Section 4.5:
GEOLOGY, SOILS, AND SEISMICITY

4.5 GEOLOGY, SOILS, AND SEISMICITY

This section describes the geology, soils, and seismicity setting and potential environmental impacts, as they pertain to implementation of the proposed Project. This section is based on the *Draft Geotechnical Evaluation Study* (July 2014) for the proposed Project site; refer to Appendix E of this EIR. Information for this section was also obtained from the *County of Los Angeles General Plan* (1980) and the *Los Angeles County Municipal Code*.

ENVIRONMENTAL SETTING

SITE HISTORY AND DESCRIPTION

The proposed Project site is located south of E. 120th Street and north of El Segundo Boulevard between S. Avalon Boulevard and Clovis Avenue. Within the existing EMJ Park on the Project site, there are two artificially created lakes, widespread grass lawn areas with scattered trees, paved parking areas, restrooms, soccer fields and typical park amenities including picnic tables, barbecues, drinking fountains and lighting fixtures. Single family residential homes are located in the north-west portion of the site and along eastern portion of the site down S. Central Avenue from E. 120th Street to El Segundo Boulevard. Commercial development is located along the major roads to the west and south of the property.

The surface of the site consists of relatively flat ground along the perimeter with gentle hills and mounds located mainly in the central portions. These elevated areas, which range from a few feet to a maximum of about 10 feet in height, are assumed to have been largely created through the placement of soil materials at these locations during excavation and grading that took place to create the two on-site lakes.

A right of way easement (Parcel 6086031273), owned by the County Department of Water and Power (LACDWP) is also located on the Project site. It presently serves as a utility corridor for overhead electrical transmission lines.

Non-structural fill soils ranging from less than one foot and up to 10 feet in thickness cover virtually all of the proposed development area. Because the majority of the fill soils were not graded to create areas suitable for the construction of structural improvements, they would require complete removal from all structural and/or proposed fill areas. A minor-to-moderate amount of approximately two feet of removals within the native soils present beneath the fill soils may also be required.

REGIONAL GEOLOGIC SETTING

The Project site is located on the Los Angeles coastal plain. This plain is a lowland that gently slopes seaward, and is underlain by as much as about 30,000 feet of sediments that rest on granitic and metamorphic basement rocks. The plain is bounded by the Santa Monica Mountains and San Joaquin Hills to the south, and the Palos Verde Hills and Pacific Ocean shoreline to the west. The dominant structural feature of this coastal plain is the northwest trending Newport-Inglewood fault zone.

The nearest known active earthquake fault is the Newport-Inglewood-Rose Canyon Fault, which is located approximately 0. 7 miles (1.2 kilometers) to the southwest of the Project site. Other significant faults in the region include the Palos Verdes Fault located approximately 10 miles (16.1 kilometers) to the southwest; the Los Alamitos Fault located approximately 9.2 miles (15 kilometers) to the southeast; the Elsinore Fault located approximately 13.4 miles (21.5 kilometers) to the east; and the Sierra Madre Fault Zone located approximately 21 miles (33.2 kilometers) to the north.

SITE GEOLOGIC CONDITIONS

The site is underlain by fill soils that were derived mainly from onsite grading while alluvial sediments are present at depth. Because virtually all of the site has been modified to some extent in the past, no areas of natural ground remain exposed at the surface. Existing fill thicknesses across the site range from less than one foot to an

anticipated maximum thickness of about 10 to 15 feet. The onsite soils consist mainly of fine-grained clayey sand to sandy clay soils that are soft to very firm and have low expansion potential.

REGULATORY FRAMEWORK

FEDERAL

No Federal plans, policies, or laws related to geology, soils, or seismicity are applicable to the proposed Project.

STATE

ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT (1972)

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to ensure that no buildings utilized for human occupancy are constructed on the surface trace of active faults. Faults are fractures in the earth's crust where rocks move relative to one another over time. The Act includes only faults that have ruptured in the last 11,000 years called active faults. Cities and counties must demonstrate with a geological investigation that proposed buildings will not be constructed across active faults before a project can be permitted. If the presence of an active fault is discovered, any structure used for human occupancy cannot be constructed over the trace of the fault and is required to be set back from the active fault (generally at least 50 feet).

CALIFORNIA BUILDING CODE (CBC) (2013)

The California Building Code (also known as the California Building Standards Code) provides a minimum standard to improve safety, sustainability, quality of material, and maintain consistency for the design and construction of buildings. The code requires strict building standards specific to California's unique geologic conditions such as soft soil and ground shaking from seismic activities.

SEISMIC HAZARDS MAPPING ACT

The purpose of the Seismic Hazards Mapping Act is to address the effects of strong ground shaking, liquefaction, landslides and other ground failures that occur in the

State of California induced by earthquakes. The map identifies areas that are prone to these failures and serves as a guide to minimize the loss of life and property. Seismic Hazard Zone Maps provide a guidance for mitigation of earthquake-related hazards in land use planning and the building permit processes.

LOCAL

LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD

The Los Angeles Regional Water Quality Control Board (LARWQCB) is one of nine statewide regional water quality boards. The LARWQCB protects ground and surface water quality in the Los Angeles region, including the coastal watersheds of Los Angeles and Ventura Counties, along with very small portions of Kern and Santa Barbara Counties. In order to carry out its mission to preserve and enhance water quality, the LARWQCB conducts the following range of activities to protect ground and surface waters under its jurisdictions:

- Addresses region-wide and specific water quality concerns through updates of the Water Quality Control Plan (Basin Plan) for the Los Angeles region;
- Prepares, monitors compliance with, and enforces Waste Discharge Requirements, including NPDES permits;
- Implements and enforces local stormwater control efforts;
- Regulates the cleanup of contaminated sites, which have already polluted or have the potential to pollute ground or surface water;
- Enforces water quality laws, regulations, and waste discharge requirements;
- Coordinates with other public agencies and groups that are concerned with water quality; and
- Informs and involves the public on water quality issues.

CONSTRUCTION STORMWATER PERMITS

Stormwater runoff from construction activity that results in soil disturbances of at least one acre of total land area (and projects that meet other specific criteria) is governed by

the State Water Resources Control Board (SWRCB) under Water Quality Order 2009-0009-DWQ. These regulations prohibit discharges of polluted stormwater from construction projects that disturb one or more acres of soil.

LOS ANGELES COUNTY GENERAL PLAN

Safety Element

Seismic Hazards

Goal	Minimize injury and loss of life, property damage, and the social, cultural, and economic impacts caused by the earthquake hazards.
Policy 1	Encourage the use of non-urbanized segments of active fault zones for rural and open space purposes.
Policy 2	Review projects proposing expansion of existing development and construction of new development, especially critical facilities, and encourage them to avoid localities exposed to high earthquake hazards through such techniques as cluster development and transfer of development rights.
Policy 3	Continue enforcement of stringent site investigations (such as seismic, geological, hydrologic, and soils investigations) and implementation of adequate hazard mitigation measures for development projects in areas of high earthquake hazard, especially those involving critical facilities. Do not approve proposals and projects which cannot mitigate safety hazards to the satisfaction of responsible agencies.
Policy 4	Promote the development of seismically resistant major lifelines serving Los Angeles County and connecting it to surrounding regions and the rest of the nation
Policy 5	Promote the strengthening or replacement of critical facilities; and the retrofitting or abatement of potentially

hazardous buildings, highway structures, and dams and reservoirs which do not meet seismic safety standards.

Policy 6 Encourage the preservation and sensitive reuse of historic buildings that need strengthening for protection from seismic hazards, in a manner that does not endanger public safety.

Policy 7 Strengthen earthquake resistance standards for non-structural components, especially in critical facilities.

Geological Hazards

Goal Protect public safety and minimize the social and economic impacts from geologic hazards.

Policy 8 Review proposals and projects proposing new development and expansion of existing development in areas susceptible to landsliding, debris flow, and rockfalls, and in areas where collapsible or expansive soils are a significant problem; and disapprove projects which cannot mitigate these hazards to the satisfaction of responsible agencies.

Policy 9 Continue to improve and enforce stringent slope investigation and design standards, and to apply innovative hazard mitigation and maintenance plans for development in hillside areas.

Policy 10 Upgrade slope maintenance measures and improve emergency response capability in hillside areas.

IMPACT ANALYSIS AND MITIGATION MEASURES

METHODOLOGY

An evaluation of the significance of potential impacts related to geology, soils and seismicity must consider both direct effects as well as indirect effects in the local or regional context. Potentially significant impacts would generally result if people or structures are exposed to risk of loss, injury or death from rupture of a known

earthquake fault or seismic-related ground failure, or location on a geologic unit or soil that is unstable (including expansive soils), or if the project would result in substantial soil erosion or the loss of topsoil.

THRESHOLDS OF SIGNIFICANCE

The following thresholds of significance are based, in part on the CEQA Guidelines Appendix G. For purposes of this EIR, implementation of the proposed Project may have a significant adverse impact on geology, soils, or seismicity if it would do any of the following:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known active fault trace. Refer to Division of Mines and Geology Special Publication 42;
    - Strong seismic groundshaking or seismic-related ground failure, including liquefaction and lateral spreading; or
    - Landslides.
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

PROJECT IMPACTS AND MITIGATION

Threshold:	*Would the Project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:* *- Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known active fault trace?* *- Strong seismic ground shaking?* *- Seismic-related ground failure, including liquefaction?* *- Landslides?*

Impact 4.5-1 **Implementation of the Project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault; strong seismic groundshaking; seismic-related ground failure, including liquefaction; or landslides. This impact would be *less than significant.***

The *Draft Geotechnical Evaluation Study* (July 2014) prepared for the Project found that no active or potentially active faults are known to exist at the Project's site and the Project does not lie within a current State of California Earthquake Fault Zone. The closest known active fault is the Newport-Inglewood-Rose Canyon Fault located approximately 0.7 miles southwest of the Project. The historical seismicity of the Project site entails numerous small-to-medium magnitude earthquake events occurring around the Project site, predominately associated with the Newport-Inglewood fault. As is the case with most of California, any future development within the Project site should anticipate that moderate-to-large seismic events could occur within or in close proximity to the Project site.

In addition, the Project site lies on a relatively flat surface. Due to the low relief of the site and surrounding area, the occurrence of mass movement failures, such as landslides, rockfalls, or debris flows within such areas is generally not considered common and no evidence of mass movement was observed on the site. The potential for liquefaction generally occurs during strong ground shaking within loose, geologic young, granular sediments where the depth to groundwater is usually less than 50 feet. The depth to static groundwater within areas of the Project site is approximately 40 feet below ground surface. However, the site is underlain by relatively dense/stiff deposits of older alluvium soils and these materials are less susceptible to liquefaction, and is located outside of areas that may be susceptible to liquefaction. Therefore, the potential for liquefaction to occur at the site is very low to low. Settlement generally occurs within areas of loose, granular soils with relatively low density. Since the site is underlain by relatively dense/stiff, older alluvial materials, the potential for settlement is considered low. Impacts would be less than significant.

The *Draft Geotechnical Evaluation Study* (July 2014) has recommended Mitigation Measures for design and construction of all Project-related facilities in accordance with the California Building Code. Therefore, implementation of Mitigation Measures GEO-1 through GEO-10 would ensure maximum practicable protection for users of the buildings and associated infrastructure. All aspects of seismic-related hazards, other geotechnical hazards, and erosion and sedimentation issues are regulated by the County and/or the State of California. Impacts would be less than significant.

MM GEO-1 *Foundation Support. A compacted fill mat shall be constructed beneath footings and slabs. The compacted fill mat shall provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils. The construction of this compacted fill mat shall include the removal of any existing non-structural fill material as well as the removal of any upper, loose/soft to medium dense/stiff underlying natural earth materials.*

MM GEO-2 *General Site Grading. All areas to be graded shall be stripped of significant vegetation and other deleterious materials. In areas of existing grass, the grass and upper approximately 3 inches of topsoil must be removed. The remaining soil, when blended for use as engineered fill, shall have an organic content of no more than 3 percent.*

MM GEO-3 *General Site Grading. All existing non-structural fill soils shall be completely removed from all proposed structural areas. Subsequent to removal of deleterious items to the satisfaction of the soils engineer, the fill soils may then be placed as compacted fill. Irrigation and drain lines, as well as their associated trench backfill materials, shall also be removed during site clearing and grading.*

MM GEO-4 *General Site Grading. All existing fills under any proposed flatwork and paved areas shall be removed and replaced with engineered compacted fill.*

MM GEO-5 *Preparation of Fill Areas. Prior to placing fill, the surfaces of all areas to receive fill shall be scarified to a depth of at least 12 inches. The scarified soil shall be brought to near optimum moisture content and recompacted to a relative compaction of at least 90 percent.*

MM GEO-6 *Preparation of Foundation Areas. All footings shall rest upon at least 24 inches of properly compacted fill material. In areas where the required fill thickness is not accomplished by the recommended removals or by site rough grading, the footing areas shall be further subexcavated to a depth of at least 24 inches below the proposed footing base grade, with the subexcavation extending at least 5 feet beyond the footing lines. Where removal and/or over-excavation depths exceed 5 feet, subexcavation shall extend beyond the footing lines a minimum distance equal to the depth of the removal and/or overexcavation. The bottom of all excavations shall then be scarified to a depth of at least 12 inches, brought to near optimum moisture content, and recompacted to at least 90 percent relative*

compaction prior to refilling the excavation to grade as properly compacted fill. These recommendations are subject to revision pending the completion of supplemental geotechnical investigation and/or review of proposed development plans.

MM GEO-7 *Engineered Compacted Fill. The onsite soils shall provide adequate quality fill material, provided they are free from organic matter and other deleterious materials. Unless approved by the geotechnical engineer, rock or similar irreducible material with a maximum dimension greater than 12 inches shall not be buried or placed in fills. Rocks or other irreducible material greater than 12 inches in diameter shall be disposed of within designated rock disposal areas approved by the soils engineer and/or local governing agency.*

Import fill shall be inorganic, non-expansive granular soils free from rocks or lumps greater than 6 inches in maximum dimension. Sources for import fill shall be approved by the geotechnical engineer prior to their use.

Fill shall be spread in maximum 8-inch uniform, loose lifts, each lift brought to near optimum moisture content, and compacted to a relative compaction of at least 90 percent.

MM GEO-8 *Slabs-On-Grade. To provide adequate support, concrete slabs-on-grade shall bear on a minimum of 12 inches of compacted soil. The final pad surfaces shall be rolled to provide smooth, dense surfaces upon which to place the concrete. Slabs to receive moisture-sensitive coverings shall be provided with a moisture vapor barrier. This barrier may consist of an impermeable membrane. Two inches of sand over the membrane will reduce punctures and aid in obtaining a satisfactory concrete cure. The sand shall be moistened just prior to placing of concrete. The slabs shall be protected from rapid and excessive moisture loss which could result in slab*

curling. Careful attention shall be given to slab curing procedures, as the site area is subject to large temperature extremes, humidity, and strong winds.

MM GEO-9 *Supplemental Geotechnical Reviews. Once grading plans are generated for the Project, these plans shall be reviewed by a geotechnical engineer. Any additional design recommendations shall be incorporated thereafter.*

MM GEO-10 *Construction Monitoring. During construction, sufficient and timely geotechnical observation and testing shall be provided to correlate the findings of this study and the previous subsurface investigation with the actual subsurface conditions exposed. Items requiring observation and testing include, but are not necessarily limited to, the following:*

1. *Site preparation-stripping and removals.*
2. *Excavations, including approval of the bottom of excavations prior to filling.*
3. *Scarifying and recompacting prior to fill placement.*
4. *Subgrade preparation for pavements and slabs-on-grade.*
5. *Placement of engineered compacted fill and backfill, including approval of fill materials and the performance of sufficient density tests to evaluate the degree of compaction being achieved.*
6. *Foundation excavations.*

Threshold:	*Would the Project result in substantial soil erosion or the loss of topsoil?*

Impact 4.5-2 **Implementation of the Project would not result in substantial soil erosion or the loss of topsoil. This impact would be *less than significant with mitigation incorporated.***

Construction required for implementation of the Project must comply with the General Construction Permit, which requires preparation of a Stormwater Pollution Prevention

Plan (SWPPP) for the Project that lists Best Management Practices (BMPs) to be used by the discharger during construction. Additionally, implementation of Mitigation Measures GEO-11 and GEO-12 would ensure that substantial soil erosion does not occur. Therefore, a less than significant impact would occur.

Upon completion of Project construction, the majority of the Project site's surfaces would be stabilized by landscaping or hardscaping (trails, parking lots, roads, etc.). Because these surfaces would be stabilized, they would not be subject to substantial soil erosion or the loss of topsoil from the Project site. Impacts would be less than significant with mitigation incorporated.

MM GEO-11 *Slope Construction. Preliminary data indicates that cut and fill slopes shall be constructed no steeper than two horizontal to one vertical. Fill slopes shall be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction, then roll the final slopes to provide dense, erosion-resistant surfaces.*

MM GEO-12 *Slope Protection. Since the native materials are susceptible to erosion by running water, measures shall be provided to prevent surface water from flowing over slope faces. Slopes at the project shall be planted with a deep rooted ground cover as soon as possible after completion. The use of succulent ground covers such as ice plant or sedum is not recommended. If watering is necessary to sustain plant growth on slopes, then the watering operation shall be monitored to assure proper operation of the irrigation system and to prevent over watering.*

Threshold:	*Would the Project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse*?

Impact 4.5-3 **The Project site is not located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse. This impact would be *less than significant.***

The site lies on a relatively flat surface. The occurrence of mass movement failures, such as landslides, rockfalls, or debris flows within such areas is generally not considered common and no evidence of mass movement was observed on the site during the geotechnical evaluation. The Project site is underlain by relatively dense/stiff deposits of older alluvium soils and these materials are less susceptible to liquefaction and settlement. In addition, the Inglewood Quadrangle Seismic Hazards Map prepared by the California Division of Mines and Geology, 1991, shows the area of the site as being located outside of the area that may be susceptible to liquefaction and settlement. Therefore, the potential for liquefaction and settlement occurring at the site is considered to be very low to low. Impacts would be less than significant.

Threshold:	*Would the Project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property*?

Impact 4.5-4 **Implementation of the Project would not be located on expansive soil as defined in Table 18-1-B of the Uniform Building Code (1994) that would create a substantial risk to life or property. This impact would be *less than significant.***

The Project site is underlain by fill soils that were derived mainly from onsite grading while alluvial sediments are present at depth. Because virtually all of the Project site has

been modified to some extent in the past, no areas of natural ground remain exposed at the surface. Existing fill thicknesses across the Project site range from less than one foot to an anticipated maximum thickness of about 10 to 15 feet. The onsite soils consist mainly of fine-grained clayey sand to sandy clay soils that are soft to very firm and have low expansion potential. Therefore, impacts would be less than significant.

CUMULATIVE IMPACTS

The redevelopment of the existing EMJ Park along with new development into areas of the Project site would not have significant cumulative impacts on the Project site or the surrounding area. Each development project must comply with all applicable state laws, including the CBC, and each development project must address site-specific geology, soils, and seismicity issues to County standards through implementation of recommendations outlined in site-specific geotechnical evaluations. Therefore, site-specific geology, soils, and seismicity issues are addressed through compliance with existing requirements for individual development projects, and do not contribute to a cumulative impact regionally.

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