

INTRODUCTION

This section analyzes the impacts of the Whole Foods and the Park Shopping Center Project related to geology and soils. The analysis in this section was prepared based on the *Limited Geologic and Soils Engineering Investigation* prepared for the proposed project site by GeoConcepts, Inc., June 21, 1999, *Supplemental Report No. 1* (GeoConcepts, Inc., prepared March 30, 2010 [revised April 22, 2010]), *Supplemental Report No. 2* (GeoConcepts, Inc., prepared September 27, 2010 [revised October 5, 2010]), *Supplemental Report No. 3* (GeoConcepts, Inc., prepared November 5, 2010), *Supplemental Report No. 4* (GeoConcepts, Inc., prepared December 6, 2010), *Update Report* (GeoConcepts, Inc., prepared June 8, 2011), and *Addendum I Limited Geotechnical Response Report, Proposed Whole Foods in the Park Shopping Center* (EPD Consultants, prepared May 25, 2011). These reports are provided in **Appendix 3.5**.

ENVIRONMENTAL SETTING

Existing Conditions

The project site is located north of the Pacific Ocean and the Pacific Coast Highway (PCH), west of the City of Santa Monica, east of the City of Oxnard, and south of the City of Calabasas, in the City of Malibu. The project site is bounded on the north by commercial development on the south by Civic Center Way, on the east by Cross Creek Road, and on the west by vacant land. The project site and adjacent properties are illustrated in **Figure 2.0-3, Project Boundary**, in **Section 2.0, Project Description**.

The project site is currently vacant and dominated by flat, previously leveled alluvial terrain. The site slopes generally to the south with a maximum relief of approximately 5 feet. The site is currently fenced on all sides with a gated entry on the south from Civic Center Drive. The southern portion of the site has been graded and contains gravel bedding, particularly in the eastern portion fronting Civic Center Drive and Cross Creek Road. The northern portion contains more trees and shrubs with a water tank and several cement pads near the northwest corner.

Surface water at the project site consists of direct precipitation onto the site and runoff from adjacent properties to the north. No active groundwater seeps or springs are present. Groundwater within the site is present at depths of 9 to 10 feet, which could fluctuate seasonally depending on rainfall, irrigation, and recharge.

Stratigraphy

The project site is underlain by non-marine sediments of Quaternary time, which are covered by Holocene earth materials. The earth materials encountered on the site are briefly described below.

Fill (Af)

Previous grading has resulted in fill placement for the existing small parking areas on a small portion of the project site. Fill materials were presumably used during pad grading for the cement pad area. Fill was encountered in four of the test pits ranging from 2 to 2.5 feet in thickness. A near horizontal contact between the fill and the underlying alluvium was exposed within the exploratory test pits.

Native Soil (Qs)

Native soil was derived from weathered bedrock materials that have accumulated on natural descending slopes. Soil varies between 1 and 4 feet in thickness.

Older Quaternary Alluvium (Qoal)

Older Alluvial deposits underlie the site. The Older Alluvium is weathered bedrock material that has eroded from natural ascending slopes and accumulated in generally flat lying areas. Regional geologic maps classify these deposits as floodplain and fluvial from the Malibu Creek Watershed. Older Alluvium primarily consists of interlayered loose to dense, fine to coarse sands, gravels, and firm to stiff sandy silt. These deposits were encountered within all of the exploratory test pits and borings ranging over 61 feet in thickness.

Seismicity

The project site is within the Transverse Ranges Geomorphic Province of Southern California. The Transverse Ranges consist of a series of west-trending mountains and intervening valleys, which is contrary to the northwest geomorphic trend that is typical of most of California and reflects the underlying structural (geologic) trend. These ranges are largely the result of north-south compression which has resulted in east-west-trending folds and thrust faults. The project site is not located within a designated Earthquake Fault Zone. No known active faults are mapped on the project site.¹

There are several active and/or potentially active faults that could possibly affect the site within Los Angeles County. The Southern California region is traversed by the San Andreas Fault, which is a

¹ *Limited Geologic and Soils Engineering Investigation, 2010 Supplemental Report No. 2, prepared by Geo Concepts Inc., September 27, 2010 [revised October 5, 2010].*

transform boundary between the Pacific Plate and the North American Plate. The San Andreas Fault is part of the San Andreas system of northwest-striking, right-lateral faults. The faults of this system are generally historically active, as evidenced by the June 28, 1992 Landers (magnitude 7.6) Earthquake.

The Southern California region is seismically active and commonly experiences strong ground shaking resulting from earthquakes along active faults. Earthquakes along these faults are part of a continuous, naturally occurring process which has contributed to the characteristic landscape of the region.

The closest active fault to the project site is a trace of the Malibu Coast Fault, located approximately 2 miles to the west of the site at the southern base of the Santa Monica Mountains, near Latigo Canyon. This trace has exhibited Holocene faulting (i.e., movement in the last 11,000 years) and has consequently been zoned as an Earthquake Fault Rupture Hazard Zone.² Since June of 1995 two portions of the Malibu Coast fault zone were reclassified as an active fault. However, while traces have been determined to be active, on August 16, 2007, the fault zone near the east side of Malibu Bluff Park was removed from the State of California Earthquake Fault Zone map by the California Geological Survey.³

The main trace of the Malibu Coast high-angle sinistral-oblique reverse fault is mapped along the south and southeastern portions of the property near Cross Creek and along the southern portion of the site near Civic Center Way. As shown in **Figure 3.5-1, Location of Malibu Coast Fault**, the location of this fault has been mapped in different locations by the US Geological Survey and the Dibblee Geological Foundation. Through a series of tests including cone penetrometer soundings (CPT) and the collection and dating of floodplain deposits, GeoSoils, Inc., and Leighton and Associates⁴ have determined that the Malibu Coast fault is not correctly mapped, or a portion of the fault which underlies the site is pre-Holocene. Evidence of faulting was not observed during the more recently-excavated seismic trenching and in a review of aerial photographs of the site. GeoConcepts, Inc. concurs that the fault is not correctly mapped and/or is pre-Holocene in age.

Three common types of geologic hazards may be produced during a seismic event (earthquake). These include ground rupture, ground motion, and ground failure.

² Van Beveren and Butelo, Inc. 2007. *Report of Geologic and Geotechnical Investigation Proposed Rancho Malibu Resort*.

³ *Limited Geologic and Soils Engineering Investigation, 2010 Supplemental Report No. 1*, prepared by Geo Concepts Inc.

⁴ GeoSoils. 1989. *Response to County of Los Angeles Geologic Review of 18.4 Acre Parcel NW of Cross Creek Road and Civic Center Way*; and Leighton and Associates, Inc. 1994. *Report for Geotechnical Studies for Planning Purposes in the Civic Center Area, City of Malibu, California*. Volumes I and II.

Ground Rupture

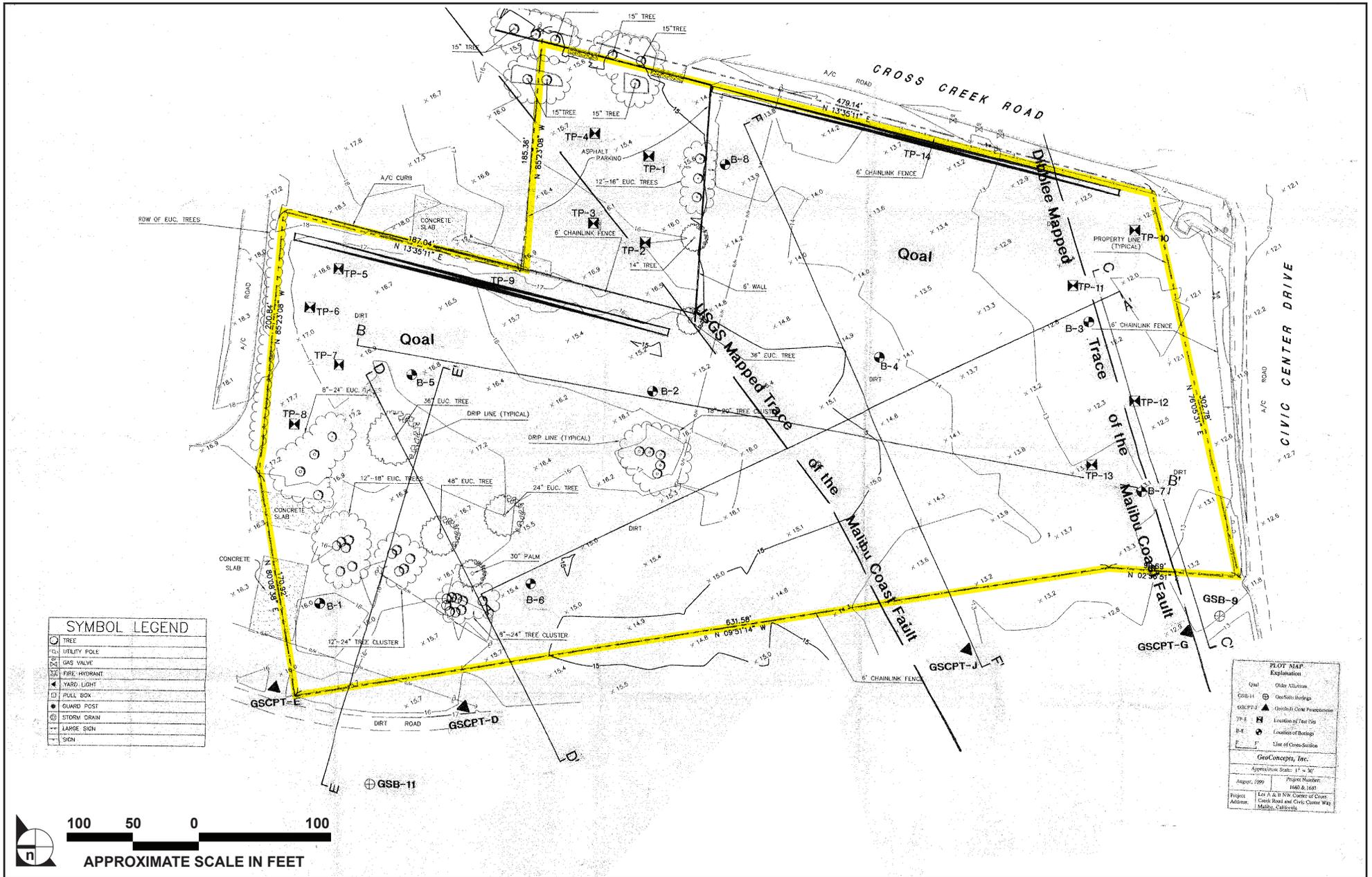
Ground rupture is the result of movement along an active fault. No evidence of faulting was exhibited within the seismic trenches on the subject site, or in the investigations by Leighton and Associates and GeoSoils. No active faults are known to traverse the site.

Although new faults may develop during a seismic event, significant ground rupture is generally expected to occur along pre-existing faults. Ground rupture cannot be prevented; therefore, mitigation of the ground rupture hazard involves identifying major faults which exhibit evidence for potential ground rupture in the near future and avoiding construction over their surface traces. Recognition and mapping of these pre-existing, active fault breaks is accomplished by review of published literature, field mapping, evaluation of aerial photo-lineaments, and by excavating appropriate trenches and CPTs.

Ground Motion

Ground motion is generated during an earthquake as two blocks of the earth's crust slip past each other. The intensity of ground motion at a specific site is controlled primarily by the magnitude of the earthquake and the distance from the epicenter or ground rupture area. Ground motion generally increases with increasing magnitude and is generally greatest near the epicenter or rupture area, and decreases (attenuates) with increasing distance. However, the ground motion measured at a given site is modified by a number of factors including focal depth, proximity to projected or actual fault rupture, fault mechanism, duration of shaking, local geologic structure, source direction of earthquake, underlying earth material characteristics, and topography. All of these factors make it difficult to accurately predict potential ground motions at a given site in the geologically and topographically complex Southern California area.

Earthquake magnitude is a quantitative measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic or geologic observations. It does not vary with distance or the underlying earth material. This differs from intensity, which is a qualitative measure of the effects a given earthquake has on people, structures, loose objects, and the ground at a specific location. Intensity generally increases with increasing magnitude and in areas underlain by unconsolidated materials, and decreases with distance from the epicenter.



SOURCE: Goldman Firth Rossi Architects, August 1999

FIGURE 3.5-1

Location of Malibu Coast Fault

In the past, potential ground motions were evaluated using the maximum credible earthquake magnitude for critical facilities and the maximum probable earthquake magnitude for standard developments based on California Department of Mines and Geology (CDMG) Note 43 (now the California Geological Survey, [CGS]). However, current CGS guidelines and Building Code requirements now use revised terminology. CGS guidelines suggest that a maximum magnitude be estimated for each significant fault based on a maximum rupture size-to-magnitude relationship for use in deterministic analyses.

A deterministic seismic hazard analysis has been completed for the site utilizing the computer program EQFAULT (Version 2.20) by Thomas F. Blake. The Santa Monica thrust fault and Malibu Coast fault have the potential to produce the largest Maximum Credible Peak and Repeatable Acceleration on the subject property. The duration of the Malibu Coast fault is estimated at 11 seconds.

The project site is located in Southern California, which is in a geologically and seismically active region where large magnitude, potentially destructive earthquakes are common. Therefore, it is reasonable to assume that moderate or large magnitude earthquakes will affect the site during the life of a given structure. The current standards for construction provided in the CBC are designed to safeguard against major failures and loss of life, but are not intended to limit damage, maintain functions, or provide for easy repair. Conformance to these recommendations does not guarantee that significant structural damage will not occur in the event of a maximum level of earthquake ground motion. However, it is reasonable to expect that a well-planned and -constructed structure will not collapse in a major earthquake and that protection of life is reasonably provided.

Ground Failure

Ground failure is a general term describing seismically induced secondary permanent ground deformation caused by strong ground motion. This includes liquefaction, lateral spreading, seismic settlement of poorly consolidated materials (dynamic densification), differential materials response, slope failures, sympathetic movement on weak bedding planes or non-causative faults, shattered ridge effects and ground lurching.

Differential materials response refers to the different responses various materials display when subjected to seismic waves. Where materials with different densities or strengths are in contact, differential response to the seismic energy may cause distress along the contact. The combination of dynamic compaction and differential settlement along with differential materials response is a source of future potential hazard along cut/fill and bedrock/alluvium contacts.

Based upon the subsurface exploration and laboratory testing, the loose alluvial sands located on the project site are potentially liquefiable. The potentially liquefiable sands were identified at depths ranging

from 8 to 30 feet. The project site is located in an area subject to identified geotechnical hazards related to liquefaction. **Figure 3.5-2, Liquefaction Hazard in the Project Vicinity**, illustrates the project's location on the California Geological Survey's Seismic Hazard Zones map for the Malibu Beach Quadrangle, in which the site is located.

REGULATORY FRAMEWORK

Federal

Clean Water Act Section 402 (National Pollutant Discharge Elimination System Program).

This act mandates that certain types of construction activity comply with the requirements of the United States Environmental Protection Agency (US EPA) National Pollutant Discharge Elimination System Program (NPDES). Under State Water Resources Control Board (SWRCB) enforcement, the Los Angeles Regional Water Quality Control Board (RWQCB) implements the NPDES program in the City. The program requires a General Construction Activities Permit, including implementation of established Best Management Practices (BMPs) for management of stormwater, erosion control, and/or siltation. More information regarding this regulation is provided in **Section 3.8, Hydrology and Water Quality**.

State

California Geological Survey

The California Geological Survey (CGS) is responsible for enforcing the Alquist-Priolo Earthquake Fault Zoning Act and enforcing the Seismic Hazards Mapping Act. Both are described below.

Alquist-Priolo Earthquake Fault Zoning Act

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act (formerly called the Alquist-Priolo Special Studies Zones Act)⁵ is to prohibit the location of most structures for human occupancy across the traces of active faults, which are faults that have ruptured the ground surface in the past 11,000 years, and to mitigate the hazard of fault rupture. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. Under the act, the State Geologist (Chief of the CGS), is required to delineate "earthquake fault zones" (EFZs) along known active faults in California.

⁵ California Public Resources Code, Sec. 2621 et seq. The Alquist-Priolo Special Studies Zones Act was signed into law in 1972. In 1994, it was renamed the Alquist-Priolo Earthquake Fault Zoning Act. The act has been amended 10 times.

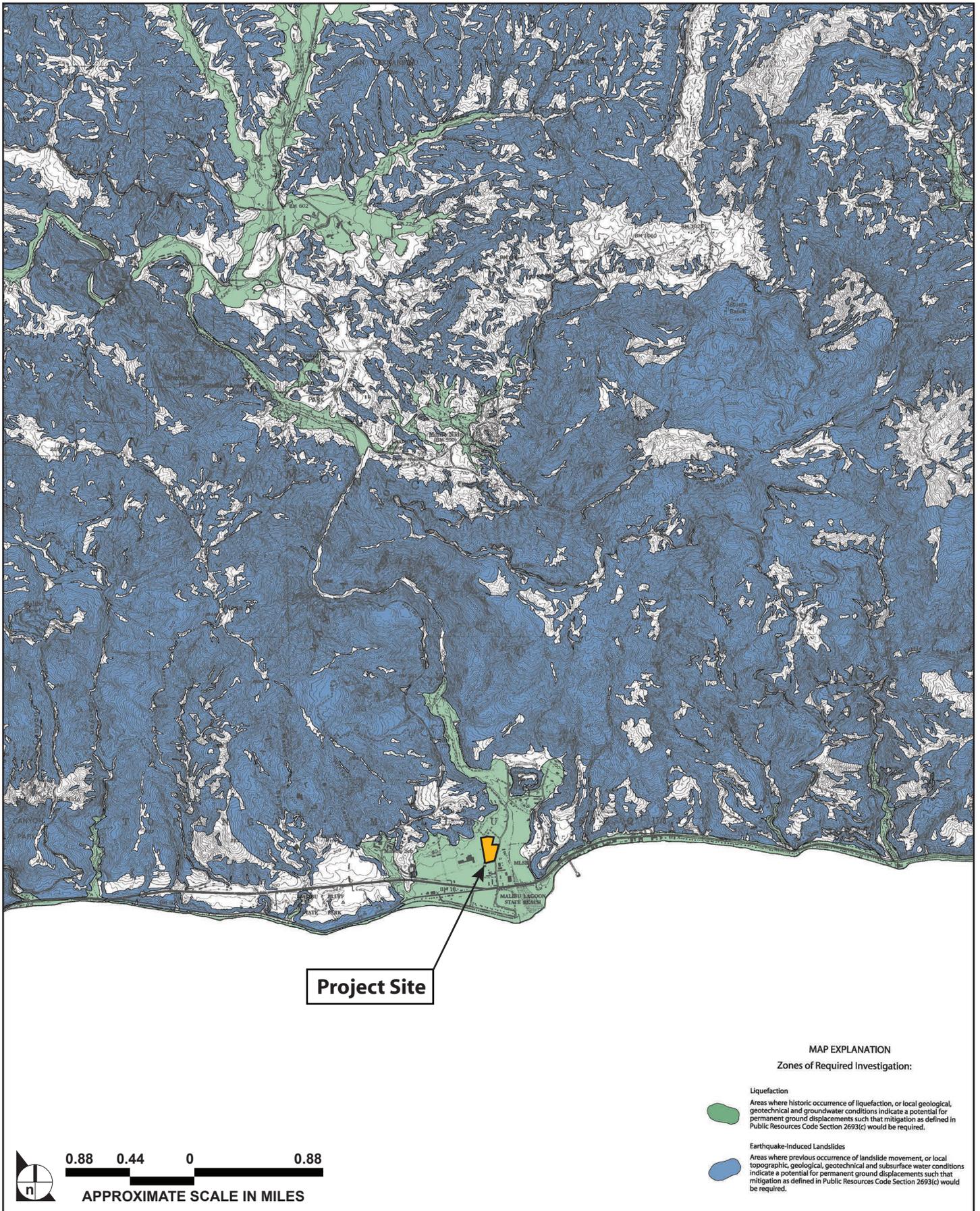


FIGURE 3.5-2

Liquefaction Hazard in the Project Vicinity

The boundary of an EFZ is generally approximately 500 feet from major active faults, and 200 to 300 feet from well-defined minor faults. Cities and counties affected by the EFZs must withhold development permits for certain construction projects proposed within the zones until geologic investigations demonstrate that the sites are not significantly threatened by surface displacement from future faulting. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault. Setbacks from the fault are usually provided by the geotechnical consultant who performed the fault investigation.

Seismic Hazards Mapping Act

Under the CGS's Seismic Hazards Mapping Act,⁶ which was passed in 1990, seismic hazard zones are to be identified and mapped to assist local governments for planning and development purposes. The Seismic Hazards Mapping Act differs from the Alquist-Priolo Earthquake Fault Zoning Act in that it addresses non-surface fault rupture earthquake hazards, including strong ground shaking, liquefaction, landslides, other types of ground failure, and other hazards caused by earthquakes. The CGS provides guidance for evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations.⁷

California Building Code

The State of California provides a minimum standard for building design through the California Building Code (CBC). The City of Malibu has adopted the 2013 California Building Codes as amended by County of Los Angeles as amended by the City. The 2013 edition of the CBC is based on the 2012 International Building Code (IBC) as published by the International Code Council, together with other amendments provided in local/municipal codes, and is adopted on a jurisdiction-by-jurisdiction basis, subject to further modification based on local conditions. Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in the California Occupational Safety and Health Administration (Cal-OSHA) regulations⁸ and in Section A33 of the CBC.

Standard residential, commercial, and light industrial construction is governed by the CBC, to which cities and counties add amendments. The 2013 CBC⁹ includes additions to the previous building code that make it more stringent, in particular with regard to seismic and earthquake conditions for critical

⁶ California Public Resources Code, Sec. 2690 et seq.

⁷ California Geological Survey, *Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California*, 1997.

⁸ California Code of Regulations, Title 24, Part 8, "California Historical Building Code."

⁹ California Code of Regulations, Title 24, Part 2, "California Building Code."

structures such as essential facilities, public schools, and hospitals. The CBC, which is included in Title 24 of the California Administrative Code, is a compilation of three types of building standards from three different origins:

- Those adopted by state agencies without change from building standards contained in national model codes (e.g., the IBC)
- Those adopted and adapted from the national model code standards to meet California conditions (e.g., most of California is in Seismic Design Categories D and E)
- Those authorized by the California legislature that constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns (e.g., the specification of Certified Engineering Geologist rather than engineering geologist)

In addition, the CBC regulates excavation, foundations, and retaining walls; contains specific requirements pertaining to site demolition, excavation, and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction materials; and regulates grading activities, including drainage and erosion control. Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in the Cal-OSHA regulations.

California Coastal Act

This act states in part that new development shall be sited in such a way that it will not be subject to or contribute to erosion or stability hazard over the course of its design life. The act does not specify a particular value for design life, through many Local Coastal Programs (the implementation of the California Coastal Act at the local government level) do.

California Environmental Quality Act

The 1970 California Environmental Quality Act (CEQA) ensures that local agencies consider and review the environmental impacts of development projects within their jurisdictions. CEQA requires that an environmental document (e.g., Environmental Impact Report [EIR], Mitigated Negative Declaration [MND]) be prepared for projects that are judged in an Initial Study (IS) to have potentially significant effects on the environment. Environmental documents (IS, MND, EIR) must consider, and analyze as deemed appropriate, geologic, soils, and seismic hazards. If impacts are considered potentially significant, recommendations of mitigation measures to reduce geologic and seismic hazards to less than significant are made. This allows early public review of proposed development projects and provides lead agencies the authority to regulate development projects in the early stages of planning.

Local

City of Malibu Municipal Code

The City of Malibu has adopted by reference Title 26 of the Los Angeles County Code, which incorporates the 2013 CBC. Standard residential, commercial, and light industrial construction is governed by the CBC. Due to the type, quality, and age of some of the City buildings, the 2013 State Historical Building Code¹⁰ (SHBC) applies to the strengthening of unreinforced historic structures, while the 1986 Unreinforced Masonry Law¹¹ applies to the identification, reporting, and retrofit of non-historic unreinforced masonry buildings. The 2013 CBC¹² includes additions to the previous building code that make it more stringent, in particular with regard to seismic and earthquake conditions for critical structures such as essential facilities, public schools and hospitals. The CBC, which is included in Title 24 of the California Administrative Code, is a compilation of three types of building standards from three different origins:

- Those adopted by state agencies without change from building standards contained in national model codes (e.g., the IBC)
- Those adopted and adapted from the national model code standards to meet California conditions (e.g., most of California is Seismic Design Categories D and E)
- Those authorized by the California legislature, which constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns (e.g., the specification of Certified Engineering Geologist rather than engineering geologist)

International and national model code standards adopted into Title 24 apply to all occupancies in California except for modifications adopted by state agencies and local governing bodies. Facilities and structures such as power plants, freeways, emergency management centers (traffic, 911), and dams are regulated under criteria developed by various California and federal agencies.

City of Malibu General Plan

The City's General Plan is primarily a policy document that sets goals concerning the community and gives direction to growth and development. In addition, it outlines the programs that were developed to accomplish the goals and policies of the General Plan. California Government Code Section 65302(g)(1)

¹⁰ The State Historical Building Code is defined in Part 8 of Title 24 <http://ohp.parks.ca.gov/pages/1074/files/2013%20CHBC.pdf>.

¹¹ This law can be found in Section 8875 *et seq.*, of California's Government Code (CA 1986) <http://www.seismic.ca.gov/COG/Gov%20Code%208875.pdf>.

¹² The California Building Code is defined in Part 2 of Title 24, http://www.documents.dgs.ca.gov/bsc/prpsd_chngs/documents/2012/DSA-SS-02-12-FET-Pt2.pdf.

requires that each local government prepare and adopt a Safety Element as a component of its general plan. This involves identifying and mapping natural hazards and the administration of zoning and subdivision regulations that account for the safety hazards. The policies and implementation measures contained in this element provide direction and a course of possible future action for the various City departments. Below is a list of goals, objectives, and policies related to geologic hazards in the City as set forth in the Safety and Conservation elements:

- S Goal 1:** A community that is free from all avoidable risks to safety, health, and welfare from natural and man-made hazards.
- S Policy 1.1.1:** The City shall protect people and property from environmental hazards.
- S Policy 1.1.7:** The City shall minimize the risks from landslides and debris flows.
- S Policy 1.2.1:** The City shall require development to provide for analyses of site safety related to potential hazards of fault rupture, earthquake ground shaking, liquefaction, and rockfalls.
- S Policy 1.2.2:** The City shall require development to provide site safety analyses related to landsliding, debris flows, expansive soils, collapsible soils, erosion/sedimentation, and groundwater effects.

City of Malibu Local Coastal Program

The California Coastal Act requires that its goals and policies be implemented by local government through the City's Local Coastal Program (LCP). The Malibu LCP consists of two subparts, the Land Use Plan (LUP) and the Local Implementation Plan (LIP). LCP policies are contained within the LUP, while the purpose of the LIP is to implement and carry out the policies of the LUP.

The policies pertaining to geology and soils identified in the LUP and relevant to the proposed project include:

- LUP Policy 3.79** Grading and landform alteration shall be limited to minimize impacts from erosion and sedimentation on marine resources.
- LUP Policy 3.110** New development shall include construction phase erosion control and polluted runoff control plans. These plans shall specify BMPs that will be implemented to minimize erosion and sedimentation, provide adequate sanitary and waste

disposal facilities and prevent contamination of runoff by construction chemicals and materials.

LUP Policy 4.1: The City and the Santa Monica Mountains Coastal Zone contains areas subject to hazards that present substantial risks to life and property. These areas require additional development controls to minimize risks and include, but shall not be limited to, the following:

- Low Slope Stability and Landslide/Rockfall Potential: Hillside areas that have the potential to slide, fail, or collapse.
- Fault Rupture: Malibu Coast-Santa Monica Fault Zone.
- Seismic Ground Shaking: Shaking induced by seismic waves traveling through an area as a result of an earthquake on a regional geologic fault.
- Liquefaction: Areas where water-saturated materials (including soil, sediment, and certain types of volcanic deposits) can potentially lose strength and fail during strong ground shaking.

LUP Policy 4.2: All new development shall be sized, designed, and sited to minimize risks to life and property from geologic, flood, and fire hazard.

LUP Policy 4.3: Information should be provided to the public concerning hazards and appropriate means of minimizing the harmful effects of natural disasters upon persons and property relative to siting, design, and construction.

LUP Policy 4.4: On ancient landslides, unstable slopes and other geologic hazard areas, new development shall only be permitted where an adequate factor of safety can be provided, consistent with the applicable provisions of Chapter 9 of the certified LIP.

LUP Policy 4.5: Applications for new development, where applicable, shall include geologic/soils/geotechnical study that identifies any geologic hazards affecting the proposed project site, any necessary mitigation measures, and contains a statement that the project site is suitable for the proposed development and the development will be safe from geologic hazard. Such reports shall be signed by a licensed Certified Engineering Geologist (CEG) or Geotechnical Engineer (GE) and subject to review and approval by the City Geologist.

LUP Policy 4.11: New development involving a structure dependent on a six wastewater disposal system shall utilize secondary treatment, at a minimum, and evapotranspiration waste disposal systems or other innovative measures, where feasible.

LUP Policy 4.14: New development shall be prohibited on property or in areas where such development would present an extraordinary risk to life and property due to an existing or demonstrated potential public health and safety hazard.

The Chapters of the LIP pertaining to geology and soils and relevant to the Project are listed below. For specific development standards within these chapters, please refer to the LIP:

LIP Chapter 3, Part 3.10 – Landscaping and Fuel Modification: All new development shall minimize the removal of natural vegetation including native trees and plants in order to minimize erosion and sediment, impacts to scenic and visual resources, and impacts to sensitive resources.

LIP Chapter 8, Grading: Development shall be planned to fit the topography, soils, geology, hydrology, and other conditions existing on the site so that grading is kept to an absolute minimum. Grading is also subject to compliance with maximum dimensions put forth in the LIP.

Chapter 9 – Hazards: All proposed new development located in or near an area subject to geologic hazards shall be required to submit a geologic/soils/geotechnical study report. Additionally, all recommendation of the consulting CEG or GE and/or the City geotechnical staff shall be incorporated into all final designs.

ENVIRONMENTAL IMPACTS

Thresholds of Significance

The following thresholds for determining the significance of impacts related to geology and soils are contained in the environmental checklist form contained in Appendix G of the most recent update of *CEQA Statutes and Guidelines*. Impacts related to geology and soils are considered significant if the proposed project would:

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

- rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of known fault,
 - strong seismic groundshaking,
 - seismic-related ground failure, including liquefaction, and
 - landslides.
- Result in substantial soil erosion, or the loss of topsoil.
 - Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.
 - Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.
 - 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.

Impact Analysis

Threshold 3.5-1 **Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving: (a) a rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issues by the State Geologist for the area or based on other substantial evidence of a known fault; (b) Strong seismic ground shaking; (c) Seismic-related ground failure, including liquefaction; (d) Landslides.**

The project site is located within the Malibu Beach 7.5-minute quadrangle, for which there are no identified Alquist-Priolo Earthquake Fault Zones. There are no active or potentially active faults known to exist on the site. As discussed above, the Malibu Coast fault has been mapped near the southern portion of the project site parallel to Civic Center Way. While this fault trace was previously identified by the State as potentially active, having exhibited seismic activity in the last 1.6 million years, additional studies and information gathered by Leighton and Associates, GeoSoils, and GeoConcepts , have determined that surface rupture or displacement has not occurred in over 100,000 years and that the fault is not active. Therefore, expert review has concluded that there is no significant risk associated with fault rupture.

The proposed project would be required to follow design provisions through the Uniform Building Code (UBC) and California Building Code (CBC) (as adopted by the City of Malibu in codified in Section

15.04.010 of the Malibu Municipal Code) to employ design standards that consider seismically active areas in order to safeguard against major structural failures or loss of life. Therefore, while the project site would be subject to ground shaking during future seismic events, (as most structures within Southern California) through the incorporation of proper engineering measures in accordance with existing regulations, building codes, and the application of the engineering recommendations provided in the approved geotechnical investigation, risks to life and property would be minimized.

Loose alluvial sands located on the project site are potentially liquefiable. Liquefaction on the project site can be mitigated by reinforcing the buildings' foundations and deriving support from the alluvial soils below the potentially liquefiable soils. Alternatively, removal or treatment of the liquefiable material could lead to denser sands which would reduce the project site's liquefaction potential.¹³

The project site and surrounding areas are topographically flat. The project site is not located in an area subject to landslides. The nearest such area is located approximately 750 feet northwest of the project site.¹⁴ Therefore as a result of required compliance with applicable regulations, the proposed project would not substantially expose people or structures to seismic hazards. However, as seismic risk remains, impacts from liquefaction would be potentially significant. Mitigation is required.

Mitigation Measures

The following mitigation measure shall be implemented:

3.5-1: Prior to project approval, the project applicant shall submit for review and approval by the City of Malibu Building Department detailed plans to address potential liquefaction hazards. These plans shall reduce liquefaction hazards through one of the following methods:

- The proposed structures may be supported on friction piles extending through the potentially liquefiable sands. The friction piles may be designed in two ways.

- Option 1:

The minimum friction pile diameter is 24 inches. Friction piles should extend into the non-liquefiable alluvium a minimum of 10 feet, which is found at a depth of 30 feet. The friction piles may be proportioned using skin friction value of 500 pounds per square foot. All friction piles shall be designed to resist a creep force of 1,000 pounds per lineal foot for each foot of shaft exposed to the liquefiable sands above 30 feet.

¹³ Limited Geologic and Soils Engineering Investigation, prepared by GeoConcepts, Inc. p.5

¹⁴ California Department of Conservation, Malibu Beach 7.5-minute quadrangle

Lateral loads may be resisted by friction at the base of the conventional foundations and by passive resistance within the compacted fill. A coefficient of friction of 0.4 may be used between the foundations and the alluvium. The passive resistance may be assumed to act as a fluid with a density of 500 pounds per cubic foot. A maximum passive earth pressure of 2,000 pounds per square foot may be assumed. For isolated poles, the allowable passive earth pressure may be doubled.

Buried utilities and parking areas would still be affected by liquefaction. Appropriate measures such as flexible connections resistant to earthquake damage and shutoff valves should be considered.

– Option 2:

The minimum continuous footing size is 12 inches wide and 24 inches deep into the compacted fill, measured from the lowest adjacent grade. Continuous footings may be proportioned, using a bearing value of 1,500 pounds per square foot. Column footings placed into the compacted fill may be proportioned, using a bearing value of 2,000 pounds per square foot, and shall be a minimum of 2 feet in width and 24 inches deep, below the lowest adjacent grade.

The bearing values given above are net bearing values; the weight of concrete below grade may be neglected. These bearing values may be increased by one-third for temporary loads, such as, wind and seismic forces.

All footing excavation depths shall be measured from the lowest adjacent grade of recommended bearing material. Footing depths shall not be measured from any proposed elevations or grades. Any foundation excavations that are not the recommended depth into the recommended bearing materials will not be acceptable.

Lateral loads may be resisted by friction at the base of the conventional foundations and by passive resistance within the compacted fill. A coefficient of friction of 0.4 may be used between the foundations and the alluvium. The passive resistance may be assumed to act as a fluid with a density of 300 pounds per cubic foot. A maximum passive earth pressure of 2,000 pounds per square foot may be assumed. For isolated poles, the allowable passive earth pressure may be doubled.

- The liquefaction hazard may be mitigated by in place treatment of the liquefiable sands to reduce the liquefaction potential. In place densification of the material may be accomplished with Vibro Compaction or Stone Column densification. Shallow foundations may be utilized provided that the liquefaction potential is reduced to an acceptable level. Additional testing following the treatment shall verify the results of the densification.

Residual Impacts

With incorporation of the geotechnical recommendations as required by implementation of **Mitigation Measure 3.5-1**, impacts related to liquefaction would be less than significant.

Threshold 3.5-2 Result in substantial soil erosion, or the loss of topsoil.

Construction activity associated with large-scale grading can result in wind, gravity, and water driven erosion of soils. The proposed project would require 17,519 cubic yards of cut and fill material which could result in a substantial loss of topsoil on the project site.¹⁵

The proposed project would be subject to compliance with a National Pollutant Discharge Elimination System (NPDES) permit, including the implementation of Best Management Practices (BMPs), some of which are specifically implemented to reduce soil erosion or loss of topsoil. Further, the City is a co-permittee under the *Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach* MS4 (Order No. R4-2014-0024, NPDES Permit No. CAS004003).

Pursuant to Section 17.4.1 of the LCP, prior to the issuance of a grading or building permit, the applicant shall be required to prepare and submit an Erosion and Sediment Control Plan for approval (MS4 Permit Section VI.D.8.h.ii) that identifies BMPs during the construction phases of development to minimize or prevent construction-related soil erosion or loss of topsoil. BMPs include practices such as installing sandbag barriers, temporary desilting basins near inlets, gravel driveways, dust controls, employee training, and other general good housekeeping practices that help prevent erosion and water quality contamination. The Erosion and Sediment Control Plan BMPs would ensure that erosion and sediment transport are minimized to ensure that potential off-site impacts during construction would be reduced to less than significant.

The project site is relatively flat with a minimal slope to the south. Once constructed, the project site would be landscaped with native vegetation, hardscape areas, and exclude any constructed slopes or exposed loose soil. Thus impacts from soil erosion or the loss of topsoil during the operation of the proposed project would be less than significant.

Mitigation Measures

No mitigation measures are required.

¹⁵ Total Grading Yardage Verification Certificate

Residual Impacts

Impacts would be less than significant.

Threshold 3.5-3 **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; or be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property**

No active surface groundwater seeps or springs were observed on the project site. The reported groundwater levels were a minimum of 7 feet deep, with the reported historic high groundwater level of 5 feet below grade. The proposed pad elevation is proposed to be approximately 3 feet higher than the existing grade. Further, the geotechnical analysis of the site recommended that the upper 2 feet of the natural soils be removed and recompacted.

Sandy soils were found at depths ranging from eight to 30 feet. The loose alluvial sands collected at the project site indicate that liquefaction could occur. However, as discussed above with **Mitigation Measure 3.5-1** impacts from liquefaction would be less than significant.

Based on field observations, analysis, and laboratory testing, the alluvium found in the borings 30 feet and below are expected to possess sufficient strength to support the structures. As discussed above, the City has adopted the CBC standards. While the groundwater is relatively high, the proposed project would be constructed in accordance with the latest CBC's construction requirements and include features to reduce the potential for liquefaction (as described above). As the project site is relatively flat, it is not susceptible to landslides. Thus, no impacts related to landslides, subsidence, high groundwater levels, or liquefaction are expected to occur. Impacts would be less than significant.

Mitigation Measures

Implementation of **Mitigation Measure 3.5-1**, above.

Residual Impacts

Impacts would be less than significant.

Threshold 3.5-4 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

As discussed in **Section 2.0, Project Description**, the project would connect to the future Civic Center Wastewater Treatment Facility for wastewater disposal. Therefore, no on-site wastewater treatment system is included as part of the proposed project. No impact would occur.

Mitigation Measures

No mitigation measures are required.

Residual Impacts

Impacts would be less than significant.

Cumulative Impacts

Cumulative projects would be subject to varying risks associated with geotechnical hazards. The cumulative projects are located in Southern California, a seismically active region, and would therefore be subject to hazards during seismic events, including ground shaking, rupture, liquefaction, and subsidence. Development within nearby properties in Malibu, including Pepperdine University and the Civic Center Area, particularly at the Crummer property (24120 PCH) and the Towing property (23915 Malibu Road) and the Rancho Malibu Hotel (which requires substantial slope grading) could lead to cumulative effects of potential erosion and sedimentation. While grading in this area would be substantial, standard erosion control measures (i.e., compliance with NPDES) would avoid or minimize the potential for significant erosion impacts. Further, the proposed project would not result in substantial grading that could contribute to a cumulative impact.

The California Building Code, as codified in the Malibu Municipal Code would require that structures be constructed to meet minimum seismic safety standards. However, depending on the location of each specific cumulative project, potential hazards could remain with implementation of CBC requirements.

Geotechnical impacts typically affect a specific project, and the potential impacts of each cumulative project would be evaluated and mitigated on a project-by-project basis. It is expected that mitigation measures similar to those provided for the proposed project would be required of cumulative projects, and would in most cases reduce impacts to less than significant levels. The proposed project would not cause a significant cumulative impact in combination with some or all of the identified cumulative projects. Cumulative impacts would be less than significant.

Mitigation Measures

No mitigation measures are required.

Residual Impacts

Impacts would be less than significant.