3.6 GEOLOGY AND SOILS

This section of the Environmental Impact Report (EIR) describes the existing geology and soils at the Beach Cities Health District (BCHD) campus and within the wider region. These conditions are discussed in the context of potential geologic hazards that could affect the existing proposed re-development of the BCHD campus – including the Phase 1 preliminary site development plan and the more general Phase 2 development program.

Information for this analysis is based on the Geotechnical Report prepared by Converse Consultants (2016), a Seismic Assessment prepared by Nabih Youssef and Associates Structural Engineers (2018), and other sources of publicly available information including the Redondo Beach General Plan Environmental Hazards/Natural Hazards Element (1993), Torrance General Plan Safety Element (2010), Southern California Earthquake Data Center, California Department of Conservation California Geological Survey (CGS) (previously known as the California Division of Mines and Geology), and California Emergency Management Agency (Cal EMA).

3.6.1 Environmental Setting

Regional Geology

The City of Redondo Beach and the City of Torrance are located within the western Coastal Plain of the Los Angeles Basin and the Peninsular Ranges Geomorphic Province in Los Angeles County (U.S. Geological Survey [USGS] 1971). The Los Angeles Basin – bounded by the Transverse Ranges to the north, the Peninsular Ranges to the east, and the continental border to the west – is underlain by both marine and non-marine accumulations of gravel, sand, silt, and clay, that were deposited over time as a consequence of sea level fluctuations and erosion. This western Coastal Plain has been uplifted to form the existing gently rolling topography towards the southeast (City of Redondo Beach 1993).

The topography within the vicinity of the Project site is generally level with gently rolling hills including the location pictured above along 190th Street, located approximately 0.25 miles north of the Project site.

Geologic deposits underlying Redondo Beach and Torrance consist predominantly of late Pleistocene to Holocene-age (i.e., 200,000 to 100,000 years old) dune sands located west of the adjacent older alluvial deposits in the inland areas of the Los Angeles Basin. The youngest of these deposits are the El Segundo Sand Hills comprised of Late Pleistocene to Holocene-age sand, silty sand, and silt. The El Segundo Sand Hills parallel the coast for approximately 11 miles from the Ballona Escarpment (a bluff just south of Ballona Creek) to the base of the Palos Verdes Hills, and extend from the coast to between 3 and 6 miles inland. Directly underlying the El Segundo Sand Hills layer is the Upper Pleistocene Lakewood formation, consisting of marine and non-marine derived gravel, sand, silt, and clay (USGS 1971).

Southern California is generally a seismically active (i.e. earthquake prone) region. Faulting and seismicity in Southern California are largely determined by the San Andreas Fault Zone, which extends from Baja California to the Oregon Coast. The San Andreas Fault Zone separates two of the major tectonic plates that comprise the Earth's crust. The Pacific Plate is located west of the San Andreas Fault Zone and moves in a northwesterly direction relative to the North American Plate, which is located east of the San Andreas Fault Zone. This relative movement between the two plates is the driving force of fault ruptures (i.e., earthquakes) in western California. The San Andreas Fault generally trends northwest-southeast. However, north of the Transverse Ranges Province, the fault trends more in an east-west direction – generally known as the Big Bend – causing the fault's right-lateral strike-slip movement, which produces north-south compression between the two plates. This compression has produced rapid uplift of many of the mountain ranges in Southern California.

Faults are generally characterized as active, potentially active, or inactive according to their most recent seismic activity. Active faults are faults that show evidence of surface displacement within the past 11,700 years (i.e., during the Holocene epoch). Potentially active faults are those that show evidence of fault rupture between 11,700 and 2.6 million years ago (i.e., during the Pleistocene epoch).[1] Inactive faults are those without recognized activity within the past 2.6 million years. Buried (i.e., blind) thrust faults are faults that do not have a surface expression but are still a potentially significant source of seismic activity. They are typically defined based on the analysis of seismic wave recordings of hundreds of small and large earthquakes in Southern California. Due to the buried nature of these thrust faults, their existence is usually not known until they produce an earthquake, such as the Northridge Earthquake in 1994, which was produced by the Northridge blind thrust fault (Geotechnologies, Inc. 2019).

[1] Quaternary was previously recognized to extent to 1.6 million years. Recent studies have extended the Quaternary system to 2.588 million years (CGS 2016).

Regional Groundwater Basin

The Los Angeles Coastal Plain is divided into several distinct groundwater basins, which are formed by geologic features such as non-water bearing bedrock, faults, and other features that impede the flow of groundwater. Redondo Beach and Torrance are located within the West Coast Groundwater Basin, a sub-basin of the Los Angles Groundwater Basin. The West Coast Groundwater Basin underlies 160 square miles in the southwestern part of the Los Angeles Coastal Plain in Los Angeles County (see Section 3.9, *Hydrology and Water Quality*).

Project Site Geology

A Geotechnical Report was prepared for the proposed Project by Converse Consultants (2016) (see Appendix G). This investigation included 12 exploratory borings that were drilled to characterize the geologic conditions on the Project site and identify potential geologic hazards such as active or potentially active faults, liquefiable or expansive soils, etc. The existing BCHD campus is developed, resulting in a relatively level surface supporting building footprints or pavements (e.g., asphalt surface parking lots, sidewalks, etc.). The elevation of the BCHD campus generally ranges from an elevation of approximately 165 feet above mean sea level (MSL) within the central area of the campus, to an elevation of approximately 145 feet MSL at the southern entrance from North Prospect Avenue. The ground level elevation of the Project site is approximately 30 feet higher than the vacant Flagler Lot as well as the residential area to the east along Flagler Lane and Flagler Alley.

The majority of the Project site is developed with building footprints or pavements and is located on top of an uplifted terrace approximately 30 feet higher than Flagler Lane, Flagler Alley, and Diamond Street (left). The vacant Flagler Lot, located at the northeastern corner of the Project site, is currently undeveloped and is located at a similar grade to Beryl Street and Flagler Lane.

The vacant Flagler Lot, located in the northeastern corner of the Project site at the intersection of Flagler Lane & Beryl Street has been previously disturbed with the development of an oil and gas well that has previously been plugged and abandoned (see Section 3.8, *Hazards and Hazardous Materials*). Unlike the rest of the Project site, the vacant Flagler Lot is currently undeveloped. The elevation of the Flagler Lot is approximately 130 to 145 feet MSL, with a gentle slope to the northeast.

Based on an analysis of the 12 exploratory borings collected by Converse Consultants (2016), the first 3 feet of the soil beneath the Project site includes asphalt from previous development, beginning with the original development of the former South Bay Hospital in 1958 (refer to Section 2.1, *Introduction*). Existing fill soils placed at the Project site during previous grading activities are encountered from 3 feet to 13 feet below ground surface (bgs) and consist of silty and clayey sand. Underlying subsurface soils consist of alluvial sediments, primarily older dune and drift sand (Converse Consultants 2016).

Project Site Groundwater

In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present at various depths due to local conditions or during rainy seasons. Groundwater conditions at any given location vary depending on numerous factors including seasonal rainfall, local irrigation, and groundwater pumping, among other factors. Groundwater was not encountered in the exploratory borings, which were collected by Converse Consultants (2016) to a maximum depth of 61.5 feet bgs. In accordance with the Seismic Hazard Zone Report for the Redondo Beach Quadrangle (California Department of Conservation Division of Mines and Geology 1998), the historically highest groundwater level is reportedly at depths of greater than 50 feet. For further information regarding groundwater hydrology and groundwater quality (see Section 3.9, *Hydrology and Water Quality*).

Geologic Hazards

Faults and Fault Rupture

Fault rupture involves the displacement and cracking of the ground surface along a fault trace. Fault ruptures are visible instances of horizontal or vertical displacement, or a combination of the two typically confined to a narrow zone along the fault. Fault rupture is more likely to occur in conjunction with active fault segments where earthquakes are large, or where the location of the movement (i.e., earthquake hypocenter) is shallow.

As discussed in Section 3.6.2, *Regulatory Setting*, the Alquist-Priolo Earthquake Fault Zoning Act regulates development near active faults to mitigate the hazard of surface fault rupture. The Act requires the State Geologist to establish regulatory zones, also known as Earthquake Fault Zones, around the surface traces of active faults and to issue appropriate maps. Local agencies must regulate most development projects within the zones, as appropriate. Before a project can be permitted, local agencies must require a site-specific geologic investigation to demonstrate that the proposed buildings would not be constructed across active faults. An evaluation and written geotechnical report must be prepared by a licensed geologist. If an active fault is documented, a structure for human occupancy cannot be placed over the trace of the fault and must be set back – generally 50 feet – from the fault (CGS 2018).

There are no Alquist-Priolo Earthquake Zones within Redondo Beach or Torrance. According to the Earthquake Fault Zone Map for the Redondo Beach Quadrangle Map, the closest Earthquake Fault Zone is associated with the Palos Verdes Fault which is located approximately 3 miles south of the Project site (CGS 2019b). The Palos Verdes Fault is identified as an active fault, meaning it has ruptured in the last 11,000 years; however, it has not yet been zoned by the State of California under the provisions of the Alquist-Priolo Earthquake Fault Zoning Act (Geocon West, Inc. 2016).[2] The Newport Inglewood – Rose Canyon Fault, the designated Alquist-Priolo Earthquake Fault Zone nearest to the Project site, is located approximately 6.3 miles to the northeast (Converse Consultants 2016). Several earthquakes have occurred along the Newport Inglewood – Rose Canyon Fault including the March 10, 1933 "Long Beach" earthquake of magnitude 6.4, with its epicenter off Newport Beach, and smaller earthquakes at Inglewood on June 20, 1920 (magnitude 4.9), Gardena on November 14, 1941 (magnitude 5.4). These earthquakes show evidence of right-lateral strike slip focal mechanisms (Converse Consultants 2016).

Seismicity and Earthquakes

Seismic ground shaking is defined as motion that occurs as a result of energy released during faulting which could potentially result in the damage or collapse of buildings and other structures, depending on the magnitude of the earthquake, the location of the epicenter, and the character and duration of the ground motion. The composition of the underlying soil and rock, the locations of existing structure, and the building materials used are important details affecting the potential for damage due to seismic ground shaking.

[2] The State of California does not have the funds required to map every potentially dangerous faulting, leaving a number of well-known faults unmapped including several in Los Angeles County. As such, many cities have taken the lead creating their own Alquist-Priolo-like rules for active faults in the area. For example, the City of Torrance has designated a Fault Hazard Management Zone for the Palos Verdes Fault.

Earthquake magnitudes are quantified using the Richter scale, which is a logarithmic scale whereby each whole number increase in magnitude represents a tenfold increase in the amplitude of the seismic wave generated by an earthquake. For example, at a given distance from a fault, the shaking during a magnitude 5.0 earthquake will be 10 times larger than a magnitude 4.0 earthquake while the amount of energy released would increase by a factor of 32. Earthquakes of magnitude 6.0 to 6.9 are classified as moderate, those between 7.0 and 7.9 are classified as major, and those of 8.0 or more are classified as great.

Historically, the Redondo Beach and Torrance have experienced seismic activity from various regional faults. The strongest, most recent regional seismic event was the 6.7 magnitude Northridge Earthquake generated from the Northridge Fault in January 1994. The epicenter of this event was approximately 12 miles northeast of the Project site in Northridge, California. The City of Redondo Beach and the City of Torrance experienced extensive damage from the Northridge Earthquake, particularly from earthquake-induced landslides.

As previously described, the active fault nearest to the Project site is the Palos Verdes Fault, located approximately 3 miles south (see Figure 3.6-1; see Table 3.6-1). The Palos Verdes Fault extends from the Santa Monica-Malibu Coast Fault in northern Santa Monica Bay southeastward across the Palos Verdes Peninsula and the San Pedro Shelf to the vicinity of Lassen Knoll, a distance of more than 50 miles. The location of the Palos Verdes Fault is not precisely known because nearly the entire onshore portion of the fault is covered by development, and the age of the last earthquake along the fault is unknown. Several strands of the fault segments, located offshore of San Pedro and Redondo Beach, are known to cut Holocene deposits (younger than 10,000 to 11,000 years old), and are therefore considered to be active.

The Palos Verdes Fault system is characterized with a right-lateral strike-slip movement with an estimated slip rate of between 1.0 and 5.0 millimeters per year (mm/year) and causing earthquakes up to magnitudes 7.3 (USGS 2017). To address hazards associated with this fault, the Torrance General Plan Safety Element established a Fault Hazard Management Zone for the Palos Verdes Fault. However, the proposed Project site is not included as part of the Fault Hazard Management Zone (City of Torrance 2010).

The Newport – Inglewood Fault is a right-lateral strike-slip fault that extends for approximately 47 miles from Culver City southeast through Inglewood and other coastal communities to Newport Beach at which point the fault extends east-southeast into the Pacific Ocean where it is known as the Rose Canyon Fault. The fault can be inferred on the Earth's surface as passing along and through a line of hills extending from Signal Hill to Culver City. The fault is active and is located

approximately 6.3 miles northeast of the Project site. The fault has a slip rate of approximately 0.6 mm/year and is predicted to be capable of a 6.0 to 7.4 magnitude earthquake.

In addition, there are two major, potentially active buried thrust fault structures in the Los Angeles area: the Elysian Park fold and thrust belt and the Torrance-Wilmington fold and thrust belt (see Table 3.6-2; see Appendix G).

Table 3.6-1. Active and Potentially Active Faults in the Project Vicinity

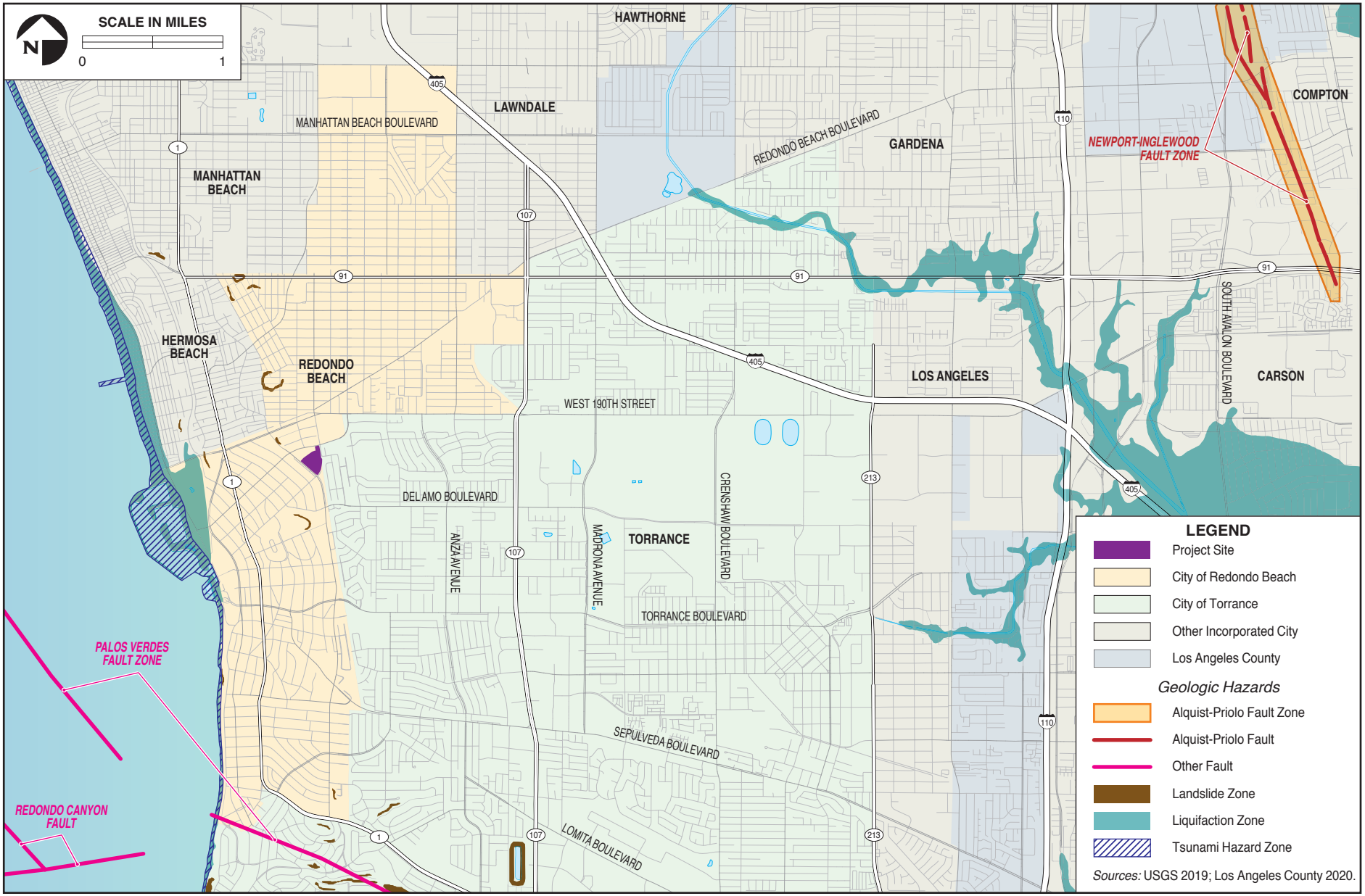
Fault Name	Distance from Project site	Onshore or Offshore Fault	Estimated Maximum Magnitude
Palos Verdes Fault	3.0 miles to the south	Onshore/Offshore	7.3
Newport-Inglewood Fault	6.3 miles to the northeast	Onshore	7.1
Puente Hills	13.8 miles to the east	Onshore	6.6
Santa Monica Fault	14.4 miles to the northwest	Onshore/Offshore	6.6
Elysian Park Thrust	16.0 miles to the northeast	Onshore	6.7
Hollywood Fault	16.1 miles to the north	Onshore	6.4
Malibu Coast	20.3 miles to the northwest	Onshore/Offshore	6.7
Raymond Fault	20.4 miles to the north	Onshore	6.5
Whittier Fault	21.4 miles to the northeast	Onshore	6.8
Verdugo Fault	22.1 miles to the northeast	Onshore	6.9
Anacapa-Dume Fault	24.3 miles to the northwest	Offshore	7.5
San Gabriel Fault System	31.0 miles to the northeast	Onshore	N/A
San Andreas Fault System	50.1 miles to the northeast	Onshore	7.8

Source: City of Torrance 2010.

Table 3.6-2. Buried Thrust Fault Related Earthquakes in the Los Angeles Area

Buried Thrust Fault	Earthquake	Date of Earthquake	Magnitude
Elysian Park	Whittier Narrows Earthquake	October 1, 1987	5.9
Torrance-Wilmington	Malibu Earthquake	January 19,1989	5.0
Unidentified Buried Thrust Fault	Northridge Earthquake	January 17, 1995	6.7

Source: City of Torrance 2010.



wood.

Geologic Hazards

FIGURE 3.6-1

In the event of an earthquake along any of the faults listed in Table 3.6-1, the South Bay (including Redondo Beach and Torrance) would be subject to high-frequency strong ground motions with potential horizontal ground accelerations of up to 1.01g,[3] which could potentially result in damage, particularly to older buildings and infrastructure, liquefaction, and risk to human health (City of Torrance 2010). Many older buildings constructed before 1996, including the existing development on the BCHD campus, do not meet current California Building Code (CBC) standards and are more likely to sustain significant damage during a seismic event and the aftershocks that follow. In cases of moderate to major earthquakes failures in older buildings' structural systems could cause significant damage. The Beach Cities Health Center, formerly the South Bay Hospital, is a 60-year-old, non-ductile concrete building. The original 4-story (north) tower was constructed in 1958 and the 4-story addition (south tower) was constructed in 1967. Both of these towers were constructed with non-ductile concrete roofs, floors, and poorly reinforced columns, making them susceptible to collapse in the event of an earthquake. A Seismic Assessment prepared by Nabih Youssef Associates (2018) concluded that the original north tower and south tower addition of the Beach Cities Health Center have numerous seismic deficiencies (e.g., brittle concrete columns result from poor steel design) and require extensive seismic upgrades. In particular, the structural foundations of the building, concrete walls (north tower), and interior columns of the building require strengthening. Additionally, the building requires new exterior steel braced frames (south tower) (Nabih Youssef Associates 2018). The Beach Cities Advanced Imaging Building (510 North Prospect Avenue), which was constructed in 1976 is subject to similar deficiencies (refer to Section 2.1, *Introduction*).

The Redondo Beach General Plan Environmental Hazards / Natural Hazards Element (1993) identifies types of hazardous buildings that would be of concern during an earthquake (i.e., non-ductile concrete frame buildings). The Element also identifies critical facilities (i.e., facilities whose continued functioning is necessary to maintain public health and safety following a natural disaster), sensitive facilities (e.g., housing for the elderly, handicapped, and mentally ill), and high-occupancy facilities (e.g., housing) that pose a greater degree of importance for or risk to the public, and may warrant special standards or protection from seismic-related impacts or damage. The Redondo Beach Draft Local Hazard Mitigation Plan identifies the Providence Family Medical Center and the Beach Cities Health Center on the BCHD campus as critical facilities (City of Redondo Beach 2019). The Torrance General Plan Safety Element (2010) also identifies unreinforced masonry buildings as most susceptible to seismic-related damage. Torrance adopted a mandatory retrofit seismic ordinance (Torrance Municipal Code [TMC] Division 2 Chapter 6)

[3] G-force is a unit of force equal to the force exerted by gravity and is used to indicate the force to which a body is subjected when it is accelerated, in this case from seismic ground shaking.

in 1987 and used subsidies to prioritize the retrofit of older buildings, especially unreinforced masonry buildings that needed to be reinforced and strengthened. As a result, most of the unreinforced masonry buildings in Torrance have been brought into compliance with Torrance's mandatory strengthening requirements (City of Torrance 2010).

In October 2015, the City of Los Angeles adopted Ordinance 183893 requiring Mandatory Earthquake Hazard Reduction in Existing Non-Ductile Concrete Buildings (Section 2, Division 95, or Article 1 of Chapter IX of the Los Angeles Municipal Code). Although neither Redondo Beach nor Torrance have adopted a similar ordinance, the seismic hazard presented by the present condition of the Beach Cities Health Center warrants significant hazard reduction measures. As previously describe, the proposed Project would address these hazards by demolishing the Beach Cities Health Center and potentially the Beach Cities Advanced Imaging Building, because the work needed to implement a proper seismic retrofit are financially infeasible (refer to Section 1, *Introduction*).

Liquefaction and Lateral Spreading

Liquefaction is a form of earthquake-induced ground failure that occurs primarily in relatively shallow, loose, granular, water-saturated soils. Liquefaction is defined as the transformation of a granular material from a solid state into a liquefied state as a consequence of increased pore pressure, which results in the loss of grain-to-grain contact (Converse Consultants 2016). Unconsolidated silts, sands, and silty sands are most susceptible to liquefaction. Almost any saturated granular soil can induce an increase in pore water pressures when shaken, and subsequently, these excess pore water pressures can lead to liquefaction if the intensity and duration of earthquake shaking are great enough.

According to the Redondo Beach Quadrangle Seismic Hazard Zones Map, the Project site is not located within an area where historic occurrence of liquefaction or geological, geotechnical, and high groundwater conditions indicate a potential for permanent ground failure due to liquefaction (CGS 1999). The Redondo Beach Draft Local Hazard Mitigation Plan maps liquefaction zones along coastline stretching from the waterline inland as far as North Francisca Avenue at the widest point, a distance of approximately 2,150 feet inland. The remainder of the liquefaction zone reaches approximately 1,000 feet inland from the coast. The Project site is located well outside of these liquefaction zones (City of Redondo Beach 2019). The Geotechnical Report prepared for the proposed Project determined that the absence of shallow groundwater and relatively dense soils indicate the Project site is not susceptible to liquefaction (Converse Consultants 2016).

In addition, lateral spreading can occur when potentially liquefiable soils are present and exposed in conjunction with a sloping ground surface. If liquefiable soils in the slope are continuous, the toe of the slope is unsupported, and the soils liquefy, the result may be temporary instability resulting in movement of sediments on the slope, causing slope failure. While the Project site includes sloping ground surfaces at the vacant Flagler Lot and along the eastern boundary of the Project site, there are no liquefiable soils underlying the Project site. Therefore, the potential for lateral spreading at the Project site is considered to be negligible (Converse Consultants 2016).

Landslides and Slope Instability

The stability of slopes is affected by gravity, rock and soil type, and amount of water and vegetation present. Events that can cause a slope to fail include but are not limited to sudden movements, such as those during a seismic event, modification of the slope by natural processes or human activities, undercutting caused by erosion, and changes in hydrologic characteristics (California Department of Transportation [Caltrans] 2001). The Seismic Hazards Maps prepared by CGS indicate the Project site is not located within an "Earthquake Induced Landslide" zone (CGS 2019a). The nearest areas to the Project site that are designated within a landslide zone are an area developed as multi-family residences east of North Prospect Avenue, approximately 1,100 feet to the northwest and Redondo Beach High School, approximately 1,800 feet to the southwest. The Redondo Beach Draft Local Hazard Mitigation Plan also maps the area beneath Redondo Beach High School as a landslide zone (City of Redondo Beach 2019).

Tsunamis and Seiches

A tsunami is a wave or surge most commonly caused by an earthquake beneath the sea floor. The Project site is located outside of a mapped Tsunami Inundation Area as mapped by the California Official Tsunami Inundation Maps (CGS 2009) and the Redondo Beach Draft Local Hazard Mitigation Plan (City of Redondo Beach 2019). Therefore, the Project site would not likely be affected by a tsunami. (For issues associated with emergency evacuation and/or emergency access see Section 3.8, *Hazards and Hazardous Materials*.) Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Based on the Project site's location away from lakes and reservoirs, seiches do not pose a hazard (Converse Consultants 2016).

Soils and Surface Hazards

Many of the properties, including the Project site, have been previously developed and are underlain by a layer of fill soils with native soils underneath. These soils and surfaces can be subject to risk from hazards related to erosion, expansion, subsidence, settlement, consolidation

(including hydroconsolidation[4]), and/or collapse. These hazards can result from the nature of the soils themselves, physical site conditions, or the presence of groundwater.

Erosion Susceptibility

Erosion of exposed soils and rocks occurs naturally as a result of physical weathering caused by water and wind energy. Currently, the Project site is developed and most of the land surface is covered by impervious materials such as buildings, asphalt pavements (e.g., surface parking lots), concrete (e.g., sidewalks). The only exception is the vacant Flagler Lot, which is currently undeveloped and characterized by exposed gravel and dirt. Therefore, minimal area of exposed soils and the moderately sloped nature of the Project site, the potential for substantial erosion hazards is low.

Expansive Soils

Expansive soils consist largely of clays, which can greatly increase in volume when saturated with water and shrink when dried. The potential for soil to undergo shrink and swell is greatly enhanced by the presence of a fluctuating, shallow groundwater table. Expansive soils tend to swell with seasonal increases in soil moisture in the winter months and shrink as soils become drier in the summer months. Repeated shrinking and swelling of the soil can lead to stress and damage of structures, foundations, fill slopes, and other associated facilities (CGS 1998).

As previously described, the Project site is located above silty and clayey sand earth materials. However, the Expansion Index tests conducted on soil samples collected from the Project site yielded a value of 0-1 (very low). Therefore, the Geotechnical Report concluded that the soils underlying the Project site have a very low potential for expansion (Converse Consultants 2016).

Subsidence

Subsidence is the downward shift of the ground surface and is most frequently caused by subsurface withdrawal of water (i.e., groundwater drawdown), oil, or natural gas earth extraction (e.g., subsurface mining), faulting, or seasonal changes in soil moisture. Compaction of soils in some aquifer systems can accompany excessive groundwater pumping and is the largest cause of subsidence in the region (City of Redondo Beach 1993).

Historically, hydrostatic pressure in the West Coast Groundwater Basin confined aquifers was sufficient to maintain a freshwater outflow to the ocean and prevent seawater intrusion. Prior to

[4] Hydroconsolidation, commonly referred to as soil collapse, is a common problem in Southern California. This happens when wetted, collapsible soils undergo a rearrangement of their grains and the water removes the cementing material, causing rapid, significant settlement

the 1953, an almost total dependence on groundwater to meet water demand resulted in a serious overdraft of the Basin, resulting in seawater intrusion and higher risk of subsidence. The West Coast Basin Barrier Project, which started in 1953, prevents subsidence by injecting water into sea barriers, which prevents seawater intrusion and replenishes the groundwater basin. Additionally, operation of the Torrance Oil Field, which underlies portions of the City of Redondo Beach and the City of Torrance – including the Project site (see Section 3.8, *Hazards and Hazardous Materials*) – had a peak production from approximately 82 active on- and off-shore wells from 1925 to 1956. However, subsidence from hydrocarbon withdrawal is considered to have been negligible (City of Redondo Beach 1993). Additionally, based on the substantial depth to groundwater greater than 61.5 feet bgs, the risk of subsidence on-site is considered very low (Converse Consultants 2016).

Differential Settlement

Differential settlement is the process whereby soils settle non-uniformly, potentially resulting in stress and damage to utility pipelines, building foundations, or other overlying structures. Such movement can occur in the absence of seismically induced ground failure, due to improper grading and soil compaction or discontinuity of underlying fill and naturally occurring soils. Strong ground shaking often greatly exacerbates soil conditions already prone to differential settlement, resulting in distress to overlying structures. Elongated structures, such as pipelines, are especially susceptible to damage as a result of differential settlement.

The risk of differential settlement is considered to be low at the Project site and in the surrounding vicinity. Some seismically induced settlement (i.e., approximately 0.5 inches) of the Project site should be expected as a result of strong ground-shaking; however, the Geotechnical Report concluded that the absence of shallow groundwater and relatively dense soils indicate differential settlement to be less than 0.25 inches over a distance of 30 feet (Converse Consultants 2016).

Paleontological Resources

Significant paleontological resources include fossils and fossiliferous deposits such as identifiable vertebrate fossils, uncommon invertebrate, plant, and trace fossils, and other data that provide information regarding the preservation, biochronology, and paleoecology of past life on Earth (Society of Vertebrate Paleontology [SVP] 2010). The potential to encounter paleontological resources is based on the geologic unit, and array of fossil resources known to be contained within that unit, within which excavations would occur. The Project site is located in an area that has been regionally mapped as underlain by Pleistocene-aged stabilized dune and drift sand (Converse Consultants 2016). Exploratory borings at the Project site identified the presence of recent artificial

fills (Qaf) up to 13 feet below existing grade underlain by Quaternary-aged alluvium (Qal) composed of dune and drift sand (Converse Consultants 2016). Recent artificial fills are typically too young to contain fossil resources; however, Pleistocene-aged units are sufficiently old to preserve fossil resources.

Pleistocene-aged geologic deposits have an unpredictable potential for containing fossil resources including significant locations that produce large numbers of fossils (i.e., bonebeds or trackways) as well as broad swaths where no resources are uncovered during extensive excavations. For instance, a search of the University of California Museum of Paleontology (UCMP) online locality database for Pleistocene-aged[5] paleontological localities in Los Angeles County recorded a total of 12,357 entries. However, of these entries 11,796 are associated with Rancho La Brea (commonly known as the La Brea Tar Pits) and 553 are associated with the marine deposits of the San Pedro Formation in the vicinity of San Pedro. Only 2 entries are associated with the Palos Verde sand and only 2 entries are associated with the unnamed Pleistocene-aged deposits ranging from Signal Hill to Timm's Point (UCMP 2020). Therefore, based on the distance from known high density paleontological resources localities and no known localities recorded during previous construction at the BCHD campus, Quaternary-aged alluvium deposits within the Project site can be expected to have a low potential for containing fossil resources.

3.6.2 Regulatory Setting

Federal Regulations

Earthquake Hazards Reduction Act

The purpose of the Earthquake Hazards Reduction Act is to reduce the risks to life and property from future earthquakes in the U.S. through establishment and maintenance of an effective earthquake hazards reduction program. To accomplish this, the Act established the National Earthquake Hazards Reduction Program (NERHP). The NERHP was amended in November 2004 by refining the description of agency responsibilities, program goals, and objectives.

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

Clean Water Act (CWA) Section 402 mandates that certain types of construction activities comply with the requirements of the U.S. Environmental Protection Agency's (USEPA's) National Pollutant Discharge Elimination System (NPDES) program. Under State Water Resources Control Board (SWRCB) enforcement, the Los Angeles Regional Water Quality Control Board (RWQCB)

[5] Geologic units deposited prior to the Quaternary-aged alluvium deposit identified at the site were not assessed as they are unlikely to be encountered during implementation of the proposed Project.

implements the NPDES program in Los Angeles County. 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 the NPDES program is provided in Section 3.9, *Hydrology and Water Quality*.

State Regulations

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act addresses the hazard of surface fault rupture only, and is not directed toward other earthquake hazards. Local cities and counties must regulate certain development projects within the Earthquake Fault Zones, generally by issuing building permits only after geologic investigations demonstrate that development sites are not threatened by future surface displacement. A buffer prohibiting the construction of structures for human occupancy in proximity to an active fault may be established. Typically, structures for human occupancy are not allowed within 50 feet of the trace of an active fault. Projects subject to these regulations include all land subdivisions and most buildings intended for human occupancy.

California Building Code

The State of California provides a minimum standard for building design through the CBC, which is based on the Uniform Building Code (UBC) but has been modified to account for California's unique geologic conditions. All provisions of the CBC are uniformly applicable throughout the State of California, except where they may be made even stricter by local jurisdictions, based on local conditions. Chapter 16 of the CBC contains specific requirements for seismic safety. Chapter 18 of the CBC regulates excavation, foundations, and retaining walls. Chapter 33 of the CBC 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. Appendix J of the CBC regulates grading activities, including drainage and erosion control. Both the Redondo Beach and Torrance have adopted the CBC.

Seismic Hazards Mapping Act

In order to address the effects of strong ground shaking, liquefaction, landslides, and other ground failures due to seismic events, the State of California passed the Seismic Hazards Mapping Act. Under the Seismic Hazards Mapping Act, the State Geologist is required to delineate *"seismic hazard zones."* Cities and counties must regulate certain development projects within these zones until the geologic and soil conditions of the project site are investigated and appropriate mitigation

measures, if any, are incorporated into development plans. The Project site is located within the seismic hazard zone for the Redondo Beach Quadrangle (CGS 1999).

The State Mining and Geology Board provides additional regulations and policies to assist municipalities in preparing the Safety Element of their General Plan and encourages land use management policies and regulations to reduce and mitigate those hazards in order to protect public health and safety. Under Public Resources Code Section 2697, cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard. Each city or county shall submit one copy of each geotechnical report, including mitigation measures, to the State Geologist within 30 days of its approval.

South Coast Air Quality Management District Rule 403 Fugitive Dust

To address the effects of wind erosion, the South Coast Air Quality Management District (SCAQMD) Rule 403 requires the implementation of best available fugitive dust control measures (e.g., limiting vehicle speeds to 15 miles per hour [mph] on unpaved roads, wiping down construction equipment before leaving a site, etc.) during active operations capable of generating fugitive dust emissions from on-site earth-moving activities, construction/demolition activities, and construction equipment travel on paved and unpaved roads.

City of Redondo Beach Local Policies and Regulations

Redondo Beach General Plan Environmental Hazards / Natural Hazards Element

The Redondo Beach Environmental Hazards / Natural Hazards Element describes seismic-related problems associated with existing older structures and provides recommendations for new development (City of Redondo Beach 1993). The Environmental Hazards / Natural Hazards Element requires developers to submit a geotechnical report before starting construction on new buildings, as part of the environmental and development review process. The Environmental Hazards / Natural Hazards Element identifies damages that earthquakes may cause to buildings that contain people or essential functions as a principal threat. This element also identifies non-ductile concrete frame building as hazardous buildings of particular concern, noting concrete roof systems supported on non-ductile concrete columns as hazardous features. The geotechnical report must be submitted to the City for review and approval before a grading or building permit can be issued by the City for the project. The standards for data and analysis that must be included in the geotechnical report must demonstrate compliance with applicable CBC regulations and standards for review set forth by the California Geological Survey Special Publication 117 Guidelines for Evaluating and Mitigating Seismic Hazards in California. The Environmental Hazards / Natural

Hazards Element provides the following goals and policies addressing issues of protecting the public from earthquake and landslide hazards and minimizing the impact of strong ground motion, liquefaction, and fault rupture.

Objective 9.1: Substantially reduce the level of death, injury, property damage, economic and social dislocation and disruption of vital services that would result from earthquake damage and related seismic events; and to ensure the widespread availability and effective response of emergency evacuation, and disaster relief services throughout the community following an earthquake (seismic) event.

Policy 9.2.2 Periodically review and assess current formats and guidelines required for geotechnical reports and environmental impact reports prepared and submitted to the City for proposed development projects, particularly locations within high liquefaction areas, to assure their continued adequacy and comprehensiveness.

Policy 9.2.3 Monitor and evaluate existing grading standards, slope retainage standards, and erosion control mitigation measures required and implemented by the City in local development and construction projects to ensure their continued adequacy and success relative to seismic safety.

Policy 9.4.1 Maintain the existing high standards of performance currently enforced in the City for existing buildings and construction techniques of new buildings relative to potential strong ground motion and shaking that may be caused in the local area by an earthquake event.

Objective 9.6: Take all necessary and appropriate actions in the siting, maintenance, and operation of critical and sensitive facilities in the community, to ensure, as much as possible, that these facilities continue to operate safely and successfully both during and after an earthquake event.

Policy 9.6.1 Require that earthquake survival and efficient post-disaster functioning be a primary concern in the siting, design, and construction standards for essential critical facilities in the City.

Policy 9.6.2 Require that proposed Critical, Sensitive, and High-Occupancy facilities be subject to careful and rigorous standards of seismic

review prior to any local approvals or permits, including detailed site investigations for faulting, liquefaction and ground motion characteristics, and application of the most current professional standards for seismic design.

Policy 9.6.3 Prohibit the location of any Sensitive and High-Occupancy facilities within one hundred (100) feet of an active or potentially active local fault or fault system.

Policy 9.6.4 Attempt, wherever possible, to locate Critical and Sensitive structures in areas of the City with continuous road access, and areas where utility services can be easily maintained and/or quickly reinstated in the event of an earthquake.

Policy 9.6.5 Require that existing Critical and Sensitive facilities with significant seismic vulnerabilities be upgraded, relocated, or phased out as appropriate or possible.

Policy 9.6.6 Incorporate planning for potential geologic or seismic-related incidents affecting Critical, Sensitive, and High-Occupancy facilities into the City's contingency plans for disaster response, evacuation, and recovery.

Policy 9.6.7 Require all Critical, Sensitive, and High-Occupancy facilities located in areas of potential seismic-related hazards (particularly liquefaction or tsunami) to maintain site-specific emergency response plans, with contingencies for all appropriate geologic and seismic-related hazards.

Draft Local Hazard Mitigation Plan

The City of Redondo Beach began the process of updating its Local Hazard Mitigation Plan in early 2018. The City assembled a Hazard Mitigation Planning Committee, which included representatives from the public safety departments (i.e., fire and police) and other City departments including building, planning, and public works, and a series of meetings were held that guided the overall development of the Draft Local Hazard Mitigation Plan. This plan is intended to help create a safer community for residents, businesses, and visitors. The plan allows public safety officials and City staff, elected officials, and members of the public understand the threats from natural and human-caused hazards in the community. The plan also recommends specific actions to

proactively decrease these threats before disasters occur. The Redondo Beach Draft Local Hazard Mitigation Plan was published on August 8, 2019 and includes four main sections:

1. A summary of the natural and human-caused hazards that pose a risk to the community. This will include descriptions of past disaster events and the chances these disasters may occur in the future.
2. An assessment of the threat to the City of Redondo Beach, which will describe how the community is vulnerable to future disasters. The plan will look at the threat to important buildings and infrastructure, such as police and fire stations, roads, and utility lines. It will also look at the threat to community members, particularly disadvantaged persons.
3. A hazard mitigation strategy, which will lay out specific policy recommendations for the City to carry out over the next 5 years. These recommendations will help reduce the threat that the community faces from hazard events.
4. A section on maintaining the plan, which will help ensure that the Local Hazard Mitigation Plan is kept up to date. This will make it easier for the City to continue to proactively protect itself and will also keep the City eligible for additional funding.

Redondo Beach Municipal Code

Redondo Beach Municipal Code (RBMC) Section 5-7.113 requires planning priority projects to prepare and submit a SUSMP to the City's Engineer for review and approval. The Standard Urban Stormwater Mitigation Plan (SUSMP) shall also contain low impact development (LID) requirements consistent with Parts VI.D.7.c and VI.D.7.d(iii) of the Municipal NPDES Permit. The provisions of this section establish requirements for construction activities and facility operations of development and redevelopment projects to comply with the current Municipal NPDES Permit to minimize potential water quality impacts, including soil erosion, from development.

City of Torrance Local Policies and Regulations

Torrance General Plan Safety Element

The Torrance General Plan Safety Element contains goals and policies aimed at reducing the risk of natural disasters and anthropogenic (i.e., human-made) hazards. The basic objective of the Safety Element is to reduce death, injuries, property damage, and economic and social impact from hazards. The Safety Element provides the following goals and policies addressing issues of protecting the public from earthquake and landslide hazards and minimizing the impact of strong ground motion, liquefaction, and fault rupture:

Objective S.1: To protect the community from hazards related to earthquakes, seismic-related activity, and flooding.

Policy S.1.2 Reduce the risk associated with structures which would likely be seriously damaged during a major earthquake, such as those located in high-risk seismic areas and buildings that do not meet current seismic codes.

Policy S.1.4 Require increased levels of structural protection for critical facilities such as hospitals, police and fire facilities, communication and emergency operations centers, and places of community assembly.

Draft Local Hazard Mitigation Plan

The Torrance Local Hazard Mitigation Plan is a blueprint for how the City of Torrance may reduce the threat posed by natural hazards. This plan is intended to help make Torrance a safer place to live, work, and visit by identifying effective and feasible actions to reduce the risks posed by various hazards (i.e., drought, seismic hazards, extreme weather, hazardous materials, flood, diseases and pest management, and geologic hazards). The City of Torrance established goals for the plan as part of the planning process to develop its previous Local Hazard Mitigation Plan, which was adopted in 2004. The planning team modified these goals for Torrance Draft Local Hazard Mitigation Plan, which was published in September 2016.:

- Make properties and structures more resilient to natural hazards, reducing injuries and damage.
- Improve assessments of hazards to encourage preventive measures.
- Create outreach and education efforts to increase public awareness of risks.
- Support the local environment through hazard mitigation planning efforts.
- Improve public and private participation to encourage leadership and prioritize hazard mitigation actions.
- Coordinate hazard planning and emergency operations by strengthening collaboration.

Torrance Municipal Code

Section 81.2.5 – Grading Permit Requirements: The City of Torrance adds to the CBC with grading and permit requirements. Each application for a grading or paving permit shall be accompanied by two sets of plans and specifications and, when required, supporting data consisting of, but not limited to, a geotechnical report, engineering geology report, drainage report, and

hillside landscape report to incorporate erosion control. This section also includes requirements for the geotechnical report, engineering geology report, drainage report, and hillside landscape report.

Section 26 – Seismic Safety Building Rehabilitation Bond Procedural Ordinance: The City of Torrance's Seismic Safety Building Rehabilitation Bond Procedural Ordinance, adopted in February 1988, issued the first Special Assessment bond to finance the retrofit of privately owned hazardous structures. The Special Assessment program is one of two incentives provided to owners of hazardous structures. The second, a subsidy to pay for engineering analysis, was used by owners of more than half of the City's unreinforced masonry parcels. To date, Torrance has seen 43 of its 50 identified unreinforced masonry parcels retrofitted.

3.6.3 Impact Assessment and Methodology

Thresholds of Significance

The following thresholds of significance are based on Appendix G of the 2020 California Environmental Quality Act (CEQA) Guidelines. For purposes of this EIR, implementation of the proposed Project may have a significant adverse geological impact if it would do any of the following:

a) The project would 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;
    ii. Strong seismic ground shaking;
    iii. Seismic-related ground failure, including liquefaction; or
    iv. Landslides.
b) The project would result in substantial soil erosion or the loss of topsoil.
c) The project would 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.
d) The project would 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.

e) The project would 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.
f) The project would directly or indirectly destroy a unique paleontological or site or unique geologic feature.

Screened-Out Threshold(s):

- Threshold (a.i) (*Fault Rupture*): Based on the Redondo Beach Quadrangle Seismic Hazard Zone Map and the Geotechnical Report prepared by Converse Consultants (2016). The fault located nearest to the Project site is the Palos Verdes Fault, located approximately 3 miles to the south of the Project site. While the proposed Project may be subject to seismic shaking from nearby faults, the proposed Project would not be subject to rupture along a fault that traverses the Project site. Therefore, for the reasons stated above and as discussed in Section VII, *Geology and Soils* of the Initial Study (IS), this issue will not be analyzed further in this EIR.
- Threshold (e) (*Septic Systems*): The proposed Project would not involve the use or development of on-site wastewater treatment systems, such as septic tanks or alternative wastewater disposal systems, because sewers are available for the disposal of wastewater at the Project site (see Section 3.15, *Utilities and Service Systems*). The proposed Project would not result in impacts related to the capability of soils for supporting septic systems or alternative wastewater disposal systems. Therefore, for the reasons stated above and as discussed in Section VII, *Geology and Soils* of the IS, this issue will not be analyzed further in this EIR.

Methodology

Geology and Soils

The impact analysis for geology and soils focuses on the potential for the proposed Project to cause or increase the risk for geologic hazards including but not limited to seismicity and soil stability. As previously described, this analysis relies on a Geotechnical Report prepared by Converse Consultants (2016) and a Seismic Assessment prepared by Nabih Youssef and Associates Structural Engineers (2018) as well as other sources of publicly available information including the Environmental Hazards/Natural Hazards Element of the City of Redondo Beach General Plan (1993), Safety Element of the City of Torrance General Plan (2010), Southern California Earthquake Data Center, CGS, and Cal EMA.

Regional and on-site geologic and soil conditions were compared to relative risk of potential geologic hazards under the proposed Project, which could affect the Project site and/or the surrounding community.

Paleontological Resources

The analysis of paleontological resources is based on a review of the UCMP paleontological records search results as well as geologic map and literature review including the site-specific Geotechnical Report prepared for the proposed Project (Converse Consultants 2016). The objective of the analysis was to determine the geological formations underlying the Project site, whether any paleontological localities have previously been identified within the Project site or in the same or similar formations near the Project site, and the potential for excavations associated with the proposed Project to encounter paleontological resources. These methods are consistent with the SVP guidelines for assessing the potential for paleontological resources to occur in individual geologic units (SVP 2010).

As described further in Impact GEO-4, although no known paleontological resources were identified within the Project site from the UCMP search, this does not preclude the existence of previously unknown buried paleontological resources within the Project site that may be impacted during construction of the proposed Project.

3.6.4 Project Impacts and Mitigation Measures

Impact Description (GEO-1)

a) The project would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving:

ii. Strong seismic ground shaking;
iii. Seismic-related ground failure, including liquefaction; or
iv. Landslides.

GEO-1 Compliance with all applicable State and local regulations as well as the recommendations of the Geotechnical Report would ensure that the proposed Project – including the Phase 1 preliminary site development plan and the more general Phase 2 development program would not directly or indirectly cause potential substantial adverse effects involving strong seismic ground shaking, seismic-related ground failure, including liquefaction, or landslides. Potential impacts would be *less than significant with mitigation*.

Strong Seismic Shaking

As previously described, the Project site is located within the seismically active region of Southern California. During an earthquake along any of the nearby faults (e.g., Palos Verdes Fault and Newport – Inglewood Fault), strong seismic ground-shaking has the potential to affect the existing buildings located at the Project site – including the Beach Cities Health Center and to a lesser extent the Beach Cities Advanced Imagining Building, which do not meet the most recent seismic requirements included in Chapter 16 of the CBC. Phase 1 of the proposed Project would demolish the Beach Cities Health Center and eliminate the need for ongoing seismic-related structural maintenance as well as the potential for catastrophic seismic failure or collapse during an earthquake event (refer to Section 2.4.3, *Project Objectives*). This would also eliminate seismic hazards in an identified critical and sensitive facility, in support of Redondo Beach Environmental Hazards / Natural Hazards Element Policy 9.6.5. Similarly, the potential demolition of the Beach Cities Advanced Imagine Building during Phase 2 would also accomplish these goals. As such, the implementation of the proposed Project would have a *beneficial impact* related to the elimination of geologic hazards.

Development under the proposed Project – including the Phase 1 preliminary site development plan and the more general Phase 2 development program – would also be subject to strong seismic ground-shaking during an earthquake event. However, unlike the existing buildings on the Project site, the proposed development would comply with the latest State and local building standards including Chapter 16 of the CBC (as adopted by the RBMC and the TMC), which contains specific requirements for seismic safety (refer to Section 3.6.2, *Regulatory Setting*). The Geotechnical Report prepared by Converse Consultants (2016), which evaluates site-specific geologic hazards including strong seismic ground-shaking (Converse Consultants 2016), confirmed that the proposed development would be capable of withstanding lateral ground movement from an earthquake provided that it incorporates all appropriate earthwork and site grading, design, and construction recommendations (Converse Consultants 2016). Therefore, compliance with all applicable State and local building standards as well as the implementation of Mitigation Measure (MM) GEO-1, which would ensure the incorporation of all appropriate earthwork and site grading, design, and construction recommendations provided in the Geotechnical Report, would not exacerbate and would reduce potentially significant impacts from strong seismic ground-shaking to *less than significant with mitigation*.

Liquefaction

As previously described, according to the State of California Seismic Hazards Map the Project site is not located within a designated liquefiable area (CGS 2019a). Similarly, according to the

Redondo Beach Draft Local Hazard Mitigation Plan Liquefaction Zones Map the Project site is not located in an area that is at risk for liquefaction (City of Redondo Beach 2019). The Geotechnical Report prepared for the proposed Project also categorizes the underlying soils as silty and clayey sands with low risk of liquefaction. Therefore, required compliance with the CBC would ensure that potential impacts associated with liquefaction would be *less than significant*.

Landslides

As previously described, according to the CGS Seismic Hazard Maps for Earthquake-Induced Landslides the Project site is not located in a designated landslide zone (CGS 2019a). Similarly, according to the Redondo Beach Draft Local Hazard Mitigation Plan Earthquake-Induced Landslide Zones Map the Project site is not located in an area at risk for landslides (City of Redondo Beach 2019). Further, the Geotechnical Report prepared for the proposed Project determined that the Project site is underlain by dense alluvial deposits on an older terrace slope. No evidence of landslides was observed on descending hillside slopes below the Project site and the potential for seismically induced landslides is considered by very low (Converse Consultants 2016). Therefore, required compliance with the CBC would ensure that potential impacts associated with landslides would be *less than significant*.

Mitigation Measure (MM)

MM GEO-1 ***Geotechnical Report Recommendations.*** *The proposed Project shall comply with all earthwork and site grading, design, and construction recommendations provided in the Geotechnical Report prepared for the proposed Project. These recommendations shall be reviewed by the City of Redondo Beach and the City of Torrance Building & Safety Divisions and formalized on all final grading plans, design drawings, and construction plans, as appropriate, prior to the issuance of any demolition or grading permits. City of Redondo Beach and City of Torrance permit compliance staff shall observe and ensure compliance with these recommendations and specifications during grading and construction activities associated with the proposed Project.*

Residual Impacts

The CBC (as adopted by the RBMC and TMC) includes comprehensive requirements and standards to ensure that all development is constructed to provide the maximum level of protection feasible and minimize the risk to life and property. Accordingly, required compliance with the CBC along with the implementation of the recommendations in the Geotechnical Report prepared for the proposed Project would reduce the risk of potential impacts associated with geologic

hazards to *less than significant*. However, it should be noted that although the occurrence probability of a larger-than-expected seismic event with corresponding ground acceleration is low, it is not zero. Consequently, while impacts associated with geologic hazards would be *less than significant*, any structure built in Southern California, regardless of compliance with the CBC, is susceptible to failure during larger-than-expected seismic events.

Impact Description (GEO-2)

b) The project would result in substantial soil erosion or the loss of topsoil.

GEO-2 The proposed Project – including the Phase 1 preliminary site development plan and the Phase 2 development program – would redevelop the existing BCHD campus. The proposed Project would not result in substantial soil erosion or the loss of topsoil. While the construction of the proposed Project would involve excavation of soils and grading, compliance with applicable State and local regulations would ensure potential impacts would be *less than significant*.

As described in Section 2.2.3, *Existing Project Site*, the Project site consists of the existing 9.35-acre campus and the adjacent 0.43-acre vacant Flagler Lot at the corner of Flagler Lane and Beryl Street. The existing BCHD campus is nearly entirely developed with existing building footprints and pavements. The vacant Flagler Lot has been previously disturbed, but unlike the rest of the existing Project site is currently undeveloped with exposed gravel and direct.

Construction of the proposed Project would involve the excavation of substantial amounts of soil. As described in Section 2.5.1.6, *Construction Activities*, Phase 1 would involve the excavation of approximately 20,000 cubic yards (cy) of soil, in order to facilitate construction of the proposed subterranean service area and loading dock. Additional grading would be required to backfill the basement associated with the existing Beach Cities Health Center and to level the other areas of the Project site. Phase 2 would include the excavation of approximately 30,250 cy of soil, which would be necessary to facilitate the construction of the basement levels of the proposed parking structure. While construction activities would be temporary – lasting for a period of 29 months during Phase 1 and 28 months during Phase 2 – excavation and grading associated with the proposed Project would result in exposed soil and the potential for erosion caused by wind and/or stormwater runoff.

Because the Project site is greater than 1 acre in size, BCHD would be required to prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) in order to meet the requirements of the Statewide General Permit for Construction in accordance with the NPDES program (see

Section 3.9, *Hydrology and Water Quality*). The SWPPP would contain BMPs designed to reduce the potential for erosion (e.g., sand/gravel bags, silt fences, dust control, etc.). Additionally, the proposed Project would be required to comply with all applicable SUSMP and LID requirements (RBMC Section 5-7.113) to address soil erosion and urban runoff. Under this ordinance, construction projects in Redondo Beach must prepare and submit a SUSMP, for compliance with the Municipal NPDES Permit to minimize potential water quality impacts, including soil erosion, from development. The SUSMP would include erosion drainage controls (e.g., detention ponds, sediment ponds or infiltration pits; dikes, filter berms or ditches; and/or down drains, chutes or flumes). Proof of compliance with the Municipal NPDES Permit would be required prior to the issuance of any demolition, grading, building, or occupancy permits, or any other type of permit or license issued by the City of Redondo Beach. With the implementation of BMPs in accordance with the SWPPP, and all applicable SUSMP and LID requirements, construction activities during Phase 1 and Phase 2 would not result in substantial erosion or loss of topsoil. As such, potential impacts associated with erosion or the loss of topsoil would be *less than significant*.

Following the completion of Phase 1 the overall open space on the BCHD campus would be increased to approximately 205,200 sf. Following the completion of Phase 2 the overall open space on the BCHD campus would range from 198,500 square feet (sf) to 221,400 sf depending on the ultimate site plan. As such, the overall open space would increase dramatically from the existing 82,940 sf currently on the campus – primarily along the eastern property boundary. As described further in Section 3.9, *Hydrology and Water Quality* stormwater would be captured and treated within the proposed storm drain network associated with the proposed Project, which would include the use of an infiltration system. Therefore, stormwater runoff associated with the proposed Project would not result in substantial erosion. Additionally, compliance with all earthwork and site grading, design, and construction recommendations provided in the Geotechnical Report prepared for the proposed Project, as required by MM GEO-1, would ensure that there would be no substantial erosion associated with engineered slopes and impacts would be *less than significant*.

Impact Description (GEO-3)

c) *The project would 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.*

d) *The project would be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.*

GEO-3 The proposed Project – including the Phase 1 preliminary site development plan and the more general Phase 2 development program – would not be located on an unstable geologic unit or soil that is made unstable as a result of the proposed Project or an expansive soil creating a substantial risk to life or property. Compliance with all applicable State and local regulations as well as the recommendations of the Geotechnical Report would ensure that potential impacts associated with the proposed Project would be *less than significant.*

As described in Impact GEO-2, construction of the proposed Project – including the Phase 1 preliminary site development plan and the more general Phase 2 development program would involve excavation of substantial amounts of soil. Shoring would be required to provide adequate structural support for the excavations associated with the subterranean service area and loading dock in Phase 1 and the basement levels of the parking structure in Phase 2. Shoring may also be required to provide structural support for neighboring adjacent roadways, buildings, and other infrastructure. For example, the proposed excavation associated with the service area and loading dock in Phase 1 would be located immediately adjacent to Beryl Street and Flagler Lane. The shoring system recommended in the Geotechnical Report prepared by Converse Consultants (2016) is summarized in Section 2.5.1.6, *Construction Activities* and described in further detail within Appendix G. All excavation activities for the proposed Project – including the Phase 1 preliminary site development plan and the more general Phase 2 development program – would be required to adhere to mandatory regulations set forth by the California Occupational Safety and Hazard Administration (CalOSHA), which specify excavation requirements to protect life and safety of construction workers during excavation, as well as all requirements of Section 1541 (General Requirements) of Title 8 of the California Code of Regulations. All excavation activities would also be required to adhere to all applicable provisions of the CBC, including Section 3304 of Chapter 33 of the CBC (refer to Section 3.6.2, *Regulatory Setting*), which includes requirements for safeguards at work sites to ensure stable excavations and cut or fill slopes. Excavation and shoring requirements are enforced through the City of Redondo Beach's and the City of Torrance's plan check process, which would require BCHD to prepare and submit grading plans, which depict excavation and shoring, to the City of Redondo Beach and City of Torrance Building & Safety Divisions prior to the issuance of permits for demolition or grading. Conformance with all applicable State and local regulations as well as the implementation of MM GEO-2, which would require monitoring of adjacent roads, would ensure that impacts associated with soil stability would be *less than significant*.

The level topography of the Project site as well as the depth to groundwater and soil type result in limited potential for hydroconsolidation and differential settlement. According to the Geotechnical

Report prepared by Converse Consultants (2016), the silty and clayey sands, which underlie the Project site do not exhibit hydroconsolidation or differential settlement characteristics (see Appendix G).

The soil borings collected as a part of the Geotechnical Report were tested and conservatively determined to be in the "Very Low" expansion range (Converse Consultants 2016). The UBC mandates that special foundation design consideration be employed if the Expansion Index is 20, or greater, as recorded in UBC Table 18-1-B. Compliance with all earthwork and site grading, design, and construction recommendations, including implementation of a monitoring program as recommended in the Geotechnical Report prepared by Converse Consultants (2016) and required by MM GEO-1 would ensure that any proposed import fill would have an Expansion Index of less than 20 would be reduced to *less than significant*.

Impact Description (GEO-4)

f) The project would directly or indirectly destroy a unique paleontological or site or unique geologic feature.

GEO-4 The proposed Project – including the Phase 1 preliminary site development plan and the more general Phase 2 development program – would require excavations below fill soils placed during previous grading activities. However, the geologic unit that is likely to be affected by these excavations has a low potential to contain paleontological resources. Impacts would be *less than significant with mitigation.*

Implementation of the proposed Project would result in excavations to a depth of up to 26 feet. These excavations would occur in a 20,000-sf area at the corner of Flagler Lane and Beryl Street and an area of between 23,100 sf and 39,200 sf near the central area of the BCHD campus. The two geologic units likely to be encountered by these ground-disturbing activities include graded fill material extending as much as 13 feet below existing grade, and underlying Pleistocene-aged alluvium deposits, primarily composed of dune and drift sands. As previously described, the Pleistocene-aged alluvium deposits underlying the Project site have a low potential for containing paleontological resources and the fill materials placed at the Project site from prior grading operations are too young to preserve paleontological resources. However, while individual fossil localities are rare, paleontological resources may still be present and should be protected or collected and deposited with an appropriate institution if uncovered during ground-disturbing activities. With adherence to MM GEO-2a and -2b, potential impacts to paleontological resources would be *less than significant with mitigation*.

Mitigation Measures

MM GEO-2a Worker Paleontological Resource Awareness Session. *In order to educate construction contractors regarding the protection of any paleontological resources that are unexpectedly discovered during excavations associated with the proposed Project. Beach Cities Health District (BCHD) shall retain a qualified paleontologist to develop a worker awareness program to educate all workers regarding the paleontological resources that, while unlikely, may occur on the development site as well as appropriate procedures to enact should paleontological resources be discovered during development. The qualified paleontologist shall develop appropriate training materials including, but not limited to, a summary of geologic units present at the Project site by depth, a description of potential paleontological resources that may be encountered during the proposed excavations, and worker attendance sheets to record workers' completions of the awareness session. The worker awareness session for paleontological resources shall occur prior to the initiation of excavation and grading activities. BCHD shall provide awareness session sign-in sheets documenting employee attendance to the City of Redondo Beach and City of Torrance permit compliance staff, if requested.*

MM GEO-2b Paleontological Resources Inadvertently Discovered During Ground-Disturbing Activities. *In the unlikely event that any potentially significant paleontological resources are uncovered during ground disturbance or construction activities the following actions would be implemented by the construction contractor to prevent potential significant impacts on paleontological resources:*

- *Temporarily cease grading in the vicinity of the find and redirect activity elsewhere to ensure the preservation of the resource and surrounding rock in which the discovery was made.*
- *Immediately notify the City of Redondo Beach and/or the City of Torrance regarding the resource and redirected ground-disturbing activity.*
- *Obtain the services of a qualified professional paleontologist who shall assess the significance of the find and provide recommendations, as necessary, for its proper disposition.*
- *Complete all significance assessment and mitigation of impacts to the paleontological resource prior to resuming ground-disturbing activities in the area of the find.*

Residual Impacts

With the implementation of mitigation measures MM GEO-2a and -2b, impacts to paleontological resources would be reduced to *less than significant*.

Cumulative Impacts

A cumulative impact related to geology and soils would result if the impacts associated with the proposed Project, when combined with other past, present, and future project within Redondo Beach, Torrance, and the other neighboring South Bay communities would increase the potential for the number of residents and visitors to be exposed to geologic hazards. The geographic context for analysis of impacts on development from ground shaking or unstable soil conditions including landslides, liquefaction, subsidence, collapse, or expansive soil is generally site-specific. In accordance with State and local requirements, future projects in the Redondo Beach, Torrance, Hermosa Beach, and Manhattan Beach would be required to conduct a geotechnical investigation prior to construction. This analysis would include sampling of native soils on-site and an assessment of the structural stability of each proposed structure, given the reasonably foreseeable seismic activity or unstable soil conditions. Each of the cumulative projects would be required to meet the most current and stringent building safety requirements. Therefore, it is anticipated that the cumulative risks of seismic ground shaking, seismic-related ground failure, soil instability, subsidence, collapse, and/or expansive soil would not be substantial. Compliance with the current CBC standards MM GEO-1 and MM GEO-2a and -2b would ensure that impacts to geology and soils associated with the proposed Project would be reduced to less than significant. As such, the proposed Project *would not substantially contribute to cumulatively considerable impacts*.