4.6 Geology and Soils

This section evaluates the potential for impacts on geology and soils—specifically liquefaction—resulting from implementation of the French Hotel Project (Project). This section is partially based on the following technical report:

- Geotechnical Update Report, Proposed Hotel and Associated Improvements, Oyharzabal Project, 31861 Camino Capistrano, San Juan Capistrano, California, GMU Engineers & Geologists, Inc., April 30, 2024 (Appendix F).

A Notice of Preparation for the Project was released for public review on March 19, 2026, and an Environmental Impact Report (EIR) Scoping meeting was held on April 6, 2026. No comments were made during the public scoping period that pertain to geology and soils. Additionally, no comments related to geology and soils were received during the public scoping meeting.

4.6.1 Environmental Setting

The following sections describe the environmental setting for the project as it relates to geology and soils.

4.6.2 Regulatory Setting

This section describes the federal, state, and local regulatory framework adopted to address geology and soils.

4.6.2.1 Federal

Clean Water Act

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was substantially reorganized and expanded in 1972. “Clean Water Act” became the Act's common name with amendments in 1972. Under the CWA, the U.S. Environmental Protection Agency has implemented pollution control programs such as setting wastewater standards for industry, and also has set water quality standards for all contaminants in surface waters. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. The U.S. Environmental Protection Agency’s National Pollutant Discharge Elimination System permit program controls discharges. Point sources are discrete conveyances such as pipes or human-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an National Pollutant Discharge Elimination System permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.

Antiquities Act (16 USC 431–433)

The Antiquities Act of 1906 states, in part, the following:

> That any person who shall appropriate, excavate, injure or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

Although there is no specific mention of natural or paleontological resources in the Antiquities Act itself or in its uniform rules and regulations (43 CFR 3), the term "objects of antiquity" has been interpreted to include fossils by the National Park Service, Bureau of Land Management, U.S. Forest Service, and other federal agencies. Permits to collect fossils on lands administered by federal agencies are authorized under this act. However, because the wording is imprecise and leaves large gray areas to interpretation, agencies are hesitant to interpret this act as governing paleontological resources.

Paleontological Resources Preservation, Omnibus Public Lands Act, Public Law 111-011, Title VI, Subtitle D

This legislation directs the Secretaries of the U.S. Department of the Interior and U.S. Department of Agriculture to manage and protect paleontological resources on federal land using "scientific principles and expertise." To formulate a consistent paleontological resources management framework, the act incorporates most of the recommendations from the Secretary of the Interior's Assessment of Fossil Management on federal and Indian Lands (USDI 2000). In passing the act, Congress officially recognized the scientific importance of paleontological resources on some federal lands by declaring that fossils from these lands are federal property that must be preserved and protected. The act codifies existing policies of the Bureau of Land Management, National Park Service, U.S. Forest Service, Bureau of Reclamation, and U.S. Fish and Wildlife Service and provides the following:

- Uniform criminal and civil penalties for illegal sale and transport and theft and vandalism of fossils from federal lands
- Uniform minimum requirements for paleontological resource-use permit issuance (terms, conditions, and qualifications of applicants)
- Uniform definitions for "paleontological resources" and "casual collecting"
- Uniform requirements for curation of federal fossils in approved repositories

4.6.2.2 State

Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code, Section 2621, et seq.)

The Alquist-Priolo Earthquake Fault Zoning Act was signed into state law in 1972. Its primary purpose 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 act delineates "Earthquake Fault Zones" along faults that are "sufficiently active" and "well defined." The act also requires that cities and counties withhold development permits for sites in an earthquake fault zone until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting. Pursuant to this act, structures for human occupancy are not allowed within 50 feet of the trace of an active fault.

California Building Code (California Code of Regulations, Title 24, Part 2)

The National Model Code Standards adopted into Title 24, Part 2, of the California Code of Regulations, also referred to as the California Building Code (CBC), apply to all occupancies in California except for modifications adopted by state agencies and local governing bodies. The CBC establishes general standards for the design and construction of buildings, including provisions related to seismic safety. The CBC provides standards that must be met to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures in its jurisdiction. CBC Chapter 18, Soils and Foundations, specifies the level of soil investigation required by law in California. Requirements in Chapter 18 apply to building and foundations systems and consider reduction of potential seismic hazards. The most recent building standard adopted by the legislature and used throughout the state is the 2022 version of the CBC (effective January 1, 2023). The 2022 CBC would apply to the Project.

California Public Resources Code, Section 5097.5

Paleontological sites are protected under a variety of state policies and regulations in the California Public Resources Code. In addition, paleontological resources are recognized as nonrenewable resources and receive protection under the California Public Resources Code and California Environmental Quality Act (CEQA). California Public Resources Code, Section 5097.5, states the following:

> A person shall not knowingly and willfully excavate upon, or remove, destroy, injure, or deface, any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, rock art, or any other archaeological, paleontological or historical feature, situated on

> public lands, except with the express permission of the public agency having jurisdiction over the lands. A violation of this section is a misdemeanor.

This statute prohibits the removal, without permission, of any paleontological site or feature from lands under the jurisdiction of the state or any city, county, district, authority, public corporation, or any agency thereof. As a result, local agencies are required to comply with California Public Resources Code, Section 5097.5, for their own activities, including construction and maintenance, as well as for permit actions (e.g., encroachment permits) undertaken by others. California Public Resources Code, Section 5097.5, also establishes the removal of paleontological resources as a misdemeanor and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, and district) lands.

Natural Hazards Disclosure Act (California Civil Code, Section 1103.2)

The Natural Hazards Disclosure Act requires that sellers of real property and their agents provide prospective buyers with a Natural Hazard Disclosure Statement when the property being sold lies in one or more state-mapped hazard areas, including a seismic hazard zone. California law also requires that, when houses built before 1960 are sold, the seller must give the buyer a completed earthquake hazards disclosure report and the booklet The Homeowners Guide to Earthquake Safety. This publication was written and adopted by the California Seismic Safety Commission.

Seismic Hazard Mapping Act (California Public Resources Code, Sections 2690–2699.6)

The Seismic Hazard Mapping Act was adopted by the state in 1990 to protect the public from the effects of non-surface 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 California Geological Survey prepares and provides local governments with seismic hazard zone maps that identify areas susceptible to amplified shaking, liquefaction, earthquake-induced landslides, and other ground failures. The act requires responsible agencies to only approve projects in seismic hazard zones following a site-specific investigation to determine if the hazard is present, and if so, the inclusion of appropriate mitigation. In addition, the act requires real estate sellers and agents at the time of sale to disclose if a property is in one of the designated seismic hazard zones.

Soils Investigation Requirements

California Health and Safety Code, Sections 17953–17955, and CBC Section 1802 include requirements for soils investigations for subdivisions requiring tentative and final maps and for other specified types of structures. Testing of samples from subsurface investigations, such as from borings or test pits, is required. Studies must be done as needed to evaluate slope stability, soil

strength, position and adequacy of load-bearing soils, the effect of moisture variation on load-bearing capacity, compressibility, liquefaction, differential settlement, and expansiveness.

Essentials Services Building Seismic Safety Act

In 1986, the California Legislature determined that buildings providing essential services should be capable of providing those services to the public after a disaster. Their intent in this regard was defined in legislation known as the Essential Services Buildings Seismic Safety Act of 1986 and includes requirements that such buildings shall be "…designed and constructed to minimize fire hazards and to resist…the forces generated by earthquakes, gravity, and winds." This enabling legislation can be found in the California Health and Safety Code, Chapter 2, Sections 16000 through 16022. In addition, the California Building Code defines how the intent of the act is to be implemented in Title 24, Part 1 of the California Building Standards Administrative Code, Chapter 4, Articles 1 through 3.

4.6.2.3 Regional

South Coast Air Quality Management District Rule 403

The South Coast Air Quality Management District is responsible for enforcing air pollution control measures in the South Coast Air Basin, in which the Project Site is located. Rule 403 (Fugitive Dust) addresses blowing dust from construction sites and is applicable to the Project due to the potential for wind erosion during Project grading and construction activities.

San Diego Basin Water Quality Control Plan

The City of San Juan Capistrano is located in the San Diego Basin, Region 9, in the Aliso-San Onofre Watershed. The Water Quality Control Plan for the San Diego River Basin (9) was updated in 2016. This Basin Plan gives direction on the beneficial uses of the state waters in Region 9, describes the water quality that must be maintained to support such uses, and provides programs, projects, and other actions necessary to achieve the standards established in the Basin Plan.

4.6.2.4 Local

City of San Juan Capistrano General Plan

A complete rewrite of the City's General Plan was last adopted in December 1999. In May 2002, the City Council approved a variety of changes to several elements of the General Plan. In February 2022, a new Environmental Justice Element was added to the General Plan. The General Plan's Housing Element is updated every eight years with the latest update adopted in August 2022. The City's General Plan is the principal land use document guiding development in the City. The City's General Plan is a comprehensive plan that establishes goals, objectives, and policies intended to guide growth and development in the City. The General Plan also serves as a blueprint for development throughout the community and is the vehicle through which the community needs,

desires, and aspirations are balanced. The San Juan Capistrano General Plan is the fundamental tool for influencing the quality of life in the City.

Safety Element

The Safety Element (1999) identifies and addresses those features or characteristics existing in or near the City which represent a potential hazard to the community's citizens, sites and structures, public facilities and infrastructure. The Safety Element establishes policies to minimize the danger to residents, workers and visitors while identifying actions needed to manage crisis situations such as earthquakes, fires and floods. Additionally, the Safety Element contains specific policies and programs to regulate existing and proposed development in hazard-prone areas. Continuing education of City officials and citizens about emergency preparedness is also addressed.

The following goals and policies applicable to the Project and related to geology and soils are presented in the Safety Element:

- **Goal S-1:** Reduce the risk to the community from hazards related to geologic conditions, seismic activity, wildfires, structural fires and flooding.
  - **Policy S-1.1.** Reduce the risk of impacts from geologic and seismic hazards by applying proper development engineering, building construction, and retrofitting requirements.

City of San Juan Capistrano Municipal Code

The City Municipal Code provides regulations and standards that help implement the goals and policies of the General Plan. The following sections of the Municipal Code contain relevant regulations related to geology and soils.

- **Section 9-3.545, Soil Subsidence Remediation Program.** The purpose of this program is to establish specific measures that will provide resources and programs to assist in the correction of damages arising from slope displacement.

4.6.3 Existing Conditions

4.6.3.1 Regional Geology

The Project Site is located in the Capistrano Embayment, a geologic sub-basin situated at the southeastern extremity of the Los Angeles Basin. The embayment is bounded by the San Joaquin Hills to the west and the Santa Ana Mountains to the east and is part of California's Peninsular Ranges Geomorphic Province. The province is characterized by northwest-trending mountain ranges and valleys formed by tectonic activity associated with the regional fault system of Southern California. The Capistrano Embayment developed as a north–south trending structural trough approximately 4 to 10 million years ago and was inundated by marine waters that deposited

thick sequences of fine-grained sedimentary materials. The region is generally underlain by marine sedimentary rocks of Tertiary age overlain by younger alluvial deposits.

4.6.3.2 Site Geology

Subsurface exploration conducted by GMU Geotechnical identified three principal geologic units beneath the Project Site: artificial fill, old alluvium, and bedrock of the Capistrano Formation.

Artificial Fill (Qaf)

Artificial fill is present across portions of the site and consists primarily of dark gray to very dark brown sandy silts and silty sands containing localized organic material and construction debris. These materials generally exhibit soft to firm consistency and medium-dense conditions. The fill materials are undocumented and vary in thickness across the site.

Old Alluvium (Qoal)

Underlying the artificial fill are native old alluvial deposits consisting of interbedded clay, silt, sand, and gravel. The upper portion generally comprises firm to stiff clay deposits extending to depths of approximately 4 to 10 feet below ground surface. These materials transition to loose to medium-dense silty sands and locally contain interbeds of dense poorly graded sand, sandy clay, sandy silt, and sandy gravel. The alluvial sequence extends to depths of approximately 38 feet below ground surface.

Capistrano Formation (Tc)

The alluvial deposits are underlain by bedrock assigned to the Capistrano Formation. Bedrock encountered during subsurface exploration consists of moderately hard to hard, laminated siltstone that is fresh to slightly weathered. The upper surface of the formation was encountered at elevations ranging from approximately 61 to 64 feet above mean sea level.

4.6.3.3 Groundwater

Groundwater conditions beneath the Project Site were evaluated through review of regional well data and subsurface borings. Groundwater was encountered during field exploration at elevations ranging from approximately 82 to 84 feet above mean sea level. Based on groundwater monitoring data, site observations, and professional evaluation, GMU concluded that a seasonal high groundwater elevation of approximately 82 feet above mean sea level is representative of site conditions. Groundwater is estimated to occur approximately 17 feet below the lowest existing ground surface elevations on the Project Site.

4.6.3.4 Seismic Setting

Southern California is a seismically active region subject to ground shaking generated by movement along numerous active and potentially active faults. The Project Site is not located in an Alquist-Priolo Earthquake Fault Zone, and no known active faults have been mapped crossing the site.

The nearest significant regional faults include the Newport-Inglewood Fault, located approximately 5.6 miles from the site, and the San Joaquin Hills Blind Thrust Fault, located approximately 6.7 miles from the site. The Newport-Inglewood Fault is capable of generating earthquakes up to moment magnitude (Mw) 7.5, while the San Joaquin Hills Blind Thrust Fault is capable of generating earthquakes up to Mw 7.1. Given the proximity of these faults and other active fault systems in Southern California, the Project Site is expected to experience strong seismic ground shaking during its lifetime.

4.6.3.5 Seismic Hazard Zones

According to California Geological Survey seismic hazard mapping, the Project Site is not located in a designated earthquake-induced landslide hazard zone. However, the site is located in an area identified as potentially susceptible to earthquake-induced liquefaction.

4.6.3.6 Liquefaction and Seismic Settlement

The Project Site is underlain by granular alluvial materials and groundwater occurs at depth beneath portions of the site. As a result, the geotechnical investigation evaluated the potential for liquefaction and associated seismic settlement. Analysis of the subsurface conditions determined that the deeper alluvial deposits below the groundwater table do not exhibit a significant potential for liquefaction-induced settlement. However, certain near-surface sandy deposits have the potential to undergo minor seismic-induced dry sand settlement during a major earthquake event. Estimated seismic settlements range from approximately 0.2 to 0.4 inches based on site-specific analyses.

4.6.3.7 Soil Characteristics

Expansion Potential

Laboratory testing conducted on representative site soils indicates that the artificial fill materials exhibit low to moderate expansion potential, with Expansion Index values ranging from 31 to 59. Accordingly, site soils are considered moderately expansive and may experience volume changes associated with fluctuations in soil moisture.

Corrosivity

Laboratory testing indicates that site soils are slightly basic, with pH values ranging from approximately 7.7 to 8.0. Sulfate concentrations are negligible and are not considered corrosive to

concrete. However, elevated chloride concentrations and low electrical resistivity values indicate that on-site soils are corrosive to severely corrosive toward ferrous metals.

4.6.3.8 Settlement Characteristics

The native alluvial deposits underlying the site consist primarily of medium-dense silty sands with interbedded sandy clay, sandy silt, sand, and gravel layers. Geotechnical testing indicates that these materials are not susceptible to hydro-collapse; however, they may experience compression and settlement when subjected to structural loading. The geotechnical investigation concluded that hydro-collapse potential beneath proposed development areas is negligible, ranging from approximately zero to 0.01 percent.

4.6.4 Method of Analysis

The geology and soils analysis is based primarily on the findings and recommendations contained in the Geotechnical Update Report, Proposed Hotel and Associated Improvements, Oyharzabal Property, 31861 Camino Capistrano, San Juan Capistrano, California prepared by GMU Geotechnical, Inc. (April 30, 2024) (Appendix F). The geotechnical investigation included a review of previous geotechnical studies, published geologic and seismic hazard maps, aerial photographs, groundwater information, and other available geologic and geotechnical data relevant to the Project Site and surrounding area.

The investigation incorporated both previous and supplemental subsurface exploration programs. Previous investigations conducted by Salem Engineering Group in October 2021 included drilling and sampling of five exploratory borings to depths ranging from approximately 5 to 33 feet below ground surface. Supplemental subsurface exploration was conducted by GMU in 2024 as part of the preparation of the April 30, 2024, Geotechnical Update Report. The supplemental investigation included excavation of 12 exploratory test pits in accessible portions of the site and drilling of three additional hollow-stem auger borings to depths ranging from approximately 31.5 to 51 feet below ground surface. The subsurface exploration was conducted to evaluate existing fill materials, native alluvial soils, groundwater conditions, and the underlying Capistrano Formation bedrock. Laboratory testing was performed on representative soil samples to evaluate engineering properties, including in-situ density, consolidation characteristics, hydro-collapse potential, expansion potential, corrosivity, particle size distribution, Atterberg limits, moisture-density relationships, and other geotechnical parameters relevant to project design. Additional testing and engineering analyses were performed to evaluate seismic hazards, including fault rupture, strong ground shaking, liquefaction, seismic settlement, lateral spreading, soil expansion, and site stability.

The geotechnical investigation also evaluated groundwater conditions, foundation support characteristics, earthwork requirements, temporary excavation stability, and site preparation measures associated with the Project. The resulting recommendations regarding grading, remedial

earthwork, foundation design, shoring, and construction practices were used to assess the potential for geology and soils impacts.

This information, together with applicable provisions of the California Building Code, California Geological Survey seismic hazard mapping, and other available geologic and geotechnical data sources, was used to determine whether implementation of the Project would result in potentially significant geology and soils impacts.

4.6.5 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, the Project would have a significant impact on geology and soils if it would:

- **Threshold GEO-a:** Directly or indirectly cause 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.
- **Threshold GEO-b:** Result in substantial soil erosion or the loss of topsoil.
- **Threshold GEO-c:** 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.
- **Threshold GEO-d:** 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.
- **Threshold GEO-e:** 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.
- **Threshold GEO-f:** Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

The Initial Study, provided as Appendix A, substantiates that the Project would have no impact with respect to GEO-a(i) (rupture of a known earthquake fault) because the Project Site is not located in an Alquist-Priolo Earthquake Fault Zone or within the vicinity of any known active faults. The Initial Study also determined that the Project would have no impact with respect to GEO-a(iv) (landslides), as the Project Site is relatively flat and is not located in a mapped landslide hazard area. In addition, the Initial Study determined that the Project would have no impact with respect to GEO-e because

the Project would connect to existing municipal wastewater infrastructure and would not use septic tanks or alternative wastewater disposal systems. Therefore, these thresholds are not addressed further in this EIR.

The Initial Study further determined that impacts associated with Threshold GEO-a(ii) (strong seismic ground shaking), Threshold GEO-b (soil erosion or loss of topsoil), Threshold GEO-d (expansive soils), and Threshold GEO-f (paleontological resources and unique geologic features) would be less than significant. These thresholds will not be addressed in the following analysis.

4.6.6 Plans, Programs, and Policies

Compliance measures are uniformly applied regulations or requirements imposed by the approving agency based on the type of action proposed. Because these measures are standard requirements, they are not considered mitigation measures. The following existing plans, programs, and policies (PPPs) apply to development allowed under the Project and help reduce or avoid potential impacts related to geology and soils:

PPP GEO-1 The Project will comply with City of San Juan Capistrano Building Code – Chapter 2 (Building Code).

4.6.7 Environmental Impacts

The following sections address various potential impacts relating to geology and soils that could result from implementation of the Project.

4.6.7.1 Threshold GEO-a(iii): Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.

Impact Analysis

The Project Site is located in a California Geological Survey mapped liquefaction hazard zone. Liquefaction is a phenomenon in which saturated, loose, granular soils temporarily lose strength during strong seismic shaking and behave as a fluid. Liquefaction can result in ground settlement, lateral spreading, and damage to structures and infrastructure.

A site-specific geotechnical investigation was prepared for the Project by GMU Geotechnical (refer to Appendix F). The investigation included subsurface exploration, laboratory testing, groundwater evaluation, and analysis of the site's liquefaction potential. The geotechnical investigation identified artificial fill, old alluvial deposits, and the Capistrano Formation underlying the Project Site. Groundwater was encountered at depths sufficient to warrant evaluation of liquefaction potential.

The geotechnical investigation concluded that the deeper saturated alluvial soils underlying the site do not exhibit a significant potential for liquefaction-induced settlement. Although certain near-surface sandy soils may be susceptible to minor seismic-induced dry sand settlement during a major seismic event, estimated settlements are limited to approximately 0.2 to 0.4 inches and are not anticipated to result in substantial structural damage.

To address site-specific geotechnical conditions, the Project would implement the design and construction requirements identified in the project-specific geotechnical investigation. These requirements include removal of undocumented fill and unsuitable near-surface soils in areas of proposed improvements; recompaction of engineered fill; corrective grading beneath proposed slabs, pavement, and hardscape areas; and support of the podium structure, Building 5, and major retaining walls on deep pile foundations extending into the underlying Capistrano Formation bedrock. The geotechnical investigation also establishes site-specific criteria for grading, foundation design, settlement control, and construction monitoring intended to minimize total and differential settlement and maintain structural stability during seismic events.

Implementation of these geotechnical requirements would occur through the Project's grading, improvement plan, and building permit processes. The California Building Code requires site-specific geotechnical recommendations to be incorporated into the design of foundations, earthwork, and structural systems, and the City reviews grading and construction plans for consistency with approved geotechnical recommendations prior to permit issuance. In addition, the geotechnical report requires observation, testing, and monitoring by the project geotechnical engineer during grading and construction activities to verify compliance with the report's recommendations. Accordingly, the geotechnical recommendations are not discretionary measures but are incorporated into the Project's final design and construction requirements.

The geotechnical investigation concluded that liquefaction-induced settlement would be minimal, with estimated seismic settlements ranging from approximately 0.2 to 0.4 inches, and that deeper saturated alluvial soils underlying the site do not exhibit significant potential for liquefaction-induced settlement. Therefore, because the Project would be designed and constructed in accordance with the California Building Code, City grading requirements, and the project-specific geotechnical requirements incorporated into the final design, the Project would not expose people or structures to substantial risks associated with liquefaction or other forms of seismic-related ground failure.

The Project would be required to comply with the California Building Code, City grading requirements, and all recommendations contained in the project-specific geotechnical investigation (refer to Appendix F). Compliance with these requirements would ensure that the proposed structures are designed to accommodate anticipated seismic conditions and site-specific soil characteristics. Because the geotechnical investigation concluded that liquefaction-induced

settlement would be minimal and because the recommended foundation and earthwork measures would reduce the potential for seismic-related ground failure, the Project would not expose people or structures to substantial risks associated with liquefaction.

Therefore, impacts related to seismic-related ground failure, including liquefaction, would be less than significant.

Level of Significance Before Mitigation: Less than significant.

Mitigation Measures: No mitigation measures are required.

4.6.7.2 Threshold GEO-c: 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.

Impact Analysis

As discussed in Threshold GEO-a(iii), above, the Project Site is underlain by artificial fill, old alluvium, and bedrock of the Capistrano Formation. The site is generally flat and is not located in a mapped earthquake-induced landslide hazard zone. Therefore, the potential for on-site or off-site landsliding is minimal.

The geotechnical investigation (refer to Appendix F) evaluated the potential for liquefaction, lateral spreading, collapse, settlement, and other forms of soil instability. As discussed under Threshold GEO-a(iii), the investigation concluded that the deeper alluvial deposits underlying the site do not exhibit a significant potential for liquefaction-induced settlement. In addition, because the Project Site is relatively level and not located adjacent to free faces, channels, or steep slopes, the potential for lateral spreading is considered low.

The geotechnical investigation also evaluated the collapse potential of site soils and concluded that hydro-collapse is negligible. Testing indicated collapse potential ranging from approximately 0 to 0.01 percent, demonstrating that site soils are not susceptible to substantial collapse upon wetting. Although the alluvial deposits may experience compression and settlement under structural loading, the investigation concluded that these conditions can be adequately addressed through implementation of the recommended earthwork and foundation measures.

The geotechnical investigation identified specific design and construction requirements to address site-specific geologic and soil conditions. These requirements include removal of undocumented fill and unsuitable near-surface materials beneath proposed improvements; over-excavation and recompaction of subgrade soils; placement of engineered fill compacted to specified densities; implementation of site-specific grading, moisture conditioning, and earthwork procedures; and construction of foundation systems designed to transfer structural loads to competent underlying

materials. The geotechnical investigation further requires deep pile foundations extending into the underlying Capistrano Formation bedrock for the podium structure, Building 5, and major retaining walls, as well as corrective grading beneath proposed slabs, pavement, and hardscape areas. In addition, the report establishes site-specific design criteria for allowable bearing pressures, settlement control, slab support, foundation performance, and construction monitoring. Collectively, these requirements are intended to improve the engineering characteristics of site soils, minimize total and differential settlement, and maintain structural stability during seismic and non-seismic conditions.

Implementation of these geotechnical requirements would occur through the Project's grading, improvement plan, and building permit processes. The California Building Code requires site-specific geotechnical recommendations to be incorporated into foundation, earthwork, and structural design, and the City reviews grading and construction plans for consistency with approved geotechnical recommendations prior to permit issuance. The geotechnical report also requires observation, testing, and monitoring by the project geotechnical engineer during grading and construction activities to verify compliance with the report's recommendations. Accordingly, the geotechnical requirements are incorporated into the Project's final design and construction plans and are not discretionary measures.

Compliance with the California Building Code, City grading requirements, and the project-specific geotechnical requirements would ensure that the proposed development is designed to account for site-specific soil and geologic conditions and would minimize the potential for landslides, lateral spreading, subsidence, liquefaction, collapse, differential settlement, or other forms of soil instability. Therefore, impacts associated with unstable geologic units or soils would be less than significant.

Therefore, impacts associated with unstable geologic units or soils would be less than significant.

Level of Significance Before Mitigation: Less than significant.

Mitigation Measures: No mitigation measures are required.

4.6.8 Cumulative Impacts

The following sections address various potential cumulative impacts relating to geology and soils that could result from implementation of the Project.

Geology and soil-related impacts are generally site-specific and are determined by particular on-site soil characteristics, proximity to faults, topography, and proposed land uses. Development projects are analyzed on an individual basis and must comply with established requirements of the applicable jurisdiction’s development standards and the CBC as they pertain to protection against known geologic hazards and potential geologic and soil-related impacts.

4.6.8.1 Cumulative Threshold GEO-a(iii): Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.

Implementation of cumulative projects throughout the region could increase the number of people and structures exposed to seismic hazards. However, seismic-related ground failure and liquefaction are the result of existing geologic conditions and are not created or exacerbated by development projects. Such hazards are typically evaluated on a project-by-project basis through site-specific geotechnical investigations and compliance with applicable engineering standards.

As discussed under Threshold GEO-a(iii), the Project Site is located in a mapped liquefaction hazard zone; however, the project-specific geotechnical investigation concluded that the site does not exhibit a significant potential for liquefaction-induced settlement. In addition, implementation of the geotechnical recommendations, including remedial earthwork and site-specific foundation design measures, together with compliance with the California Building Code, would reduce potential impacts associated with seismic-related ground failure to a less than significant level.

Accordingly, the Project would not make a cumulatively considerable contribution to impacts associated with seismic-related ground failure, including liquefaction, and cumulative impacts would be less than significant.

4.6.8.2 Cumulative Threshold GEO-c: 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.

Development throughout the region could expose additional people and structures to geologic and soil hazards. However, as discussed in Cumulative Threshold GEO-a(iii), above, the potential for unstable soils, settlement, liquefaction, lateral spreading, subsidence, or collapse is site-specific and is evaluated through project-level geotechnical investigations and compliance with applicable engineering standards.

As discussed under Threshold GEO-c, the project-specific geotechnical investigation concluded that the Project Site does not exhibit significant instability hazards and that potential impacts associated with settlement, liquefaction, and other geotechnical conditions can be adequately addressed through implementation of the geotechnical recommendations and compliance with the California Building Code and City requirements. Similar requirements would apply to cumulative development projects.

Accordingly, the Project would not make a cumulatively considerable contribution to impacts associated with unstable geologic units or soils, and cumulative impacts would be less than significant.

4.6.9 Level of Significance Before Mitigation

Environmental impacts related to Threshold GEO-a(iii) and GEO-c would be less than significant.

4.6.10 Mitigation Measures

No mitigation measures are required.

4.6.11 Level of Significance After Mitigation

Not applicable.