcile the discrepancy between the Dibblee and Minch mapping which was referenced in the report and their identification of the native materials. Thus, for the purposes of providing a conservative analysis, the paleontological analysis assumes that the native materials encountered across the Project Site consisted of the older alluvium. These sediments consist of pebble-gravel, sand, and silt-clay deposited from erosion of the surrounding highlands that has since been dissected by recent erosion.⁴⁰ Older alluvium is poorly constrained in age, but is generally considered to have been deposited during the Pleistocene, 11,700 to 2.58 Ma.⁴¹

These sediments are old enough to preserve fossil resources (i.e., over 5,000 years, as per the SVP,⁴² and have a rich fossil history in Los Angeles^{43,44} and throughout southern

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- ³⁸ Dibblee, T.W. and T. Minch, 2007. Geologic map of the Venice and Inglewood quadrangles, Los Angeles County, California. Dibblee Foundation Map DF-322. 1:24,000.
- ³⁹ AECOM, 2018. *Preliminary Geotechnical Report*, September 14, 2018. p. 10.
- ⁴⁰ Dibblee, T.W. and T. Minch, 2007. Geologic map of the Venice and Inglewood quadrangles, Los Angeles County, California. Dibblee Foundation Map DF-322. 1:24,000.
- ⁴¹ Dibblee, T.W. and T. Minch, 2007. Geologic map of the Venice and Inglewood quadrangles, Los Angeles County, California. Dibblee Foundation Map DF-322. 1:24,000.
- ⁴² Society of Vertebrate Paleontology, 2010. Standard procedures for the assessment and mitigation of adverse impacts to paleontological resources. Available: http://vertpaleo.org/Membership/Member-Ethics/SVP_Impact_Mitigation_Guidelines.aspx Accessed January 3, 2017.
- ⁴³ Brattstrom, B.H. and A. Stum, 1959. A new species of fossil turtle from the Pliocene of Oregon, with notes on other fossil Clemmys from western North America. *Bulletin of the Southern California Academy of Sciences* 58:65-71).
- ⁴⁴ Steadman, D.W., 1980. A Review of the osteology and paleontology of turkeys (Aves: Meleagridinae). *Contributions in Science, Natural History Museum of Los Angeles County* 330:131-207.

The structural elements of the Proposed Project would be required to undergo appropriate design-level geotechnical evaluations prior to final design and construction in accordance with CBC Chapter 18. Implementing the regulatory requirements of the most recent CBC (currently 2016, but the 2019 CBC will likely go into effect on January 1, 2020), County and City ordinances, the CGS Guidelines for Evaluating and Mitigating Seismic Hazards in California, and ensuring all buildings and structures are constructed in compliance with the law is the responsibility of the project engineers and building officials as also detailed in CBC Chapter 18. The proposed pedestrian footbridge would utilize cast-in-drilled-hole piles (CIDH) or spread footings. Construction of the pedestrian footbridge would undergo the same geotechnical investigations to ensure that the soil or fill is suitable to support the pedestrian footbridge; any unsuitable material would be excavated and compacted until suitable.⁶⁸ Compliance with the CBC and local ordinances would minimize the potential for damage from strong seismic ground shaking. The Proposed Project would not directly or indirectly expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving strong seismic ground shaking. Further, there is no evidence that development of the Proposed Project would increase the frequency or effects of seismic activity in the area. Thus, there would be **no project-level or cumulative impacts** of the Proposed Project related to this significance criterion.

The Proposed Project would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death, involving seismic-related ground failure, including liquefaction. (No Impact)

Liquefaction occurs when saturated, granular soils within 50 feet of ground surface lose their inherent shear strength due to excess pore water pressure build-up, such as that generated during repeated cyclic loading from an earthquake. Factors that contribute to liquefaction include low relative density and loose consistency of soils, shallow groundwater tables, and long duration and high acceleration of seismic ground shaking. (The Project Site is not within a liquefaction zone area as mapped by the CGS or as shown in the Earthquake Zones of Required Investigation Map, Inglewood Quadrangle, and the *Preliminary Geotechnical Report* indicated the potential for liquefaction was remote.⁶⁹) The historic high groundwater level beneath the Project Site is reported as more than 50 feet bgs, and the Project Site is characterized by the presence of dense to very dense and very stiff to hard soils.⁷⁰ The Proposed Project would not directly or indirectly expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction. Further, there is no evidence that development of the Proposed Project would increase the frequency or effects of seismic activity in the area. Thus, there would be **no project-level or cumulative impacts** of the Proposed Project related to this significance criterion.

⁶⁸ AECOM, 2018. *Preliminary Geotechnical Report for Murphy's Bowl LLC*. p. 22.

⁶⁹ California Geological Survey, 1999. *Earthquake Zones of Required Investigation Inglewood Quadrangle*, released March 25, 1999. AECOM, 2018. *Preliminary Geotechnical Investigation*, September 14, 2018. p. 17.

⁷⁰ AECOM, 2018. *Preliminary Geotechnical Report*, September 14, 2018. p. 11.