5.4 GEOLOGY AND SOILS

This section of the Draft Environmental Impact Report (DEIR) evaluates the potential for implementation of the Museum House project to impact geological and soil resources in the City of Newport Beach. The analysis in this section is based in part on the following technical report:

- *Geotechnical Recommendations, 850 San Clemente Drive, Newport Beach, California,* Group Delta Consultants, November 10, 2015.

A complete copy of the study is included in the Technical Appendices to this Draft EIR (Volume II, Appendix G).

5.4.1 Environmental Setting

5.4.1.1 REGULATORY BACKGROUND

Laws, regulations, and plans that are potentially applicable to the proposed project are summarized below.

Federal

Clean Water Act

The federal Water Pollution Control Act (also known as the Clean Water Act [CWA]) is the principal statute governing water quality. The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States and gives the US Environmental Protection Agency the authority to implement pollution control programs, such as setting wastewater standards for industry. The statute's goal is to end all discharges entirely and to restore, maintain, and preserve the integrity of the nation's waters. The CWA regulates both direct and indirect discharge of pollutants into the nation's waters. The CWA sets water quality standards for all contaminants in surface waters and makes it unlawful to discharge any pollutant from a point source into navigable waters unless a permit is obtained under its provisions. The CWA mandates permits for wastewater and stormwater discharges and requires states to establish site-specific water quality standards for navigable bodies of water. The CWA also recognizes the need for planning to address nonpoint sources of pollution.

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 Hazard Reduction Program (NEHRP), which refined the description of agency responsibilities, program goals, and objectives. NEHRP's mission includes improved understanding, 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. NEHRP designates the Federal Emergency Management Agency as the lead agency of the program and assigns it

several planning, coordinating, and reporting responsibilities. Programs under NEHRP help inform and guide planning and building code requirements such as emergency evacuation responsibilities and seismic code standards.

State

California Alquist-Priolo Earthquake Fault Zoning Act

The California Alquist-Priolo Earthquake Fault Zoning Act was signed into state law in 1972, and amended, with its primary purpose being to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault. This act (or state law) was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The act requires the State Geologist (California Geologic Survey, CGS) to delineate regulatory zones known as "earthquake fault zones" along faults that are "sufficiently active" and "well defined" and to issue and distribute appropriate maps to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Pursuant to this act and as stipulated in Section 3603(a) of the California Code of Regulations, structures for human occupancy are not permitted to be placed across the trace of an active fault. The act also prohibits structures for human occupancy within 50 feet of the trace of an active fault, unless proven by an appropriate geotechnical investigation and report that the development site is not underlain by active branches of the active fault, as stipulated in Section 3603(a) of the California Code or Regulations. Furthermore, the act requires that cities and counties withhold development permits for sites within an earthquake fault zone until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting, as stipulated in Section 3603(d) of the California Code of Regulations.

Seismic Hazard Mapping Act

The Seismic Hazard Mapping Act was adopted by the state in 1990 for the purpose of protecting the public from the effects of nonsurface fault rupture earthquake hazards, including strong ground shaking, liquefaction, seismically induced landslides, or other ground failure caused by earthquakes. The goal of the act is to minimize loss of life and property by identifying and mitigating seismic hazards. The CGS prepares and provides local governments with seismic hazard zones maps that identify areas susceptible to amplified shaking, liquefaction, earthquake-induced landslides, and other ground failures.

California Building Code

Current law states that every local agency enforcing building regulations, such as cities and counties, must adopt the provisions of the California Building Code (CBC) within 180 days of its publication. The publication date of the CBC is established by the California Building Standards Commission, and the code is also known as Title 24, Part 2, of the California Code of Regulations. These codes provide minimum standards to protect property and public safety by regulating the design and construction of excavations, foundations, building frames, retaining walls, and other building elements to mitigate the effects of seismic shaking and adverse soil conditions. The CBC contains provisions for earthquake safety based on factors

including occupancy type, the types of soil and rock onsite, and the strength of ground shaking with a specified probability at a site. The 2013 CBC took effect on January 1, 2014.

Storm Water Pollution Prevention Plans

Pursuant to the CWA, in 2012, the State Water Resources Control Board issued a statewide general NPDES Permit for stormwater discharges from construction sites (National Pollutant Discharge Elimination System No. CAS000002). Under this Statewide General Construction Activity permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the General Permit. Coverage by the General Permit is accomplished by completing and filing a Notice of Intent with the State Water Resources Control Board and developing and implementing a Storm Water Pollution Prevention Plan (SWPPP). Each applicant under the General Construction Activity Permit must ensure that a SWPPP is prepared prior to grading and is implemented during construction. The SWPPP must list best management practices (BMPs) implemented on the construction site to protect stormwater runoff and must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a monitoring plan if the site discharges directly to a water body listed on the state's 303(d) list of impaired waters.

Local

City of Newport Beach Municipal Code Chapter 15.10

Chapter 15.10 of the City's municipal code regulates grading, drainage, and hillside construction. Grading permits are required for all project sites requiring excavation, fills, and paving. Each application for a grading permit requires plans and specifications and applicable engineering and geology reports. Similarly, drainage permits also require plans and specifications accurately showing the existing conditions and proposed alterations. Grading plan and drainage plan review fees are required for all requested permits.

5.4.1.2 EXISTING CONDITIONS

Regional Geologic Setting

The site is in the Los Angeles Basin, which is part of the Peninsular Range Geomorphic Province of California. The Peninsular Ranges are characterized by a series of northwest trending mountain ranges separated by valleys. Range geology consists of granitic rock intruding into the older metamorphic rocks. Valley geology is typified by shallow to deep alluvial basins consisting of gravel, sand, silt, and clay.

Specifically, the site is at the southern margin of the Los Angeles Basin, which ends abruptly with the Newport-Inglewood uplift. The uplift is characterized by costal mesas of late Miocene to early Pleistocene marine sediments and late Pleistocene marine terrace deposits.

Project Site Geology

The soils at the site are marine terraces and deposits that overlie bedrock of the Monterey Formation. The marine terrace deposits are generally medium dense to dense fine to medium sand with varying amounts of gravel. The Monterey Formation is composed of stiff to hard claystone; the top of the Monterey Formation is approximately 20 to 27 feet below ground surface. The clay is highly plastic and expansive. Rock within the upper 90 feet under the site is considered soft rock based on the results of a subsurface seismic survey of the site conducted in September 2015.

Three soil borings were conducted onsite to evaluate subsurface conditions onsite and collect soil samples for laboratory tests to evaluate the engineering characteristics of the underlying soils. The drilling program was performed on September 14 and September 16, 2015. The drilling program consisted of advancing two boreholes to a depth of 51.5 feet and one borehole to a depth of 95.5 feet below the existing ground surface. Boreholes were labeled A-15-001 through A-15-003.

Bedrock was encountered at approximately 155 feet above mean sea level (amsl) in boring A-15-001, approximately 158 feet amsl in boring A-15-002, and approximately 151.5 feet amsl in boring A-15-003. Based on an average existing ground level of 179 feet amsl[1] for the project site, bedrock was encountered at 24 feet below ground level, 21 feet below ground level, and 28 feet below ground level in each respective boring.

Groundwater

Groundwater at the site is controlled by the ocean approximately 2 miles to the south of the project site. The historic groundwater at the site is deeper than 50 feet. However, groundwater was encountered at a depth of 49 feet (approximate 129 feet amsl) in boring A-15-003 at the most northeastern portion of the site. The groundwater pressure was not given time to equalize in the boring as it was backfilled immediately. However, it is likely that given additional time, the groundwater elevation would have risen in this boring.

Perched groundwater is defined as an accumulation of groundwater above the water table in an unsaturated zone, usually trapped above an impermeable soil layer such as clay or controlled by fractures in the rock. Perched groundwater was found at the site during drilling at approximately 42 feet below the site grade (approximate 136 feet amsl) in boring A-15-002 on the eastern side of the project site. One week after the initial drilling, additional perched water was encountered at a depth of 23 feet (approximate 155 feet amsl) in the same boring. Given the rise in perched groundwater elevation in boring A-15-002, water would impact project construction and would need to be controlled during construction.

Faulting and Seismicity

The site is in a seismically active area. Faults in the site vicinity include the Newport-Inglewood fault (N. Los Angeles Basin and S. Los Angeles Basin Sections, Northern and Southern), the San Joaquin Hills Blind Thrust Fault (actual location unknown, but travels north-south through Orange County), and the Elsinore Fault (Whittier Section) (approximately 18 miles from the project site). No active faults are known to cross

[1] The project site is relatively flat; however, its topographic elevation ranges from approximately 173 to 185 feet amsl.

the project site. The closest active fault to the site is the Newport-Inglewood Fault, located offshore approximately 2.7 miles to the southwest.

The Pelican Hills Fault also passes approximately 0.5 mile north of the project site and is classified as potentially active. However, the City's Natural Hazards Mitigation Plan notes that this fault has largely been determined to be inactive during the Holocene period (Newport Beach 2008).

Seismic Hazards

Strong Seismic Ground Shaking

The project site is in a seismically active region, and strong ground shaking is likely to occur within the design lifetime of the proposed tower. Seismic design parameters required by the 2013 California Building Code (California Code of Regulations Title 24 Part 2) are described in the project geotechnical report, included as Appendix G of this DEIR.

Earthquake-Induced Landslides

The site is generally level, and there are no slopes near the site susceptible to earthquake-induced landslides. Also, the site is not in any of the areas identified as having landslide potential on Figure S2, Seismic Hazards, of the City's General Plan.

Liquefaction and Related Ground Failure

Strong ground shaking in sediment layers that are saturated with groundwater may cause them to lose strength and behave as a fluid. Liquefaction near or at the ground surface can result in property damage and structural failure. Surface ground failure usually takes the form of lateral spreading, flow failures, ground oscillation, and/or general loss of bearing strength. Sand boils (injections of fluidized sediment) commonly accompany these types of failure.

Typically, liquefaction occurs in areas where loose to medium dense sands and silts are present, and where the depth to groundwater is less than 50 feet below ground surface. The marine terrace deposits onsite are not subject to liquefaction due to the dense to medium dense soil; the location of the soil above the groundwater table; and groundwater depth of approximately 49 feet. The site is not in a liquefaction hazard zone designated by the State of California. Also, the site is not included within any of the areas identified as having liquefaction potential on Figure S2, Seismic Hazards, of the City's General Plan.

Lateral Spreading

Lateral spreading is the downslope movement of surface sediment due to liquefaction in a subsurface layer. Lateral spreading is not expected to occur onsite, since shallow soils onsite are not considered subject to liquefaction.

Erosion

Erosion is the movement of soil from place to place, and is a natural process. The main natural agents of erosion in the region are wind and flowing water. Erosion can be accelerated dramatically by ground-disturbing activities if effective erosion control measures are not used. Soil can be tracked off of construction sites by vehicles as well as carried off sites by wind and water. Upper Newport Bay, one of the receiving waters for the project site, is listed as impaired by sedimentation/siltation on the Clean Water Act Section 303(d) List of Water Quality Limited Segments.

Geologic Hazards

Ground Subsidence

The major cause of ground subsidence (or the sinking of land) is withdrawal of groundwater through excessive extraction and pumping of groundwater out of the ground. Although groundwater and perched groundwater was encountered during drilling and field investigation, the project site is not located over a groundwater basin. The site is also underlain by claystone bedrock, the top of which is at depths ranging from 20 to 27 feet below the ground surface. Thus, the potential for ground subsidence through groundwater extraction activities is considered negligible.

Collapsible Soil

Collapsible soils shrink upon being wetted and/or being subject to a load. According to the City's General Plan, collapsible soils underlie a significant portion of the City's lowland areas and canyon bottoms. Collapsible soils are generally young sediments of low density with variable amounts of organic materials. Under the added weight of fill embankments or buildings, these sediments can settle, causing distress to improvements. Low-density soils, if sandy in composition and saturated with water, can also be susceptible to the effects of liquefaction during a moderate to strong earthquake.

Given that the project site is not in lowland areas or canyon bottoms, it is unlikely that it is susceptible to collapsible or compressible soils. Additionally, as stated above, the soils at the site are marine terrace deposits (dense to medium dense) that overlie bedrock of the Monterey Formation (stiff to hard claystone). Thus, the site is not susceptible to collapse because of low density soils and/or organic materials.

Expansive Soils

Expansive soils shrink or swell as the moisture content decreases or increases; the shrinking or swelling can shift, crack, or break structures built on such soils. The Monterey Formation claystone under the site is considered potentially expansive.

5.4.2 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would:

G-1 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

- i) 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 42.)
- ii) Strong seismic ground shaking.
- iii) Seismic-related ground failure, including liquefaction.
- iv) Landslides.

G-2 Result in substantial soil erosion or the loss of topsoil.

G-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.

G-4 Be located on expansive soil, as defined in Table 18-1B of the Uniform building Code (1994), creating substantial risks to life or property.

G-5 Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

The Initial Study, included as Appendix A, substantiates that impacts associated with the following thresholds would either be less than significant or have no impact:

- Threshold G-1.i
- Threshold G-5

These thresholds will not be addressed in the following analysis.

5.4.3 Environmental Impacts

The following impact analysis addresses thresholds of significance for which the Initial Study disclosed potentially significant impacts. The applicable thresholds are identified in brackets after the impact statement.

Impact 5.4-1: Project residents and visitors would not be subject to substantial seismic-related hazards. [Threshold G-1.ii through G-1.iv]

Impact Analysis:

Strong Ground Shaking

Although project development would introduce new residents to the site, the project itself would not exacerbate ground shaking onsite. The proposed foundation for the tower core would extend several feet into bedrock, which would help resist seismic groundshaking, including compression and shear waves, and maintain a solid foundation. The design and construction of the building would comply with seismic design parameters in the geotechnical report, including the seismic design requirements under the 2013 CBC (see Table 1 of Appendix G), which include specific design standards to ensure earthquake safety based on factors including occupancy type, nature of underlying soils and rock, and potential for groundshaking.

A commenter during the scoping meeting voiced concerns about potential hazards from collapse of the proposed tower if a strong earthquake were to occur. As stated above, the building would be designed and constructed to comply with seismic design parameters in the geotechnical report and the 2013 CBC, which would minimize potential for building collapse and general building damage. Additionally, the City has a Natural Hazards Mitigation Plan (2008) which provides a framework for planning for major natural hazards, including earthquakes, that have the potential to impact the Newport Beach area. It establishes a basis for coordination and collaboration among agencies and the public, identifies and prioritizes future mitigation projects, and assists in meeting the requirements of federal assistance programs, if needed.

Seismic Ground Failure Including Liquefaction

Typically, liquefaction occurs in areas where loose to medium dense sands and silts are present. Development of the project would not increase liquefaction potential on or next to the site. The marine terrace deposits onsite are not subject to liquefaction given that the marine terrace deposits are considered medium dense to dense. Additionally, site grading would involve excavations to depths of about 20 to 25 feet below the ground surface, and the building foundation would be supported on native bedrock. As discussed above, the site is also not in any of the areas identified as having liquefaction potential on Figure S2, Seismic Hazards, of the City's General Plan.

Landslides

As stated above, the project site is predominantly flat (with a topographic elevation ranging from approximately 173 to 185 feet amsl, a difference of approximately 12 feet) and there are no slopes near the site that could cause earthquake-induced landslides. The site is generally level and no post-construction slopes are planned. The site is at the top of a mesa, but it is not near the mesa slopes adjacent to Upper Newport Bay. Therefore, slope stability is not considered a hazard at the site. This is also consistent with the California Seismic Hazard Zone Map for the Newport Beach 7.5-minute Quadrangle, and Figure S2, Seismic Hazards, from the City's General Plan, which shows that the site is not within a seismic-induced landslide hazard zone area.

Overall, development of the proposed project would not expose people or structures to potential substantial adverse effects from ground shaking, ground failure, or landslides. Impacts would be less than significant.

Impact 5.4-2: Project construction and project operation would not result in substantial soil erosion. [Threshold G-2]

Impact Analysis:

Project Construction

Site grading and project construction activities would disturb and expose large amounts of soil and could thus accelerate erosion if effective soil erosion measures are not used. Overall, construction activities would require the export of approximately 45,000 cubic yards of soil.

Construction projects of one acre or more, including the proposed project, are regulated under the Statewide General Construction Permit, Order No. 2012-0006-DWQ, issued by the State Water Resources Control Board in 2012. Projects obtain coverage by developing and implementing a SWPPP estimating sediment risk from construction activities to receiving waters, and specifying BMPs that would be used by the project to minimize pollution of stormwater. Categories of BMPs used in SWPPPs are described below in Table 5.4-1. Implementation of BMPs would reduce construction impacts on stormwater quality to less than significant.

Table 5.4-1 Construction Best Management Practices

Category	Purpose	Examples
Erosion Controls and Wind Erosion Controls	Cover and/or bind soil surface, to prevent soil particles from being detached and transported by water or wind	Mulch, geotextiles, mats, hydroseeding, earth dikes, swales
Sediment Controls	Filter out soil particles that have been detached and transported in water.	Barriers such as straw bales, sandbags, fiber rolls, and gravel bag berms; desilting basin; cleaning measures such as street sweeping
Tracking Controls	Minimize the tracking of soil offsite by vehicles	Stabilized construction roadways and construction entrances/exits; entrance/outlet tire wash.
Non-Storm Water Management Controls	Prohibit discharge of materials other than stormwater, such as discharges from the cleaning, maintenance, and fueling of vehicles and equipment. Conduct various construction operations, including paving, grinding, and concrete curing and finishing, in ways that minimize non-stormwater discharges and contamination of any such discharges.	BMPs specifying methods for: paving and grinding operations; cleaning, fueling, and maintenance of vehicles and equipment; concrete curing; concrete finishing.
Waste Management and Controls (i.e., good housekeeping practices)	Management of materials and wastes to avoid contamination of stormwater.	Spill prevention and control, stockpile management, and management of solid wastes and hazardous wastes.

Source: CASQA 2003.

Project Operation

In compliance with the NPDES small municipal separate storm sewer system (MS4) permit and Orange County Drainage Area Management Plan, a WQMP was prepared for the proposed project that identifies BMPs to be used onsite to control pollutant runoff. At project completion the entire site would be developed with the building, paved motor courtyard, parking spaces, and a service/fire access road. Remaining landscaped areas would be designed in accordance with the WQMP, which would limit areas subject to soil erosion.

Best Management Practices

The project water quality management plan (WQMP, included as Appendix G to this DEIR) specifies four categories of BMPs to be implemented by the project: site design BMPs, structural source control BMPs, nonstructural source control BMPs, and low-impact development BMPs. Site design BMPs, structural source control BMPs, and low-impact development BMPs are described below.

Site Design BMPs

Site design BMPs are intended to reduce or eliminate post-project runoff. The project WQMP includes the following site design BMPs:

- **Minimize Impervious Area:** Impervious surfaces have been minimized by incorporating landscaped areas throughout the site surrounding the proposed building. Landscaping will be provided throughout the site within the common areas as well as around the perimeter of the building.

- **Preserve Existing Drainage Patterns and Time of Concentration:** Runoff from the site will continue to flow similar to existing conditions. Low-flows and first-flush runoff will drain to proprietary biotreatment systems for water quality treatment via bio-filtration.

- **Disconnect Impervious Areas:** Landscaping will be provided adjacent to sidewalks and between the proposed buildings. Low-flows and first-flush runoff will drain to proprietary biotreatment systems for water quality treatment via bio- filtration.

- **Native and/or Drought-Tolerant Landscaping:** Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

Structural Source Control BMPs

Source control BMPs reduce the potential for pollutants to enter runoff. The project WQMP includes the following structural source control BMPs:

- Provide storm drain system stenciling and signage.

- Use efficient irrigation systems and landscape design, water conservation, smart controllers, and source control.

Low-Impact Development BMPs

Low-impact development principles are site design concepts that prevent or minimize project impacts and help mimic the pre-development hydrology. Low-impact development BMPs infiltrate, evapotranspire, harvest and use, or treat runoff from impervious surfaces.

The project WQMP prescribes biotreatment through installation of proprietary modular wetland systems onsite. The proposed wetland system would have capacity to treat runoff from the site from an 85th percentile, 24-hour storm, which is similar to a two-year, 24-hour storm.

Impacts from project operation would be less than significant after implementation of the project WQMP.

Impact 5.4-3: Project development would not exacerbate existing hazards related to landslide, liquefaction, lateral spreading, subsidence, or collapse. [Threshold G-3]

Impact Analysis:

Landslide

As stated above, the project site is predominantly flat and there are no slopes near the site that could cause landslides. The project site is also not identified as being in an area of the City that is subject to landslides (Newport Beach 2016).

Liquefaction and Lateral Spreading

As stated above, liquefaction typically occurs in areas where loose to medium dense sands and silts are present, and where groundwater depths are less than 50 feet below ground surface. Lateral spreading is the downslope movement of surface sediment due to liquefaction in a subsurface layer.

The project site's marine terrace deposits are not subject to liquefaction because they are considered medium dense to dense. The site's soils are considered dense to very dense, and although groundwater was encountered in one of the borings at 49 feet, the project site is not above a groundwater basin that could cause significant liquefaction hazards. Additionally, the site is not in a state-designated Liquefaction Hazard Zone or identified by the City as being subject to liquefaction (Newport Beach 2016). Therefore, hazards from potential liquefaction and lateral spreading are less than significant.

Subsidence

As stated above, the major cause of ground subsidence is excessive withdrawal of groundwater through groundwater pumping. However, the project site is not over a groundwater basin, and significant groundwater pumping would not occur. Thus, ground subsidence is not considered a significant hazard.

Collapse

As stated above, the project site is not in lowland areas or canyon bottoms; therefore, it is unlikely that the site is susceptible to collapsible or compressible soils. Additionally, as stated above, the soils at the site are

marine terrace deposits (dense to medium dense) that overlie bedrock of the Monterey Formation (stiff to hard claystone). Thus, the site is not susceptible to collapse because of low density soils and/or organic materials.

Other Geologic Hazards

Excavation activities related to the subterranean parking garage and utility trenches may cause instability in the site's geologic units. Thus, recommendations in the geotechnical study for excavation and backfill are reproduced as mitigation to ensure impacts remain less than significant.

Overall, development of the proposed project would not exacerbate any existing geologic hazards associated with landslides, liquefaction, lateral spreading, subsidence, or collapse.

Impact 5.4-4: Development of the project would not increase existing hazards arising from expansive soils. [Threshold G-4]

Impact Analysis: Although the Monterey Formation claystone under the site is expansive, the tower would be supported on mat foundations and a core extending several feet into bedrock. A mat foundation is an above-ground foundation typically two to three feet thick (but can be as thick as 10 feet) to provide load-bearing capacity in expansive or collapsible soils. The weight of mat foundation and high-rise structure would provide sufficient pressure on the expansive soil to prevent soil expansion. To ensure the mat foundations are properly installed, recommendations from the geotechnical report are reproduced as mitigation below. Upon compliance with the CBC and applicable mitigation measures, project development would not exacerbate existing hazards from expansive soils, and impacts would be less than significant.

5.4.4 Cumulative Impacts

Geology and soils impacts are site specific and generally do not combine to result in cumulative impacts. Similar to the proposed project, future development projects would be required to have a site-specific geotechnical investigation prepared by the project applicant/developer and to comply with recommendations in the geotechnical investigation report, as well as comply with the provisions of the CBC. Therefore, no significant cumulative impact would occur.

5.4.5 Existing Regulations and Standard Conditions

Existing Regulations

Federal

- Clean Water Act
- Earthquake Hazards Reduction Act

State

- California Alquist-Priolo Earthquake Fault Zoning Act
- Seismic Hazard Mapping Act
- California Code of Regulations Title 24, Part 2: 2013 California Building Code
- State Water Resources Control Board Order No. 2012-0006-DWQ: Statewide General Construction Activity permit

Local

- City of Newport Beach Municipal Code Chapter 15.10

City of Newport Beach Standard Conditions of Approval

There are no specific City-adopted standard operating conditions of approval related to geology and soils that are applicable to the proposed project at this time; however, project-specific conditions of approval may be applied to the project by the City during the discretionary approval (site development review, tentative tract map, etc.), subsequent design, and/or construction process.

5.4.6 Level of Significance Before Mitigation

Upon implementation of regulatory requirements and standard conditions of approval, the following impacts would be less than significant: 5.4-1 and 5.4-2.

Without mitigation, these impacts would be **potentially significant**:

- **Impact 5.4-3** Development of the project may cause the site's geologic unit or soil to become unstable and lead to geologic hazards.
- **Impact 5.4-4** Construction of the proposed tower could increase hazards related to expansive soils.

5.4.7 Mitigation Measures

Impact 5.4-3

4-1 Given that the project would require excavation extending to the property line, shoring is required to support subterranean excavation. Prior to issuance of grading permits, the City of Newport Beach Building Division shall confirm that the grading plans include the shoring requirements detailed in the project's geotechnical study. Cantilever, tied-back, or internally braced shoring systems can be used for the subterranean excavation. Cantilever shoring systems are typically limited to a maximum retained height of 15 feet. Tied-back

shoring walls will require a temporary or permanent easement from the adjacent property owners and the City of Newport Beach.

The shoring system shall be designed to resist a uniform pressure equal to 25 pounds per square foot (psf). An allowable passive earth pressure of 200 psf per foot of depth below the bottom of the excavation shall be used for design of the shoring system.

The residential tower would be approximately 26 feet from the property line. Therefore, it may be possible to excavate to the subgrade elevation without the use of shoring. Temporary slope in the marine terrace deposit may be excavated at slopes where the proportion of the height of the rise is less than or equal to the length of the slope (1H:1V). Alternatively, sloped excavations may be used to reduce the height of the shored excavation. In that case, the earth pressures above may be increased and will be handled on a case by case basis when the height of the sloped excavation is known.

All shoring and excavation shall comply with current Occupational Safety and Health Administration regulations and be observed by the designated competent person on site.

4-2 The bedding zone is defined as the area containing the material specified that is supporting, surrounding, and extending to one foot above the top of any proposed utility pipes. During grading and construction plan reviews, the City of Newport Beach Building Divisions shall confirm that the project's proposed bedding satisfies the requirements of the Standard Specifications for Public Works Construction Section 306-1.2.1. There shall be a 4-inch minimum of bedding below the pipe and 1-inch minimum clearance below a projecting bell. There shall be a minimum side clearance of 6 inches on each side of the pipe. Bedding material shall be sand, gravel, crushed aggregate, or native free-draining material having a sand equivalent of not less than 30, or other material approved by the engineer. Materials used for the bedding zone shall be placed and compacted with light mechanical means to reduce the potential of damaging the pipe; jetting shall not be allowed.

4-3 Backfill shall be considered as starting 12 inches above the pipe. Onsite excavated materials are suitable as backfill. During construction activities, any boulders or cobbles larger than three inches in any dimension shall be removed before backfilling. All backfill shall be placed in loose lifts not exceeding 6 to 8 inches in thickness and be compacted to at least 90 percent relative compaction. The upper 12 inches below pavement shall be compacted to at least 95 percent relative compaction. Mechanical compaction will be required to accomplish compaction above the bedding along the entire pipeline alignments.

In backfill areas, where mechanical compaction of soil backfill is impractical due to space constraints, sand-cement slurry may be substituted for compacted backfill. The slurry shall contain one sack of cement per cubic yard and have a maximum slump of 5 inches. When set, such a mix typically has the consistency of hard compacted soil and allows for future excavation.

A lean non-shrink concrete plug with a minimum width length of 3 feet shall be placed in the utility trenches at the location where offsite utilities enter the project boundaries to minimize the potential for offsite water flow onsite.

Impact 5.4-4

4-4 All foundation excavations shall be observed and/or tested by the project applicant's geotechnical consultant before placement of concrete to verify that the foundations will be supported in competent soils. If soft or loose soils are encountered at the subgrade level, the soils shall be removed or brought to a near-optimum moisture content (±2 percent), recompacted, and tested to a minimum of 95 percent relative compaction prior to placement of fill or footing or floor slab construction. Only granular soils shall be used for compacted fill.

Mat foundations may also derive lateral load resistance from passive resistance along the vertical sides of the foundations. Therefore, an ultimate passive fluid pressure of 350 pounds per cubic foot shall be used. It is recommended that an ultimate sliding friction coefficient of 0.45 to be used for design. Passive and sliding resistance may be used in combination without reduction. The required factor of safety is 1.5 for static loads and 1.1 for wind or seismic loads.

5.4.8 Level of Significance After Mitigation

Upon implementation of regulatory requirements and mitigation measures, impacts would be less than significant.

5.4.9 References

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