Section 3.6
Geology, Seismicity, and Soils

This section provides a discussion of the geologic, seismic, and soil conditions that currently exist on the Project site. The potential impacts of the Project related to existing geologic, seismic, and soil conditions, as well as hazardous materials, are evaluated in this section. Mitigation is proposed where applicable. A summary of impacts and mitigation measures is presented in **Table 3.6-1**.

The description of existing conditions and subsequent impact analysis presented in this section are based on a review of maps and information published by the U.S. Geological Survey (USGS), the California Geological Survey (CGS) (formerly the California Division of Mines and Geology), Monterey County, the Natural Resources Conservation Service (NRCS), and the site-specific geologic and geotechnical reports prepared for the Project (Haro, Kasunich and Associates, Inc. 2013a, 2013b).

Table 3.6-1. Summary of Project Impacts on Geology, Seismicity, and Soils

Impact	Significance Before Mitigation	Mitigation	Significance After Mitigation
A. Seismic Hazards			
GSS-A1. Placement of new structures could result in potential structural damage and associated human safety hazards resulting from ground shaking caused by earthquakes on nearby active and potentially active faults.	Less than Significant	None required	--
B. Landslides and Slope Stability			
GSS-B1. The Project would not result in slope failure during project operation.	No impact	None required	--
C. Erosion			
GSS-C1. Grading and excavation could result in substantial soil erosion, loss of topsoil, and sedimentation during construction.	Less than Significant	None required	--
D. Soils Constraints			
GSS-D1. Excavation activities in areas of shallow groundwater and weak soils could result in inadequate drainage and structural failure during construction.	Significant	**GSS-D1.** During Project construction, dewater where excavation activities would be 5 feet or greater and shore temporary cuts.	Less than Significant
GSS-D2. Project operation would not result in increased risks associated with expansive soils or unconsolidated fill.	Less than Significant	None required	--

Impact	Significance Before Mitigation	Mitigation	Significance After Mitigation
E. Hazardous Materials			
GSS-E1. Project construction would not create a significant hazard to the public or the environment through the release of hazardous materials into the environment.	Less than Significant	None required	--
GSS-E2. Project operation would not create a significant hazard to the public or the environment through the release of hazardous materials into the environment.	No impact	None required	--

-- = Not applicable.

Regulatory Setting

This section describes the federal, state, and local plans, policies, and laws that are relevant to geology, seismicity, soils, and hazardous materials in the Project vicinity.

Federal

Clean Water Act – Section 402

Section 402 of the Clean Water Act (CWA) regulates construction-related stormwater discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, administered by the U.S. Environmental Protection Agency (EPA). NPDES permits are required for projects that disturb more than 1 acre of land. The NPDES permitting process requires the applicant to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP), which includes required best management practices (BMPs) to prevent soil erosion and discharge of other construction-related pollutants (e.g., petroleum products, solvents, paints, cement) that could contaminate nearby water resources. Refer to Section 3.7, *Hydrology and Water Quality*, for additional information.

Toxic Substances Control Act/Resource Conservation and Recovery Act/ Hazardous and Solid Waste Act

The Toxic Substances Control Act (1976) and the Resource Conservation and Recovery Act of 1976 (RCRA) established an EPA-administered program to regulate the generation, transport, treatment, storage, and disposal of hazardous waste. The RCRA was amended in 1984 by the Hazardous and Solid Waste Act, which affirmed and extended the "cradle to grave" system of regulating hazardous wastes.

The TSCA authorized EPA to secure information on all new and existing chemical substances, as well as to control any of the substances that were determined to cause unreasonable risk to public health or the environment. The current Polychlorinated Biphenyls (PCB) regulations, CFR at 40 CFR 761, were published pursuant to the TSCA, and include the following list of CFR Sections that are applicable to the Project.

- Section 761.60 Disposal requirements
- Section 761.61 PCB remediation waste cleanup and disposal options
- Section 761.77 Coordination with the EPA Regional Administrator
- Section 761.79 Decontamination standards and procedures
- Section 761.97 Export requirements for disposal
- Section 761.125 Requirements for PCB spill cleanup
- Section 761.130 Sampling requirements
- Section 761.180 Records and monitoring

Comprehensive Environmental Response, Compensation, and Liability Act/ Superfund Amendments and Reauthorization Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as "Superfund," was enacted by Congress on December 11, 1980. This law (United States Code [USC], Title 42, Section 103) provides broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA establishes requirements concerning closed and abandoned hazardous waste sites, provides for liability of persons responsible for releases of hazardous waste at these sites, and establishes a trust fund to provide for cleanup when no responsible party can be identified. CERCLA also enabled the revision of the National Contingency Plan (NCP). The NCP (Code of Federal Regulations [CFR], Title 40, Part 300) provides the guidelines and procedures needed to respond to releases and threatened releases of hazardous substances, pollutants, and/or contaminants. The NCP also established the National Priorities List. CERCLA was amended by the Superfund Amendments and Reauthorization Acton October 17, 1986.

Occupational Safety and Health Administration

The Occupational Safety and Health Administration's (OSHA's) mission is to ensure the safety and health of American workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health. The OSHA staff establishes and enforces protective standards and reaches out to employers and employees through technical assistance and consultation programs. OSHA standards are listed in 29 CFR 1910.

Department of Transportation Hazardous Materials Regulations (49 CFR 100–185)

U.S. Department of Transportation (DOT) hazardous materials regulations cover all aspects of hazardous materials packaging, handling, and transportation. Parts 107 (Hazard Materials Program), 130 (Oil Spill Prevention and Response), 172 (Emergency Response), 173 (Packaging Requirements), 174 (Rail Transportation), 176 (Vessel Transportation), 177 (Highway Transportation), 178 (Packaging Specifications), and 180 (Packaging Maintenance) would all apply to the Project and surrounding uses.

State

Alquist-Priolo Earthquake Fault Zoning Act

The major state legislation regarding earthquake fault zones is the Alquist-Priolo Earthquake Faults Zoning Act of 1994 (formerly known as the Alquist-Priolo Special Studies Zones Act of 1972). The purpose of the act is to regulate development near active faults and thereby reduce the hazards of surface fault rupture.

California Uniform Building Code

The major state regulations regarding geo-seismic hazards other than surface faulting are contained in Title 24, Part 2, California Uniform Building Code (CUBC). The CUBC applies to public building and a large percentage of private building in the state. It is based on the current federal Uniform Building Code, but contains additional amendments, and repeals that are specific to building conditions and structural requirements in California. Local codes are permitted to be more restrictive than Title 24 but are required to be no less restrictive. Chapter 23 of the CUBC deals with general design requirements, including regulations governing seismically resistant construction. Chapters 29 and 70 deal with excavations, foundations, retaining walls, and grading including (but not limited to) requirements for seismically resistant design, foundation investigations, stable cut and fill slopes, and drainage and erosion control.

Seismic Hazards Mapping Act

The Seismic Hazard Mapping Act was enacted by the California legislature in 1990 following the Loma Prieta earthquake of 1989. The act requires that, for projects within seismic hazard zones, a certified engineering geologist prepare a site-specific geotechnical report that identifies the nature and severity of the seismic hazards and identifies appropriate mitigation. The project area has not been mapped under the Seismic Hazards Mapping Act.

Hazardous Waste Control Act

The Hazardous Waste Control Act (California Health and Safety Code Section 25100 et seq.) creates the framework under which hazardous wastes are managed in California. The law provides for the development of a state hazardous waste program that administers and implements the provisions of the federal RCRA cradle-to-grave waste management system in California. It also provides for the designation of California-only hazardous waste and development of standards that are equal to or, in some cases, more stringent than federal requirements.

The Department of Toxic Substances Control (DTSC), a department of the California Environmental Protection Agency, is responsible for the enforcement of the Hazardous Waste Control Act. DTSC is the primary agency in California for regulating hazardous waste, cleaning up existing contamination, and finding ways to reduce the amount of hazardous waste produced in California. DTSC regulates hazardous waste primarily under the authority of the federal RCRA and the California Health and Safety Code (primarily Division 20, Chapters 6.5 through 10.6, and Title 22, Division 4.5). Other laws that affect hazardous waste are specific to handling, storage, transportation, disposal, treatment, reduction, cleanup, and emergency planning.

USC 65962.5 (commonly referred to as the Cortese List) includes: hazardous waste facilities and sites listed by the DTSC, contaminated drinking water wells listed by the Department of Health Services, sites listed by the SWRCB as having underground storage tank (UST) leaks or a discharge of hazardous wastes or materials into the water or groundwater, and lists from local regulatory agencies of sites with a known migration of hazardous waste/material.

Hazardous Materials Release Response Plans and Inventory Act of 1985

The Hazardous Materials Release Response Plans and Inventory Act, also known as the Business Plan Act, requires businesses that use hazardous materials to prepare a plan that describes their facilities, inventories, emergency response plans, and training programs. Hazardous materials are defined as unsafe raw or unused materials that are part of a process or manufacturing step. They are not considered hazardous waste. Health concerns pertaining to the release of hazardous materials, however, are similar to those pertaining to hazardous waste.

Unified Hazardous Waste and Hazardous Materials Management Regulatory Program

The Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program) (California Health and Safety Code, Chapter 6.11, Sections 25404-25404.9) consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections, and enforcement activities of the environmental and emergency response programs and provides authority to the Certified Unified Program Agency (CUPA). The Monterey County Health Department is the local CUPA.

The Unified Program consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections, and enforcement activities of the following hazardous materials programs: Hazardous Materials Business Plan (HMBP) Program, California Accidental Release Prevention (CalARP) Program, UST Program, Aboveground Storage Tank (AST) Program, Hazardous Waste Generator Program, and Hazardous Waste Tiered-Permitting Program.

California Code of Regulations, Title 8—Industrial Relations

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the workplace. The California Division of Occupational Safety and Health (Cal OSHA) and the federal OSHA are the agencies responsible for ensuring worker safety in the workplace. Cal OSHA assumes primary responsibility for developing and enforcing standards for safe workplaces and work practices. These standards would be applicable to both construction and operation of the Project.

California Labor Code (Division 5; Parts 1, 6, 7, and 7.5)

The California Labor Code is a collection of regulations that include the regulation of the workplace to ensure appropriate training on the use and handling of hazardous materials and the operation of equipment and machines that use, store, transport, or dispose of hazardous materials. Division 5, Part 1, Chapter 2.5 ensures employees that are in charge of the handling of hazardous materials are appropriately trained on, and informed of, the materials they are handling. Division 5, Part 7 ensures employees who work with volatile flammable liquids are outfitted in appropriate safety gear and clothing.

Local

Monterey County Erosion Control Ordinance

Monterey County has a specific Erosion Control Ordinance (Chapters 16.08 through 16.12 of the County Code). The Building Services Department enforces the ordinance. The ordinance was adopted to safeguard the health, safety and public welfare and to minimize erosion, protect fish and wildlife, and otherwise protect the natural environment. Erosion control plans are required for building, grading, and land clearing.

Grading permits are required for all projects that move 100 cubic yards or more of soil. No grading permit can be issued if a determination is made that grading will result in hazards by reason of flood, geological hazard, seismic hazard or unstable soils, or is liable to endanger any other property or result in the deposition of debris on any public way or property or drainage course, or otherwise create a nuisance. Grading/erosion control inspectors and the chief building official conduct the procedural review associated with issuance of grading permits. Erosion control measures are enforced to eliminate and prevent conditions of accelerated erosion that have led to, or could lead to degradation of water quality, loss of fish habitat, damage to property, loss of topsoil or vegetation cover, disruption of water supply, and increased danger from flooding.

2010 Monterey County General Plan

The 2010 Monterey County General Plan presents goals and policies that guide the general distribution and intensity of land uses, including residential, agricultural, commercial and industrial, public facilities, and open space uses, for lands in the County outside the Coastal Zone (Monterey County 2010). Within the General Plan, the following policies from the Conservation and Open Space Element and the Safety Element are relevant to the issues addressed in this section.

Conservation and Open Space Element

Policy OS-3.1. Best Management Practices (BMPs) to prevent and repair erosion damage shall be established and enforced.

Safety Element

Policy S-1.1. Land uses shall be sited and measures applied to reduce the potential for loss of life, injury, property damage, and economic and social dislocations resulting from ground shaking, liquefaction, landslides, and other geologic hazards in the high and moderate hazard susceptibility areas.

Policy S-1.3. Site-specific geologic studies may be used to verify the presence or absence and extent of the hazard on the property proposed for new development and to identify mitigation measures for any development proposed. An ordinance including permit requirements relative to the siting and design of structures and grading relative to seismic hazards shall be established.

Policy S-1.4. The Alquist-Priolo Earthquake Fault Zoning Act shall be enforced.

Policy S-1.5. Structures in areas that are at high risk from fault rupture, landslides, or coastal erosion shall not be permitted unless measures recommended by a registered engineering geologist are implemented to reduce the hazard to an acceptable level. Development shall be discouraged in the following areas:

a) Areas within 50 feet of active faults. Within State or County Earthquake Fault Zones, trenching or other suitable methodology shall be used to determine the location of the fault.

b) Areas within or adjacent to large active landslides. Large active landslides are those that are economically or technically infeasible to mitigate because of their rate of movement or size and volume.

Policy S-1.6. New development shall not be permitted in areas of known geologic or seismic hazards unless measures recommended by a California certified engineering geologist or geotechnical engineer are implemented to reduce the hazard to an acceptable level. Areas of known geologic or seismic hazards include:

a) Moderate or high relative landslide susceptibility.

b) High relative erosion susceptibility.

c) Moderate or high relative liquefaction susceptibility.

d) Coastal erosion and seacliff retreat.

e) Tsunami run-up hazards.

Policy S-1.7. Site-specific reports addressing geologic hazard and geotechnical conditions shall be required as part of the planning phase and review of discretionary development entitlements and as part of review of ministerial permits in accordance with the California Building Standards Code as follows:

a) Geotechnical reports prepared by State of California licensed Registered Geotechnical Engineers are required during building plan review for all habitable structures and habitable additions over 500 square feet in footprint area. Additions less than 500 square feet and non-habitable buildings may require geotechnical reports as determined by the pre-site inspection.

b) A Registered Geotechnical Engineer shall be required to review and approve the foundation conditions prior to plan check approval, and if recommended by the report, shall perform a site inspection to verify the foundation prior to approval to pour the footings. Setbacks shall be identified and verified in the field prior to construction.

c) All new development and subdivision applications in State- or County-designated Earthquake Fault Zones shall provide a geologic report addressing the potential for surface fault rupture and secondary fracturing adjacent to the fault zone before the application is considered complete. The report shall be prepared by a Registered Geologist or a Certified Engineering Geologist and conform to the State of California's most current Guidelines for evaluating the hazard of surface fault rupture.

d) Geologic reports and supplemental geotechnical reports for foundation design shall be required in areas with moderate or high landslide or liquefaction susceptibility to evaluate the potential on- and off-site impacts on subdivision layouts, grading, or building structures.

e) Where geologic reports with supplemental geotechnical reports determine that potential hazards effecting new development do not lead to an unacceptable level of risk to life and property, development in all Land Use Designations may be permissible, so long as all other applicable General Plan policies are complied with.

f) Appropriate site-specific mitigation measures and mitigation monitoring to protect public health and safety, including deed restrictions, shall be required.

Policy S-1.8. As part of the planning phase and review of discretionary development entitlements, and as part of review of ministerial permits in accordance with the California Building Standards Code, new development may be approved only if it can be demonstrated that the site is physically suitable and the development will neither create nor significantly contribute to geologic instability or geologic hazards.

Policy S-1.9. A California licensed civil engineer or a California licensed landscape architect can recommend measures to reduce moderate and high erosion hazards in the form of an Erosion Control Plan.

Monterey County Standard Conditions of Approval

The Project would be required to comply with Monterey County's Standard Conditions of Approval which include, but may not be limited to, the following applicable condition (Monterey County 2014). Refer to Chapter 2, *Project Description*, for the full text of the conditions of approval.

PD007: Grading – Winter Restriction. No land clearing or grading shall occur on the subject parcel between October 15 and April 15 unless authorized by the Director of the RMA.

Environmental Setting

The Project site is undeveloped and contains Monterey pine forest, with a varying stand of dominant height Monterey pine trees and a coast live oak understory. The Project site gently slopes (3–6%) downward from east to west, and there is a natural drainage extending through the southwestern portion of the site (**Figures 2-2 and 2-3.**)

Geology

The Project site is located in the Coast Ranges geomorphic province of California, near the northern terminus of the Santa Lucia Range. The surficial units at the Project site are older dune sand deposits of Pleistocene age. The older dune deposits consist of weakly- to moderately-consolidated, moderately well-sorted silt and sand. The basement rock, which also outcrops in the vicinity, is weathered granodiorite which contains substantial amounts of clay. Borings performed for the project's geologic study encountered the basement rock at depths of 8 to 12 feet. Perched groundwater was found at depths of 5 to 13 feet (Haro, Kasunich and Associates, Inc. 2013a; Wagner et al. 2002).

Seismic Conditions

Seismic hazards present in Monterey County include ground rupture along faults, ground shaking, and liquefaction (Haro, Kasunich and Associates, Inc. 2013a). Each of these hazards and their potential to affect the Project site are described below. Slope stability and landslides are described separately below.

Table 3.6-2 provides relevant terminology for discussing seismic conditions.

Table 3.6-2. Terminology and Definitions for Seismic Conditions

Terminology	Definition
Earthquake	An earthquake is the result of a sudden release of energy in the Earth's crust, caused mostly by rupture of geological faults, that creates seismic waves. The *seismicity* or *seismic activity* of an area refers to the frequency, type and size of earthquakes experienced over time.
Maximum Magnitude and Moment Magnitude	An earthquake is classified by the magnitude of wave movement (related to the amount of energy released), which traditionally has been quantified using the Richter scale and *Maximum Magnitude*. This is a logarithmic scale, wherein each whole number increase in magnitude (M) represents a tenfold increase in the wave magnitude generated by an earthquake. An M8.0 earthquake is not twice as large as an M4.0 earthquake; it is 10,000 times larger (i.e., 10^4, or 10 x 10 x 10 x 10). Structure damage typically begins at M5.0. A limitation of the Richter magnitude scale is that at the upper limit large earthquakes have about the same magnitude. As a result, the *Moment Magnitude* scale (U.S. Geological Survey 2012), which does not have an upper limit magnitude, was introduced in 1979 and is often used for earthquakes greater than M3.5. Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Specifically, the seismic moment is a measure of the size of an earthquake based on the area of fault rupture, the average amount of slip, and the force that was required to overcome the friction sticking together the rocks that were offset by faulting (U.S. Geological Survey 2012). Earthquakes of M6.0 to 6.9 are typically classified as moderate; those between M7.0 and M7.9 are classified as major; and those of M8.0 or greater are classified as great.
Lateral Spreading	*Lateral spreading* can occur when *liquefaction* transforms a subsurface layer into a fluid-like mass, and then gravity causes the mass to move downslope. Lateral spreading most commonly occurs on gentle slopes that range from 0.3 to 3 degrees. It can displace the ground surface for many feet, potentially damaging pipelines, utilities, bridges, roads, and other structures. Lateral spreading propensity is typically evaluated using a method incorporating the thickness of the liquefiable layer, the fines content and mean grain-size diameter of the liquefiable soil, the relative density of the liquefiable soil, the magnitude and distance of an earthquake from a site, the slope of the ground surface, and boundary conditions.
Liquefaction	Soil *liquefaction* is a phenomenon in which saturated soils experience sudden and nearly complete loss of strength during seismic events. If not confined, the soil acquires sufficient mobility to allow for horizontal and vertical movements. Liquefaction can result in shallow foundation failures, boiling, severe settlement, and failure of fill supported on liquefiable soils. The magnitude of liquefaction-induced settlement depends on the thickness and relative density of the liquefiable soils and on the intensity of ground shaking. Soils most susceptible to liquefaction are loose, uniformly graded, fine-grained sands. Saturated silty and clayey sands may also liquefy during strong ground shaking, although clayey sands liquefy only if the clay content is quite low.
Subsidence	*Subsidence* is the phenomenon in which the soils and other earth materials underlying a site settle or compress, resulting in a lower ground surface elevation. Fill and native materials beneath a site can be water saturated, and a net decrease in the pore pressure and contained water will allow the soil grains to pack closer together. This closer grain packing results in less volume and the lowering of the ground surface.

Faults and Risk of Surface Fault Rupture

The California State Geology and Mining Board (the Board) has established policies and criteria for the classification of known faults in California based on the presence or absence of a detectable fault trace and the recency of fault displacement (Bryant and Hart 2007). Detectable fault traces that show evidence of displacement during the last 10,000 to 11,000 years (i.e., Holocene faults) are defined as *active* and are considered to have the greatest potential for surface rupture. Detectable fault traces that show evidence of displacement between 11,000 and 1.6 million years ago (i.e., Quaternary faults) are defined as "potentially active," and are considered to have less potential for surface rupture. The Board has not established an official category for faults that show no evidence of displacement greater than 1.6 million years (i.e., pre-Quaternary faults). Although such faults are not deemed inactive, they are considered to have a relatively low potential for surface rupture.

The Project site is located within a highly seismically active region of California. Fault mapping (U.S. Geological Survey 2014, Clark et al. 1997) and recent geologic investigations conducted by Haro, Kasunich and Associates, Inc. (2013a, b) indicate that the Project site is located in the vicinity of several active and potentially active faults/fault zones. **Table 3.6-3** summarizes fault segment distances and direction from Project site, and provides the estimated maximum moment magnitude (refer to Table 3.6-2 for definition).

Table 3.6-3. Regional Zoned Faults

Fault Segment	Approximate Distance from Site (miles)	Direction from Site	Maximum Moment Magnitude
Active			
San Andreas	29	East	1–3
Sargent	31	Northeast	6.8
San Gregorio-Sur-Hosgri	6	West (offshore)	7.3
Calaveras/Paicines/Hayward	33	East	7.5
Monterey Bay and the onland extensions of Tularcitos-Navy and King-Rinconada	0.1	West	7.1–7.3
Sylvan Thrust	4	Northeast	5.5
Hatton Canyon	0.1	Southeast	5.9
Potentially Active			
Reliz	9	Northeast	7
Cypress Point	0.6	Southwest	4–5*
Zayante-Vergeles	24	Northeast	7.3
Chupines	5	East	6.3–6.4

Sources: U.S. Geological Survey 2014; Mualchin 1996; Rosenberg and Bryant 2003; Bryant 2000a,b; Bryant 2001a,b.

Surface Fault Rupture

Surface fault rupture is a seismic hazard that can damage structures constructed above active faults. Surface fault rupture can occur rapidly during an earthquake or slowly over many years via a process known as fault creep. No faults zoned under the Alquist-Priolo Earthquake Fault Zoning Act cross the Project site (U.S. Geological Survey 2014). Accordingly, the surface fault rupture hazard at the Project site is very low.

Seismic Ground Shaking

Seismic ground shaking can cause varying degrees of damage to buildings, ranging from cosmetic to severe structural damage. Several faults in the Project vicinity are capable of producing an earthquake with associated strong ground shaking (Haro, Kasunich and Associates, Inc. 2013a). **Table 3.6-3** lists these faults, their distance from the Project site, and their maximum credible earthquake (moment magnitude). All of these faults could result in strong ground shaking at the Project site.

In 1996, California Division of Mines and Geology (CDMG) released a probabilistic seismic hazard assessment for the state of California to aid in the assessment of seismic ground shaking hazards in California (Peterson et al. 1996). The report contains a probabilistic seismic hazard map that depicts the peak horizontal ground acceleration values exceeded in a given region of California at a 10% probability in 50 years (i.e., a 0.2% probability in any one year). The peak horizontal ground acceleration values depicted on the map represent probabilistic estimates of the ground-shaking intensity likely to occur in different regions of California as a result of characteristic earthquake events on active and potentially active faults in California, and can be used to assess the relative seismic ground-shaking hazard for a given region. The probabilistic peak horizontal ground acceleration values for the Project site (i.e., the Monterey Peninsula) are strong (0.3g) (where *g* is equal to the acceleration due to gravity) (Peterson et al. 1996), suggesting that the Project site will likely experience strong to severe ground shaking from an earthquake in the next 50 years.

Liquefaction and Related Ground Failures

Liquefaction is a process by which soils and sediments lose shear strength and fail during episodes of intense ground shaking. Liquefaction and related ground failures, such as lateral spreading, could damage pipelines and result in the loss of foundation-bearing capacity for buildings, which can cause structures to settle, tip, or rise through liquefied soils and sediments.

The susceptibility of a given soil or sediment to liquefaction is primarily a function of local groundwater conditions and inherent soil/sediment properties such as texture and bulk density. Poorly consolidated, well-graded, and water-saturated fine sands and silts located within 50 feet of the surface are typically considered to be the most susceptible to liquefaction.

According to the geologic report (Haro, Kasunich and Associates, Inc. 2013a) and geotechnical investigation (Haro, Kasunich and Associates, Inc. 2013b), there is a low risk of liquefaction at the Project site. While loose, sandy soils appear at the Project site, they are located within the top 1 to 3 feet of the soil (Haro, Kasunich and Associates, Inc. 2013b), whereas the groundwater is generally at 5 to 13 feet below ground surface where the soil is moderately dense (Haro, Kasunich and Associates, Inc. 2013a,b). If the groundwater were to rise, the risk of liquefaction would increase (Haro, Kasunich and Associates, Inc. 2013b).

Slope Stability and Landslides

The Project site gently slopes (3-6%) downward from east-to west. The stability of existing (natural and manufactured) slopes in the Project site has been evaluated by site-specific geologic and geotechnical studies and mapped for regional hazard mitigation planning (Haro, Kasunich and

Associates, Inc. 2013a, Monterey County Hazard Mitigation Planning Team 2014). There are no landslides mapped on or near the Project site, and the topography is gentle to moderately steep and densely vegetated (Haro, Kasunich and Associates, Inc. 2013a). No slope stability hazards were identified at the Project site.

Soils

Soils at the Project site are classified as Narlon Loamy Fine Sand and Tangair Fine Sand (refer to Figure 3.5-1).

The majority of the Project site is composed of Narlon Loamy Fine Sand, 2–9% slopes. This soil consists of deep, somewhat poorly drained, coarse- and fine-textured soils formed from soft marine sediments on uplands. It has a low-high shrink-swell potential, a slow-medium runoff rate, moderate water erosion hazard, and high wind erosion hazard[1] (Natural Resources Conservation Service 2014; Natural Resources Conservation Service n.d.).

The northwest portion of the Project site is Tangair Fine Sand, 2–9% slopes. This soil consists of very deep, somewhat poorly drained, coarse-textured soils from san deposits on wind-modified terraces. It has a low shrink-swell potential, slow runoff rate, slight water erosion hazard, and a high wind erosion hazard (Natural Resources Conservation Service 2014).

Borings at the Project site encountered soils up to 25 feet below ground surface.

Hazardous Materials

According to the Geotracker website, there are no open hazardous materials sites within 1 mile of the Project site (State Water Resources Control Board 2015).

According to a Phase I Environmental Site Assessment of Portions of Various Pebble Beach Company-Owned Properties, there is a hazardous materials site located approximately 1 mile north of the Project site at the intersection of Sunset Drive and 17-Mile Drive in Pacific Grove, where a former UST was located at the Pebble Beach Market and at Sunset Patio (D&M Consulting Engineers, Inc. 1999).

Neither the County nor the Pebble Beach Company is aware of any hazardous materials sites within the Project vicinity or any former uses on the Project site in or on the immediate vicinity that could result in hazardous material contamination (Sidor pers. comm.; Burrell pers. comm.).

Impacts Analysis

Methodology

Approach

To determine potential impacts, the Project was analyzed using the information presented above and the significance criteria described below.

[1] Wind erosion hazard estimated from Wind Erodibility Group (WEG) ratings as determined by ICF as follows: WEGs 1 through 3 = high; WEGs 4 through 6 = moderate; WEGs 7 and 8 = low.

Criteria for Determining Significance

In accordance with CEQA, State CEQA Guidelines, Monterey County plans and policies, and agency and professional standards, an impact would be considered significant if the Project would result in any of the following conditions.

A. Seismic Hazards

- Expose people or structures to potential substantial adverse effects resulting from the rupture of a known earthquake fault, seismic ground shaking, landslides, or seismic-related ground-failure, including liquefaction, and that cannot be mitigated through the use of standard engineering design techniques.

B. Landslides and Slope Stability

- Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the proposed project and potentially result in an onsite or offsite landslide or slope failure.
- Be located on an existing slope with a gradient greater than 30%.

C. Erosion

- Result in substantial soil erosion or the loss of topsoil and subsequent sedimentation into local drainage facilities and water bodies.

D. Soil Constraints

- Be located on an expansive soil, as defined by the CUBC (1997) or be subject to other soil constraints that might result in deformation of foundations or damage to structures, creating substantial risks to life or property.

E. Hazardous Materials

- Create a significant hazard to the public or the environment through the release of hazardous materials into the environment.

Project Impacts and Mitigation Measures

A. Seismic Hazards

Impact GSS-A1. Placement of new structures could result in potential structural damage and associated human safety hazards resulting from ground shaking caused by earthquakes on nearby active and potentially active faults. (Less than significant)

As described in the *Environmental Setting* section, the Project site is not located within an Alquist-Priolo Earthquake Fault Zone as designated by the California Geological Survey, and no known active or potentially active faults exist on the site. The nearest fault is the Monterey Bay and the on land extensions of Tularcitos-Navy and King-Rinconada faults, located approximately 0.1 mile to the west of the Project site. This fault does not bisect the Project site. Therefore, the risk of surface fault rupture at the site is low.

However, the Project is located in a seismically active area. There is a possibility of future faulting in areas where no active faults currently exist, but the risk of surface faulting and consequent secondary ground failure from unknown faults is considered to be low.

Recent regional and site-specific seismic hazard assessments on the Monterey Peninsula indicate that the entire Project vicinity would likely experience strong to severe ground shaking from an earthquake during the next 50 years (Haro, Kasunich, and Associates, Inc. 2013a; Peterson et al. 1996). Ground shaking could cause damage to the Project's structures and expose people using or inhabiting these structures to adverse effects, such as injury or death. The Project would comply with requirements set in the CUBC to withstand settlement and forces associated with the maximum credible earthquake. The CUBC provides standards intended to permit structures to withstand seismic hazards. To this end, the code sets standards for excavation, grading, construction earthwork, fill embankments, expansive soils, foundation investigations, liquefaction potential, and soil strength loss. Because the Project would be required to comply with this policy and would be constructed in compliance with the CUBC, impacts from ground shaking would be less than significant.

B. Landslides and Slope Stability

Impact GSS-B1. The Project would not result in slope failure during Project operation. (No impact)

There are no risks associated with existing steep slopes or slope stability hazards at or adjacent to the Project site. The Project site has a gentle slope of 3-6%, which is substantially less than 30% identified in the significance criteria. The Project would not involve any activities that would introduce long-term slope instability. Therefore, there would be no impact.

C. Erosion

Impact GSS-C1. Grading and excavation could result in substantial soil erosion, loss of topsoil, and sedimentation during construction. (Less than significant)

During construction, excavation and grading activities would expose soils and could result in accelerated erosion. As discussed in Chapter 2, *Project Description*, construction activities are expected to generate approximately 3,325 cubic yards of soil, all of which would be reused onsite as fill.

The soil on the Project site is highly erodible. Because of the gentle grade of the Project site, there would not be severe uncontrolled runoff typical of steep slopes, and substantial erosion is not anticipated (Haro, Kasunich, and Associates, Inc. 2013b). However, construction-related erosion could result in the loss of a substantial amount of nonrenewable topsoil and could adversely affect water quality in nearby surface waters (Sawmill Gulch drainage). As described in Section 3.8, *Hydrology and Water Quality*, the Project applicant would be required to prepare SWPPP, in accordance with the state Stormwater NPDES Construction Permit, and implement BMPs. Additionally, compliance with the County's Erosion Control Ordinance (Chapters 16.08 through 16.12 of the County Code), and Standard Condition of Approval PD007 (Grading – Winter Restriction), would reduce this impact to a less-than-significant level.

D. Soil Constraints

Impact GSS-D1. Excavation activities in areas of shallow groundwater and weak soils could result in inadequate drainage and structural failure during construction. (Less than significant with mitigation)

The loose dune sands that overlie the dense decomposed granodiorite at the Project site are potentially unstable. Cuts into these sands during construction could collapse if they are not adequately supported. Excavation activities would be up to 6 feet deep for new utilities, and groundwater was found at depths of 5 to 13 feet (Haro, Kasunich and Associates, Inc. 2013a, Wagner et al. 2002). Thus, excavation could result in seepage. Inadequate surface drainage in this area could exacerbate soil instability.

This impact would be significant, but it would be reduced to a less-than-significant level by implementing **Mitigation Measure GSS-D1**.

Mitigation Measure GSS-D1. During Project construction, dewater where excavation activities would be 5 feet or greater and shore temporary cuts.

The applicant shall ensure construction specifications identify areas where excavation is planned to be 5 feet or greater, including utility installation (6 feet deep), and identify the groundwater depths at those locations. During construction, where groundwater will potentially be encountered, the construction contractor shall implement dewatering (water removal) and shoring methods as necessary to handle drainage and potential excavation wall stability during excavation. These shall be included as notes on construction plans.

Mitigation Monitoring: Prior to issuance of the first construction permit, Monterey County RMA-Building Services shall review and approve the construction plans to ensure they identify areas where excavation could be 5 feet or greater and groundwater could be encountered, and include dewatering and shoring activities.

Impact GSS-D2. Project operation would not result in increased risks associated with expansive soils or unconsolidated fill. (Less than significant)

Soils at the Project site are identified as having low-high shrink-swell potential. To reduce impacts from potentially expansive soils, the Project would be designed and constructed to meet or exceed standards set forth by the CUBC requirements. Because the Project would be constructed in compliance with the CUBC, this impact would be less than significant.

E. Hazardous Materials

Impact GSS-E1. Project construction would not create a significant hazard to the public or the environment through the release of hazardous materials into the environment. (Less than significant)

Project construction would involve routine transport, use, and disposal of hazardous materials such as solvents, paints, oils, grease, and caulking. Such transport, use, and disposal must comply with applicable regulations such as the RCRA and DOT hazardous materials regulations. Although small amounts of solvents, paints, oils, grease, and caulking would be transported, used, and disposed during Project construction, these materials are typically used in construction projects and are not considered acutely hazardous and, thus, would not represent the transport, use, and disposal of acutely hazardous materials. Because compliance with existing regulations is mandatory, the Project is not expected to create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials during construction activities. This impact would be less than significant.

Impact GSS-E2. Project operation would not create a significant hazard to the public or the environment through the release of hazardous materials into the environment. (No impact)

No hazardous materials sites are located on or within the vicinity of the Project site. The Project would not result in impacts related to hazardous materials during Project operation. There would be no impact.