5.5 Geology and Soils

5.5.1 INTRODUCTION

This section addresses potential environmental effects of the proposed Project related to geology, soils, seismicity, and paleontological resources. The impacts examined include risks related to geologic hazards such as earthquakes, landslides, liquefaction, expansive soils; impacts on the environment related to soil erosion and sedimentation; and impacts related to paleontological resources. Information within this section includes data from the Geotechnical EIR Due-Diligence Level Report (Geotechnical Report) that was prepared by LGC Geotechnical (GEO 2019), which is included as Appendix C.

5.5.2 REGULATORY SETTING

Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act was enacted in 1997 to "reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program." To accomplish this, the Act established the National Earthquake Hazards Reduction Program that provides characterization, and prediction of hazards and vulnerabilities; improvement of building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improvement of mitigation capacity; and accelerated application of research results. This Act designated the Federal Emergency Management Agency (FEMA) as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Programs under this Act provide building code requirements such as emergency evacuation responsibilities and seismic code standards such as those to which development under the proposed Project would be required to adhere.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface fault rupture to structures used for human occupancy. The main purpose of the Act is to prevent the construction of buildings for human occupancy on top of the traces of active faults. It was passed into law following the February 1971 magnitude 6.5 San Fernando (Sylmar) Earthquake that resulted in over 500 million dollars in property damage and 65 deaths. Although the Act addresses the hazards associated with surface fault rupture, it does not address other earthquake-related hazards, such as seismically induced ground shaking, liquefaction, or landslides.

This Act requires the State Geologist to establish regulatory zones, now referred to as Earthquake Fault Zones, around the mapped surface traces of active faults, and to publish appropriate maps that depict these zones. Earthquake Fault Zone maps are publicly available and distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. The Act requires local agencies to regulate development within Earthquake Fault Zones. Before a development project can be permitted within an Earthquake Fault Zone, a geologic investigation is required to demonstrate that proposed buildings would not be constructed across active faults. A site-specific evaluation and written report must be prepared by a licensed geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back a minimum of 50 feet from the fault.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act, which was passed by the California legislature in 1990, addresses earthquake hazards related to liquefaction and seismically induced landslides. Under the Act, seismic hazard zones are mapped by the State Geologist in order to assist local governments in land use planning. The Act states "it is necessary to identify and map seismic hazard zones in order for cities and counties to adequately prepare the safety element of their general plans and to encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety." Section 2697(a) of the Act states that "cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard."

California Building Code

The California Building Code (CBC) is included in Title 24 of the California Code of Regulations. The CBC incorporates the International Building Code, a model building code adopted across the United States. Current State law requires every city, county, and other local public agency enforcing building regulations to adopt the provisions of the CBC within 180 days of its publication. The publication date of the CBC is established by the California Building Standards Commission. The current CBC was adopted by the City and is included in Title 8 of the City's Municipal Code. These codes provide standards to protect property and public safety. They regulate the design and construction of excavations, foundations, building frames, retaining walls, and other building elements, and thereby mitigate the effects of seismic shaking and adverse soil conditions. The codes also regulate grading activities, including drainage and erosion control.

California Construction General Permit

The State of California adopted a Statewide National Pollutant Discharge Elimination System (NPDES) Permit for General Construction Activity (Construction General Permit) on September 2, 2009 (Order No. 2009-0009-DWQ, as amended by 2010-0014-DWQ and 2012-0006-DWQ). The last Construction General Permit amendment became effective on July 17, 2012. The Construction General Permit regulates construction site storm water management. Dischargers whose projects disturb one or more acres of soil, or whose projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the general permit for discharges of storm water associated with construction activity.

To obtain coverage under this permit, project operators must electronically file Permit Registration Documents, which include a Notice of Intent, a Storm Water Pollution Prevention Plan (SWPPP), and other compliance-related documents, including a risk-level assessment for construction sites, an active storm water effluent monitoring and reporting program during construction, rain event action plans, and numeric action levels (NALs) for pH and turbidity, as well as requirements for qualified professionals to prepare and implement the plan. The Construction General Permit requires the SWPPP to identify Best Management Practices (BMPs) that will be implemented to reduce soil erosion. Types of BMPs include preservation of vegetation and sediment control (e.g., fiber rolls).

City of Santa Ana General Plan

The City is currently undergoing a comprehensive update to the General Plan. The existing General Plan Conservation Element includes the following objective to protect archeological resources:

Objective 3.1: Minimize loss of natural aesthetic, historic, archeological and paleontological resources as

The following policies contained in the Seismic Safety Element are also relevant to the proposed Project:

Goal 1: Provide a safe environment for all Santa Ana residents and workers.

Goal 2: Minimize the effects of natural disasters.

Objective 1.1: Provide a high level of life safety in structures with high occupancy such as schools and hospitals.

Objective 1.3: Minimize seismic risk in the construction of new structures.

Policy: Use a higher standard of design for structures with high occupancy than for other structures.

City of Santa Ana Municipal Code

Municipal Code Chapter 8, Article 2, Division 1; California Building Code: The CBC has been amended and adopted as Chapter 8, Article 2, Division 1 of the City's Municipal Code (Building Code). This regulates all building and construction projects within the City limits and implements a minimum standard for building design and construction. These minimum standards include specific requirements for seismic safety, excavation, foundations, retaining walls and site demolition. It also regulates grading activities including drainage and erosion control.

Section 18-156; Control of Urban Runoff: This code section states that all new development and significant redevelopment within the City shall be undertaken in accordance with the County Drainage Area Management Plan (DAMP), including but not limited to the development project guidance; and any conditions and requirements established by City agencies related to the reduction or elimination of pollutants in storm water runoff from the project site. Prior to the issuance by the City of a grading permit, building permit or nonresidential plumbing permit for any new development or significant redevelopment, City agencies are required to review the project plans and impose terms, conditions and requirements on the project. The owner of a new development or significant redevelopment project shall implement and adhere to the terms, conditions and requirements on the new development or significant redevelopment project.

5.5.3 ENVIRONMENTAL SETTING

Regional Setting

The Project site is generally located within the Peninsular Ranges Geomorphic Province of California, at the eastern edge of the Los Angeles Sedimentary Basin. The Los Angeles Basin is a northwest-plunging synclinal sedimentary deposit that is bounded to the south of the Project site by the broadly uplifted coastal mesa of Newport Beach and the San Joaquin Hills, to the north by the foothills of the Santa Ana mountain range (GEO 2019).

The Project site is located on young alluvial fan materials that include previous floodplain deposits. A channelized portion of the Peters Canyon Creek passes approximately two miles away from the site to the east. The creek drains into Upper Newport Bay located south of the site (GEO 2019).

Faults and Ground Shaking

In 1972, the Alquist-Priolo Special Studies Zones Act was signed into law. In 1994, it was renamed the Alquist-Priolo Earthquake Fault Zoning Act (A-P Act). The primary purpose of the A-P Act is to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault. The A-P Act requires the State Geologist (Chief of the California Geology Survey) to delineate "Earthquake Fault Zones" along with faults that are "sufficiently active" and "well-defined." The boundary of an "Earthquake Fault Zone" is generally about 500 feet from major active faults and 200 to 300 feet from well-defined minor faults. The A-P Act dictates that cities and counties withhold development permits for sites within an Alquist-Priolo Earthquake Fault Zone until geologic investigations demonstrate that the site zones are not threatened by surface displacements from future faulting.

The Project site is not located within a State of California Earthquake Fault Zone and no active faults are known to cross the site. The closest known active faults are associated with the San Joaquin Hills Fault, located approximately 1.5 miles from the site; the Newport-Inglewood Fault Zone, approximately 8.4 miles southwest of the site; and the Elsinore Fault Zone, approximately 13.2 miles northeast of the site (GEO 2019).

However, all of southern California is seismically active. The amount of motion expected at a building site can vary from none to forceful depending upon the distance to the fault, the magnitude of the earthquake, and the local geology. Greater movement can be expected at sites located on poorly consolidated material such as alluvium located near the source of the earthquake epicenter or in response to an earthquake of great magnitude.

Onsite Soils

The Geotechnical Report describes that the site is underlain by older artificial fill soils and Quaternary aged young alluvial fan deposits. Older artificial fill was observed in the field explorations up to 7.5 feet below existing grade and consist of slightly moist to moist clays and silts with variable amounts of sand. The Quaternary young alluvial fan deposits underlie the older artificial fill, and consist of moist to wet, medium stiff to hard clays with variable sand content, as well as loose to medium dense, moist to wet clayey and silty sands to the maximum explored depth of approximately 50 feet below existing grade (GEO 2019).

The previous excavation and compaction of soils occurred on the Project site to develop the existing 3 buildings and remove underground storage tanks, as described below (GEO 2019):

- During development of the 2300 South Redhill Avenue building, soils were excavated to depths of approximately 5 feet below existing grade and compacted fill soils were used to backfill the excavation area for the building foundation.
- During development of the 2310 South Redhill Avenue building, approximately 9 feet of fill was placed in the building pad area and fill soils were backfilled up to 15 feet beyond the limit of the building foundation (GEO 2019).
- The area of the 2320 South Redhill Avenue building pad was excavated to approximately 10 to 13 feet below the existing grade. The foundation was stabilized with approximately 24 inches of gravel and approximately 13 feet of artificial fill was placed under the building and up to 5 feet beyond the building foundations.
- During removal of an underground storage tank located between 2310 and 2320 South Redhill Avenue buildings, approximately 10 feet of crushed miscellaneous base and approximately 5 feet of onsite soils were backfilled into the previous underground storage tank location.

Liquefaction and Settlement

Liquefaction occurs when vibrations or water pressure within a mass of soil cause the soil particles to lose contact with one another. As a result, the soil behaves like a liquid, has an inability to support weight, and can flow down very gentle slopes. This condition is usually temporary and is most often caused by an earthquake vibrating water-saturated fill or unconsolidated soil. Soils that are most susceptible to liquefaction are clean, loose, saturated, and uniformly graded fine-grained sands that lie below the groundwater table within approximately 50 feet below ground surface. Clayey (cohesive) soils or soils which possess clay particles in excess of 20 percent are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table. Lateral spreading refers to spreading of soils in a rapid fluid-like flow movement similar to water.

The Geotechnical Report identifies that the Project site is located within a liquefaction hazard zone. Onsite soils include relatively isolated loose to medium dense sand layers, generally located approximately 40 to 50 feet below existing grade that are considered susceptible to liquefaction. In addition, the depth of groundwater is in the range of 24 to 33 feet below ground surface (bgs), but the historic high groundwater is approximately 10 feet below the existing grade (GEO 2019).

Based on these onsite soils and groundwater conditions, the Geotechnical Report determined that the seismic settlement potential is estimated to be 2 inches or less; and differential seismic settlement is estimated as 1-inch over a horizontal span of about 40 feet (GEO 2019).

Lateral Spreading

Lateral spreading is a type of liquefaction induced ground failure associated with the lateral displacement of surficial blocks of sediment resulting from liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluid mass, gravity plus the earthquake inertial forces may cause the mass to move downslope towards a free face (such as a river channel or an embankment). Lateral spreading may cause large horizontal displacements and such movement typically damages pipelines, utilities, bridges, and structures.

As described previously the Project site contains relatively isolated loose to medium dense sand layers that are susceptible to liquefaction. However, based on the relatively flat topography of the site, lack of a free face nearby and general lack of potentially liquefiable layers in the upper 40 feet, the Geotechnical Report determined that the potential for lateral spreading on the site is low (GEO 2019).

Subsidence

Ground subsidence is the gradual settling or sinking of the ground surface with little or no horizontal movement, and occur in areas with subterranean oil, gas, or groundwater. Effects of subsidence include fissures, sinkholes, depressions, and disruption of surface drainage. However, as described in the General Plan Seismic Safety Element, the potential for area and focal ground subsidence due to earthquakes is relatively low in Santa Ana. In addition, the Project site is not located within or near a potential subsidence area, as shown on Exhibit 4, Potential Subsidence Areas, in the General Plan Seismic Safety Element.

Landslides

Landslides and other slope failures are secondary seismic effects that are common during or soon after earthquakes. Areas that are most susceptible to earthquake induced landslides are steep slopes underlain by loose, weak soils, and areas on or adjacent to existing landslide deposits.

The Geotechnical Report describes that the existing elevations of the Project site range from approximately 57 to 65 feet above mean sea level (msl) and that the site is not located within a mapped area considered potentially susceptible to seismically induced slope instability (GEO 2019). In addition, the Project site is not adjacent to any hills or slopes that could be subject to a landslide.

Expansive Soils

Expansive soils are soils containing water-absorbing minerals that expand as they take in water. These soils can damage buildings due to the force they exert as they expand. Expansive soils contain certain types of clay minerals that shrink or swell as the moisture content changes; the shrinking or swelling can shift, crack, or break structures built on such soils. Arid or semiarid areas with seasonal changes of soil moisture experience a much higher frequency of problems from expansive soils than areas with higher rainfall and more constant soil moisture. The Project is in a semiarid region with marked seasonal changes in precipitation: most rain falls in winter, and there is a long dry season in summer and autumn. Therefore, the City's climate

is such that a relatively high incidence of soil expansion is expected where soils contain the requisite clay minerals.

As described previously, the onsite soils consist of moist to wet, medium stiff to hard clays with variable sand content, as well as loose to medium dense, moist to wet clayey and silty sands (GEO 2019). Due to the clay content in the onsite soils, the site has the potential for expansion (GEO 2019).

Paleontological Resources

Paleontological resources include any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth, except that the term does not include any materials associated with an archaeological resource or any cultural item defined as Native American human remains. Significant paleontological resources are defined as fossils or assemblages of fossils that are unique, unusual, rare, uncommon, or important to define a particular time frame or geologic strata, or that add to an existing body of knowledge in specific areas, in local formations, or regionally.

As described previously, the Project site is underlain by Quaternary aged young alluvial fan deposits and older artificial fill. Quaternary alluvial materials in Orange County are assigned a low paleontological resource sensitivity due to their relatively recent age (Eisentraut and Cooper 2002). Likewise, the Orange County General Plan Figure VI-9 shows that the Project site is not located within an area of paleontological sensitivity.

5.5.4 THRESHOLDS OF SIGNIFICANCE

Appendix G of State CEQA Guidelines indicates that a project could have a significant effect if it were to:

GEO-1 Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

- GEO-1i 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. (Refer to Division of Mines and Geology Special Publication 4),
- GEO-1ii Strong seismic ground shaking,
- GEO-1iii Seismic-related ground failure, including liquefaction;
- GEO-1iv Landslides;
- GEO-2 Result in substantial soil erosion or the loss of topsoil;
- GEO-3 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 on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- GEO-4 Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property;
- GEO-5 Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater; or
- GEO-6 Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

5.5.5 METHODOLOGY

A Geotechnical Report was conducted for the Project site (GEO 2019), which included field exploration, exploratory soil borings, obtaining representative soil samples, laboratory testing, engineering analysis, and the review of pertinent geological literature. The laboratory testing determined the characteristics of the geology and soils that underlie the site. These subsurface conditions were then analyzed to identify potential significant impacts resulting from Project construction and operation in relation to geology and soils.

In determining whether a geotechnical related impact would result from the proposed Project, the analysis includes consideration of state law, including the California Building Code that is integrated into the City's Municipal Code, and implemented/verified during Project permitting approvals. In general, existing state law, building codes, and municipal codes that are implemented by the approving agency provide for an adequate level of safety or reduction of potential effects such that projects developed and operated to code reduce potential of impacts.

In determining whether a paleontological related impact would result from the proposed Project, the analysis includes consideration of the types of soils that exist on the Project site, the paleontological sensitivity of those soils, the past disturbance on the site, and the proposed excavation. The analysis combines these factors to identify the potential of Project construction to impact any unknown paleontological resources on the site.

5.5.6 ENVIRONMENTAL IMPACTS

IMPACT GEO-1i: THE PROJECT WOULD NOT DIRECTLY OR INDIRECTLY CAUSE 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 ARE OF BASED ON OTHER SUBSTANTIAL EVIDENCE OF A KNOWN EARTHQUAKE FAULT.

No Impact. As described previously, the Project site is not located within an Alquist-Priolo Earthquake Fault Zone and no active faults are known to cross the site. The closest known active faults are associated with the San Joaquin Hills Fault, located approximately 1.5 miles from the site; the Newport-Inglewood Fault Zone, approximately 8.4 miles southwest of the site; and the Elsinore Fault Zone, approximately 13.2 miles northeast of the site (GEO 2019). Because no known faults exist on the site, the proposed Project would not expose people or structures to potential substantial adverse effects from rupture of a known earthquake fault that is delineated on an Alquist-Priolo Earthquake Fault Zoning Map or other evidence of a fault, and impacts would not occur

IMPACT GEO-1ii: THE PROJECT WOULD NOT DIRECTLY OR INDIRECTLY CAUSE POTENTIAL SUBSTANTIAL ADVERSE EFFECTS, INCLUDING THE RISK OF LOSS, INJURY, OR DEATH INVOLVING STRONG SEISMIC GROUND SHAKING.

Less than Significant Impact. The proposed Project would add residents, employees, and development within the Project site. The Project site is within a seismically active region, with numerous faults capable of producing significant ground motions. The closest known active faults are associated with the San Joaquin Hills Fault, located approximately 1.5 miles from the site; the Newport-Inglewood Fault Zone, approximately 8.4 miles southwest of the site; and the Elsinore Fault Zone, approximately 13.2 miles northeast of the site (GEO 2019). Therefore, Project implementation could subject people and structures to hazards from ground

shaking. However, seismic shaking is a risk throughout southern California, and the Project site is not at greater risk of seismic activity or impacts as compared to other areas within the region.

The CBC includes provisions to reduce impacts caused by major structural failures or loss of life resulting from earthquakes or other geologic hazards. For example, Chapter 16 of the CBC contains requirements for design and construction of structures to resist loads, including earthquake loads. The CBC provides procedures for earthquake resistant structural design that include considerations for onsite soil conditions, occupancy, and the configuration of the structure including the structural system and height.

As described previously, the City of Santa Ana has adopted the CBC as part of the Municipal Code Chapter 8, Article 2, Division 1, which regulates all building and construction projects within the City and implements a minimum standard for building design and construction that includes specific requirements for seismic safety, excavation, foundations, retaining walls and site demolition. Structures built in the City are required to be built in compliance with the CBC. The Project would be required to adhere to the provisions of the CBC as part of the building plan check and development review process. Compliance with the requirements of the CBC for structural safety would reduce hazards from strong seismic ground shaking. Because the proposed Project would be required to be constructed in compliance with the CBC and the City's Municipal Code, which would be verified through the City's plan check and permitting process and is included as PPP GEO-1, the proposed Project would result in a less than significant impact related to strong seismic ground shaking.

IMPACT GEO-1iii: THE 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.

Less than Significant Impact. As described previously, the Project site is located within a liquefaction hazard area. In addition, the Geotechnical Report identified that onsite soils include relatively isolated loose to medium dense sand layers, generally located approximately 40 to 50 feet below existing grade that are considered susceptible to liquefaction. In addition, the depth of groundwater is in the range of 24 to 33 feet below ground surface (bgs), but the historic high groundwater is approximately 10 feet below the existing grade (GEO 2019).

Based on these onsite soils and groundwater conditions, the Geotechnical Report determined that the seismic settlement potential is estimated to be 2 inches or less; and differential seismic settlement is estimated as 1-inch over a horizontal span of about 40 feet (GEO 2019). However, as described previously, structures built in the City are required to be built in compliance with the CBC, as included in the City's Municipal Code as Chapter 8, Article 2, Division 1 (and in the EIR as PPP GEO-1), which regulates all building and construction projects within the City and implements a minimum standard for building design and construction that includes specific requirements for seismic safety, excavation, foundations, retaining walls and site demolition.

The Geotechnical Report (Geo 2019) prepared for the Project site provides CBC seismic design criteria that are specific to the onsite soils and the potential liquefaction and settlement. Compliance with the CBC, as included as PPP GEO-1, would require proper construction of building footings and foundations so that it would withstand the effects of potential ground movement, including liquefaction and settlement.

In addition, as described in Section 3.0, *Project Description*, the soils onsite would be excavated to a minimum of 5 feet below the bottom of the building foundations and 5 feet beyond the building perimeters, reconditioned, and recompacted as engineered fill to support the proposed structures. The compaction of fill would be in compliance with the CBC regulations, as required by PPP GEO-1.

The CBC, as currently adopted in the City's Municipal Code Chapter 8, Article 2, Division 1, includes provisions to reduce impacts caused by potential major structural failures or loss of life resulting from

geologic hazards. For example, the CBC requires that a California Certified Engineering Geologist or California-licensed civil engineer provide site-specific engineering data to demonstrate the satisfactory performance of proposed structures. The City requires the Project specific engineering design recommendations be incorporated into grading plans and building specifications as a condition of construction permit approval. Therefore, the development of the proposed Project would be required to conform to the seismic design parameters of the CBC, as included as PPP GEO-1, which are reviewed by the City for appropriate inclusion as part of the building plan check and development review process. Compliance with the requirements of the CBC and City's municipal code for structural safety (included as PPP GEO-1) would reduce hazards from seismic-related ground failure, including liquefaction and settlement to a less than significant level.

IMPACT GEO-1iv: THE PROJECT WOULD NOT DIRECTLY OR INDIRECTLY CAUSE POTENTIAL SUBSTANTIAL ADVERSE EFFECTS, INCLUDING THE RISK OF LOSS, INJURY, OR DEATH INVOLVING LANDSLIDES.

No Impact. The proposed Project site is located in a seismically active region subject to strong ground shaking. However, as described previously, the Geotechnical Report describes that the existing elevations of the Project site range from approximately 57 to 65 feet msl and that the site is not located within a mapped area considered potentially susceptible to seismically induced slope instability (GEO 2019). In addition, the Project site is not adjacent to any hills or slopes that could be subject to a landslide. Thus, the Project site is not located within or adjacent to an earthquake-induced landslide area, and the Project would not expose people or structures to substantial adverse effects involving landslides, and impacts related to landslides would not occur.

IMPACT GEO-2: THE PROJECT WOULD NOT RESULT IN SUBSTANTIAL SOIL EROSION OR THE LOSS OF TOPSOIL.

Less than Significant Impact. Construction of the Project has the potential to contribute to soil erosion and the loss of topsoil. Grading and excavation activities that would be required for the proposed Project would expose and loosen topsoil, which could be eroded by wind or water.

The City's Municipal Code Chapter 18-156, Control of Urban Runoff implements the requirements of the Orange County Municipal NDPES Storm Water Permit (Order No. R8-2016-0001). All projects in the City are required to conform to the permit requirements, which includes installation of Best Management Practices (BMPs) in compliance with the NPDES permit, which establishes minimum stormwater management requirements and controls that are required to be implemented for the proposed Project. To reduce the potential for soil erosion and the loss of topsoil, a Stormwater Pollution Prevention Plan (SWPPP) is required by the Regional Water Quality Control Board (RWQCB) regulations to be developed by a QSD (Qualified SWPPP Developer). The SWPPP is required to address site-specific conditions related to specific grading and construction activities. The SWPPP is required to identify potential sources of erosion and sedimentation loss of topsoil during construction, identify erosion control BMPs to reduce or eliminate the erosion and loss of topsoil, such as use of silt fencing, fiber rolls, or gravel bags, stabilized construction entrance/exit, hydroseeding. With compliance with the City's Municipal Code, RWQCB requirements, and the BMPs in the SWPPP that is required to be prepared to implement the Project, construction impacts related to erosion and loss of topsoil would be less than significant.

In addition, the proposed Project includes installation of landscaping, such that during operation of the Project substantial areas of loose topsoil that could erode would not exist. In addition, as described in Section 5.8, *Hydrology and Water Quality*, the onsite drainage features that would be installed by the Project have been designed to slow, filter, and slowly discharge stormwater into the offsite drainage system, which would also reduce the potential for stormwater to erode topsoil during Project operations. Furthermore, implementation

of the Project requires City approval of a site specific Water Quality Management Plan (WQMP), which would ensure that the City's Municipal Code, RWQCB requirements, and appropriate operational BMPs would be implemented to minimize or eliminate the potential for soil erosion or loss of topsoil to occur. As a result, potential impacts related to substantial soil erosion or loss of topsoil would be less than significant.

IMPACT GEO-3: THE PROJECT WOULD NOT 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 ON- OR OFF-SITE LANDSLIDE, LATERAL SPREADING, SUBSIDENCE, LIQUEFACTION OR COLLAPSE.

Less than Significant Impact. As described previously, the elevation of the site ranges from approximately 57 to 65 feet msl and the site is not located on or adjacent to a hillside or slope. Based on the relatively flat topography of the site, lack of a free face nearby and general lack of potentially liquefiable layers in the upper 40 feet, the Geotechnical Report determined that the potential for lateral spreading on the site is low (GEO 2019). Thus, impacts related to lateral spreading would be less than significant. Also, as described previously, impacts related to landslides would not occur.

However, the Geotechnical Report identified that seismic inducted settlement onsite could be 2 inches or less; and differential seismic settlement is estimated as 1-inch over a horizontal span of about 40 feet (GEO 2019). As described in the previous response, the Geotechnical Report prepared for the Project site provides CBC seismic structural design criteria that are specific to the onsite soils, including the soils settlement and minor ground subsidence conditions that could occur. The Project includes excavation and recompaction of soils, and development of foundation systems in compliance with the CBC, as included as PPP GEO-1, which would require proper construction of building foundations to reduce impacts related to settlement and subsidence would not occur onsite.

The CBC, as currently adopted in the City's Municipal Code Chapter 8, Article 2, Division 1, requires that a California Certified Engineering Geologist or California-licensed civil engineer provide site-specific engineering data for the proposed structures, which are reviewed by the City for appropriate inclusion as part of the building plan check and development review process. Compliance with the requirements of the CBC and City's municipal code for structural safety through implementation of as included as PPP GEO-1 would reduce potential impacts to a less than significant level.

IMPACT GEO-4: THE PROJECT WOULD BE LOCATED ON EXPANSIVE SOIL, AS DEFINED IN TABLE 18-1-B OF THE UNIFORM BUILDING CODE (1994) BUT WOULD NOT CREATE SUBSTANTIAL RISKS TO LIFE OR PROPERTY.

Less than Significant Impact. As described previously, the Project site contains medium stiff to hard clays with variable sand content, as well as loose to medium dense, moist to wet clayey and silty sands (GEO 2019). Due to the clay content in the onsite soils, the site has the potential for expansion (GEO 2019). However, as described in Section 3.0, *Project Description*, the soils onsite would be excavated to a minimum of 5 feet below the bottom of the building foundations and 5 feet beyond the building perimeters, reconditioned, and recompacted as engineered fill to support the proposed building structures. As part of reconditioning the compacted engineered fill, the soils would be moisture conditioned, as required by the CBC for expansive soils (GEO 2019). In addition, the Geotechnical Report includes soil moisture conditioning recommendations.

Furthermore, prior to approval of construction, an engineering level design geotechnical report is required to be prepared and submitted to the City that details the project designs that have been included to address potential geotechnical and soil conditions pursuant to the CBC requirements, that are included in the City's Municipal Code Chapter 8, Article 2, Division 1, and implemented by PPP GEO-1. Compliance with the CBC,

through design level geotechnical specifications that would be reviewed and approved by the City Engineer, per PPP GEO-1 would ensure that potential impacts related to expansive soils would be less than significant.

IMPACT GEO-5: THE PROJECT WOULD NOT RESULT IN SOILS INCAPABLE OF ADEQUATELY SUPPORTING THE USE OF SEPTIC TANKS OR ALTERNATIVE WASTEWATER DISPOSAL SYSTEMS WHERE SEWERS ARE NOT AVAILABLE FOR DISPOSAL OF WASTEWATER.

No Impact. The Project site is currently connected to the City's sewer system, and the proposed Project would install onsite sewer lines that would connect to the existing sewer lines adjacent to the site. The Project would not use septic tanks or alternative wastewater disposal systems. As a result, impacts related to septic tanks or alternative wastewater disposal systems would not occur from implementation of the proposed Project.

IMPACT GEO-6: THE PROJECT WOULD NOT DIRECTLY OR INDIRECTLY DESTROY A UNIQUE PALEONTOLOGICAL RESOURCE OR SITE OR UNIQUE GEOLOGIC FEATURE.

Less than Significant Impact. As described previously, the Project site is underlain by Quaternary aged young alluvial fan deposits and older artificial fill. Quaternary alluvial materials in Orange County are assigned a low paleontological resource sensitivity due to their relatively recent age (Eisentraut and Cooper 2002). Likewise, the Orange County General Plan Figure VI-9 shows that the Project site is not located within an area of paleontological sensitivity.

In addition, the Project site has been previously disturbed from agricultural and development activity (GEO 2019). As detailed previously, artificial fill was observed in the field explorations up to 7.5 feet below existing grade and previous excavation and recompaction ranged from 5 feet to 13 feet for development of the existing buildings. The extensive previous excavation, recompaction, and fill soils onsite have further reduced the potential of the site to contain paleontological resources. Because the Project site is within an area of low paleontological resource sensitivity, has been previously disturbed, and the depth of Project excavated is within the previously disturbed soil depths, potential impacts related to paleontological resources would be less than significant.

5.5.7 CUMULATIVE IMPACTS

The potential cumulative exposure of people or structures to unstable geologic units and/or expansive soils that have the potential to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction, movement, or collapse tend to be region wide in nature, even though each site-specific development has unique geologic considerations. Site-specific development projects within Santa Ana and adjacent areas within the City of Tustin are subject to uniform site-development policies and construction standards imposed by the Cities that are based on the state requirements in the CBC and site-specific geotechnical studies prepared to define site-specific conditions that might pose a risk to safety, such as those described previously for the proposed Project. While increases in the number of people and structures subject to unstable geologic units and soils would increase in the Project area with cumulative development, given the application of CBC requirements by the City through the construction permitting process, the cumulative effects of development related to unstable geologic units and/or expansive soils; including landslides, lateral spreading, subsidence, liquefaction, movement, or collapse would be less than significant.

Paleontological Resources: The Project site is within an area of low paleontological sensitivity and has been previously disturbed. The proposed Project would not result in impacts to paleontological resources that could cumulatively combine with impacts other projects. Therefore, impacts would be less than cumulatively significant.

5.5.8 EXISTING STANDARD CONDITIONS AND PLANS, PROGRAMS, OR POLICIES

PPP GEO-1: CBC Compliance. The Project is required to comply with the California Building Standards Code (CBC) as included in the City's Municipal Code as Chapter 8, Article 2, Division 1, to preclude significant adverse effects associated with seismic and soils hazards. As part of CBC compliance, CBC related and geologist and/or civil engineer specifications for the proposed Project shall be incorporated into grading plans and building specifications as a condition of construction permit approval.

5.5.9 LEVEL OF SIGNIFICANCE BEFORE MITIGATION

Upon implementation of regulatory requirements Impacts GEO-1 through GEO-6 would be less than significant.

5.5.10 MITIGATION MEASURES

No mitigation measures are required.

5.5.11 LEVEL OF SIGNIFICANCE AFTER MITIGATION

Compliance with existing regulatory programs would reduce potential impacts associated with potential geotechnical hazards and unique paleontological resource impacts to a level that is less than significant. Therefore, no significant unavoidable adverse impacts related to geology and soils and paleontological resources would occur.

REFERENCES

City of Santa Ana General Plan Public Safety Element. Accessed: https://www.santa-ana.org/general-plan/current-general-plan

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Orange County General Plan Figure VI-9, General Areas of Paleontological Sensitivity. Accessed: https://www.ocgov.com/civicax/filebank/blobdload.aspx?blobid=8621

State Water Resources Control Board Construction Storm Water Program. Accessed: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml