5.4 Geological Hazards and Resources

This section presents an evaluation of the Huntington Beach Energy Project (HBE P) in terms of potential exposure to geological hazards and potential to affect geologic resources of commercial, recreational, or scientific value. Section 5.4.1 describes the existing environment that could be affected, including regional and local geology and geological hazards. Section 5.4.2 identifies potential environmental effects from project development. Section 5.4.3 discusses potential cumulative effects. Section 5.4.4 discusses possible mitigation measures. Section 5.4.5 presents the laws, ordinances, regulations, and standards (LORS) applicable to geological hazards and resources. Section 5.4.6 identifies regulatory agencies and agency contacts. Section 5.4.7 describes the required permits. Section 5.4.8 provides the references used to develop this section.

5.4.1 Setting and Affected Environment

The HBE P site is located in an industrial area of Huntington Beach at 21730 Newland Street, just north of the intersection of the Pacific Coast Highway (Highway 1) and Newland Street. The project is located on the site of the existing Huntington Beach Generating Station, an operating power plant. The HBE P site is bounded on the west by a manufactured home/recreational vehicle park, on the north by a tank farm, on the north and east by the Huntington Beach Channel and residential areas, on the southeast by the Huntington Beach Wetland Preserve / Magnolia Marsh wetlands, and to the south and southwest by the Huntington Beach State Park and the Pacific Ocean. The site is located on a gently sloping coastal plain.

HBE P is a 939-megawatt combined-cycle power plant, consisting of two power blocks. Each power block is composed of three combustion turbines with supplemental fired heat recovery steam generators, a steam turbine generator, an air-cooled condenser, and ancillary facilities. HBE P will reuse existing onsite potable water, natural gas, stormwater, process wastewater, and sanitary pipelines and electrical transmission facilities. No offsite linear developments are proposed as part of the project.

The project will use potable water, provided by the City of Huntington Beach, for construction and operational process and sanitary uses. During operation, stormwater and process wastewater will be discharged to a retention basin and then ultimately to the Pacific Ocean via an existing outfall. Sanitary wastewater will be conveyed to the Orange County Sanitation District via the existing City of Huntington Beach sewer connection. Two 230-kilovolt (kV) transmission interconnections will connect HBE P Power Blocks 1 and 2 to the existing onsite Southern California Edison 230-kV switchyard.

HBE P construction will require the removal of the existing Huntington Beach Generating Station Units 1, 2, and 5. Demolition of Unit 5, scheduled to occur between the fourth quarter of 2014 and the end of 2015, will provide the space for the construction of HBE P Block 1. Construction of Blocks 1 and 2 are each expected to take approximately 42 and 30 months, respectively, with Block 1 construction scheduled to occur from the first quarter of 2015 through the second quarter of 2018, and Block 2 construction scheduled to occur from the first quarter of 2018 through the second quarter of 2020. Removal/demolition of existing Huntington Beach Generating Station Units 1 and 2 is scheduled to occur from the fourth quarter of 2020 through the third quarter of 2022.

Existing Huntington Beach Generating Station Units 3 and 4 were licensed through the California Energy Commission (00-AFC-13C) and demolition of these units is authorized under that license and will proceed irrespective of the HBE P. Therefore, demolition of existing Huntington Beach Generating Station Units 3 and 4 is not part of the HBE P project definition. However, to ensure a comprehensive review of potential project impacts, the demolition of existing Huntington Beach Generating Station Units 3 and 4 is included in the cumulative impact assessment. Removal/demolition of existing Huntington Beach Generating Station Units 3 and 4 will be in advance of the construction of HBE P Block 2.

HBE P construction will require both onsite and offsite laydown and construction parking areas. Approximately 22 acres of construction laydown will be required, with approximately 6 acres at the Huntington Beach Generating Station used for a combination of laydown and construction parking, and 16 acres at the AES Alamos Generating Station (AGS) used for construction laydown (component storage only/no assembly of components at AGS).
During HBEP construction, the large components will be hauled from the construction laydown area at the AGS site to the HBEP site as they are ready for installation.

Construction worker parking for HBEP and the demolition of the existing units at the Huntington Beach Generating Station will be provided by a combination of onsite and offsite parking. A maximum of 330 parking spaces will be required during construction and demolition activities. As shown on Figure 2.3-3 in Section 2.0, Project Description, construction/demolition worker parking will be provided at the following locations:

- Approximately 1.5 acres onsite at the Huntington Beach Generating Station (approximately 130 parking stalls)
- Approximately 3 acres of existing paved/graveled parking located adjacent to HBEP across Newland Street (approximately 300 parking stalls)
- Approximately 2.5 acres of existing paved parking located at the corner of Pacific Coast Highway and Beach Boulevard (approximately 215 parking stalls)
- 225 parking stalls at the City of Huntington Beach shore parking west of the project site.
- Approximately 1.9 acres at the Plains All American Tank Farm located on Magnolia Street (approximately 170 parking stalls)

5.4.1.1 Regional Geology

The project site is located on a coastal alluvial plain approximately 800 feet from the Pacific Ocean at an elevation of approximately 14 feet above mean sea level. The Huntington Beach Channel is located along the north and east sides of the site, which drains into the Santa Ana River to the southeast. Coastal wetlands are located along the southeast side of the site. The alluvial plain in the vicinity of the project site is generally mapped as underlain by Holocene-age alluvium associated with deposition of sediments from the Santa Ana River and other tributary drainages. Young alluvial deposits and eolian (wind-blown) deposits are indicated in the vicinity on regional geologic maps.

The project site is situated in the Los Angeles Basin at the northwest end of the Peninsular Ranges geomorphic province of southern California. Geologically, the Los Angeles Basin and vicinity is a region divided into four structural blocks that include uplifted zones and synclinal depressions. The structural blocks are generally bounded by faults. The project site is situated near the boundary between the Southwest Block and the Central Block. The Newport-Inglewood fault zone (NIFZ) is the structural boundary between these two blocks and is located just northeast of the site (Ninyo and Moore, 2011).

5.4.1.2 Local Geology and Stratigraphy

The city of Huntington Beach lies on a coastal plain above recently deposited sediment. The sediment is deposited on top of older bedrock formations buried thousands of feet below the surface. These recent sedimentary deposits originally accumulated in beach, river, bay, and estuary environments at or near sea levels. However, due to ongoing seismic uplift and folding, these deposits now form mesas at higher elevations. Subsequent erosion from wave action has produced coastal bluffs exposing these deposits. The sedimentary deposits found in Huntington Beach consist of Quaternary deposits. The older Quaternary deposits are exposed on mesas (Bolsa Chica and Huntington Beach) and in the perimeter bluffs; these are termed older alluvium or terrace materials of the Lakewood and San Pedro Formations. The California Geologic Survey (CGS) Seismic Hazard Zone report for the area indicated that the historic high groundwater in the vicinity of the site is approximately 3 feet below the ground surface (Ninyo and Moore, 2011). Groundwater depths were observed during drilling at 14 to 15 feet below the existing site grades.

The geology of Orange County is dominated by several northwest-trending fault systems, with strike-slip and reverse motions, trending north-northwest. Most of the principal faults in the area have recent Holocene activity. A preliminary geotechnical report has been completed for the project site by Ninyo and Moore (2011) (report included as Appendix 2G to this Application for Certification) and has been used as a primary source of information to support this geologic hazards and resources analysis. A second, more extensive geotechnical
investigation may be conducted to further assess site conditions to complete engineering design details prior to commencement of site foundation construction activities.

5.4.1.3 Seismic Setting
The NIFZ extends approximately 45 miles from the southern edge of the Santa Monica Mountains, through Long Beach and Torrance, southeast to Newport Bay, where it continues offshore to merge with the Rose Canyon Fault. The total length of the combined NIFZ and Rose Canyon fault is approximately 130 miles. The NIFZ is a nearly vertical right-lateral strike-slip fault zone at depth, with the Pacific Ocean side moving northwestward relative to Los Angeles. At the surface, the fault zone is a series of discontinuous, left-stepping, en echelon fault segments that define a zone of deformation that extends from Los Angeles through Long Beach to Newport Beach. The NIFZ was the source of the 1933 magnitude 6.4 Long Beach Earthquake. Surface rupture has not been documented along the NIFZ during historic time.

The NIFZ near the project site includes an approximately 2.75-mile-wide zone of multiple faults that extend from the northeast side of the project site. The principal fault strands in this zone include the Bolsa Fairview Fault, the North Branch Fault, and the South Branch Fault. The South Branch Fault is mapped crossing the northwest corner of the existing Huntington Beach Generating Station property and approximately 500 feet from the proposed area of the HBEP site (Figure 5.4-1).

Other known principal active faults within approximately 20 miles of the project site include the San Joaquin Hills (blind thrust), Palos Verdes, and Puente Hills (blind thrust). The active San Andreas Fault zone is located approximately 52 miles northeast of the site. The San Joaquin Hills, Puente Hills and Upper Elysian Park blind thrust faults are not mapped. Blind thrust faults are low-angle faults at depth that do not break the surface and are, therefore, not shown. Although blind thrust faults do not have a surface trace, they can be capable of generating damaging earthquakes. Table 5.4-1 lists the primary active faults in the region.

<table>
<thead>
<tr>
<th>Fault</th>
<th>Approximate Fault to Site Distance Miles (km)</th>
<th>Maximum Moment Magnitude (M&lt;sub&gt;max&lt;/sub&gt;)</th>
<th>Significant Historic Earthquakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newport-Inglewood (L.A. Basin)</td>
<td>0.6 (0.9)</td>
<td>7.1</td>
<td>M6.4 Long Beach, 3/10/1933</td>
</tr>
<tr>
<td>San Joaquin Hills (Blind Thrust)</td>
<td>2.3 (3.7)</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Palos Verdes</td>
<td>10.7 (17.2)</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>Puente Hills (Blind Thrust)</td>
<td>19.6 (31.5)</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Whittier</td>
<td>20.8 (33.4)</td>
<td>6.8</td>
<td>M5.9 Whittier Narrows, (Workman Hill fault extension)</td>
</tr>
<tr>
<td>Elsinore (Glen Ivy)</td>
<td>24.2 (39.0)</td>
<td>6.8</td>
<td>M6 Elsinore, 5/15/1910</td>
</tr>
<tr>
<td>Coronado Bank</td>
<td>26.3 (42.3)</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>San Jose</td>
<td>27.7 (44.6)</td>
<td>6.4</td>
<td>M4.7 Upland, 6/28/1988, M5.4 Upland, 2/28/1990</td>
</tr>
<tr>
<td>Upper Elysian Park (Blind Thrust)</td>
<td>30.0 (48.2)</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>Raymond</td>
<td>33.7 (54.3)</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>Sierra Madre</td>
<td>34.9 (56.1)</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>Verdugo</td>
<td>35.0 (56.3)</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>Hollywood</td>
<td>35.7 (57.5)</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>Cucamonga</td>
<td>36.0 (58.0)</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>Clamshell – Sawpit Canyon</td>
<td>36.7 (59.1)</td>
<td>6.5</td>
<td>M5.8 Sierra Madre, 6/28/1991</td>
</tr>
</tbody>
</table>
5.4 GEOLOGICAL HAZARDS AND RESOURCES

### TABLE 5.4-1
Regional Principal Active Faults

<table>
<thead>
<tr>
<th>Fault</th>
<th>Approximate Fault to Site Distance Miles (km)</th>
<th>Maximum Moment Magnitude (M_{\text{max}})</th>
<th>Significant Historic Earthquakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Monica</td>
<td>38.3 (61.6)</td>
<td>6.6</td>
<td>—</td>
</tr>
<tr>
<td>Malibu Coast</td>
<td>41.5 (66.8)</td>
<td>6.7</td>
<td>—</td>
</tr>
<tr>
<td>Anacapa–Dume</td>
<td>47.4 (76.3)</td>
<td>7.5</td>
<td>—</td>
</tr>
<tr>
<td>San Jacinto–San Bernardino</td>
<td>48.3 (77.7)</td>
<td>6.7</td>
<td>M6.3 Loma Linda, 7/22/1923</td>
</tr>
<tr>
<td>Rose Canyon</td>
<td>48.2 (77.6)</td>
<td>7.2</td>
<td>—</td>
</tr>
<tr>
<td>San Gabriel</td>
<td>49.5 (79.7)</td>
<td>7.2</td>
<td>—</td>
</tr>
<tr>
<td>Northridge (East Oak Ridge)</td>
<td>45.4 (73.0)</td>
<td>7.0</td>
<td>M6.7 Northridge, 1/7/1994</td>
</tr>
<tr>
<td>San Andreas–Mojave/1857 Rupture</td>
<td>52.2 (84.0)</td>
<td>7.4</td>
<td>M7.9 Fort Tejon, 1/9/1857</td>
</tr>
</tbody>
</table>

Source: Ninyo and Moore (2011)

The seismicity of the HBEP area can be characterized as an area of moderate seismic activity, with potentially large-magnitude earthquakes. Principal faults within 25 miles of the HBEP site are shown on Figure 5.4-2. These faults include the Newport-Inglewood Fault (0.6 miles northwest), San Joaquin Hills Fault (2.3 miles northeast), Palos Verdes Fault (10.7 miles west), Puente Hills Fault (19.6 miles north), Whittier Fault (20.8 miles north), and the Elsinore Fault (24.2 miles east). Other faults located between 25 and 50 miles farther to the west, north, and south include the Coronado Bank, San Jose, Upper Elysian Park, Raymond, Sierra Madre, Verdugo, Hollywood, Cucamonga, Clamshell–Sawpit Canyon, Santa Monica, Malibu Coast, Anacapa–Dume, San Jacinto–San Bernardino, Rose Canyon, San Gabriel, and the Northridge faults. Some of these faults are capable of generating maximum earthquake magnitudes of 6.4 to 7.4 (Ninyo and Moore, 2011). These fault zones represent a significant potential seismic hazard to the project site. No faults have been mapped crossing the HBEP site; however, as discussed above, the South Branch Fault is mapped crossing the northwest corner of the existing Huntington Beach Generating Station property and approximately 500 feet from the proposed area of the HBEP site (Figure 5.4-1). The site is not within an Alquist-Priolo Special Studies Zone (CGS, 2007).

5.4.1.4 Potential Geological Hazards

The following subsections discuss the potential geological hazards that might occur in the project area.

#### 5.4.1.4.1 Ground Rupture

Ground rupture is caused when an earthquake event along a fault creates rupture at the surface. As discussed, the existing Huntington Beach Generating Station is situated along the general trend of the NIFZ. The northeast corner of the existing Huntington Beach Generating Station is mapped as being transected by the South Branch of the NIFZ. The fault trace is mapped approximately 500 feet northeast of the HBEP site. Additional fault traces associated with the NIFZ are mapped further to the northeast of the site. Based on the distance of the mapped fault to the area of HBEP site, the potential for surface fault rupture affecting the project is relatively low (Ninyo and Moore, 2011).
Huntington Beach Oil Field

West Newport Oil Field

Pacific Ocean

Legend

AES Huntington Beach Generating Station
AES Huntington Beach Energy Project
Offsite Construction Parking
Onsite Construction Parking
2-Mile Radius from Project Site
Qe: Eolian Deposits
Qf: Old Paralic Deposits, Undivided
Qwa: Wash Deposits, Arenaceous
Qyaac: Young Axial-Channel Deposits
Qyas: Young Axial Channel Deposits
Qyfa: Young Alluvial Fan Deposits
Qyfs: Old Alluvial Fan and Valley Deposits (Silt)
Qm: Marine Deposits
Qyfc: Old Alluvial Fan and Valley Deposits (Clay)
af: Artificial Fill
Active Oil Well
Oil Fields

Source:
CGS, 2006. Geologic Map of the San Bernardino and Santa Ana 30’x60’ Quadrangles, CA.
CGS, 2003. Geologic Map of the Long Beach 30’x60’ Quadrangle, CA.

FIGURE 5.4-1
Regional Geology
AES Huntington Beach Energy Project
Huntington Beach, California
FIGURE 5.4-2
Fault Locations
AES Huntington Beach Energy Project
Huntington Beach, California

Source: Preliminary Geotechnical Evaluation, Huntington Beach Generating Station, Ninyo & Moore, 2/12/2011.
5.4.1.4.2 Seismic Shaking

The project area has experienced seismic activity with strong ground motion during past earthquakes, and it is likely that strong earthquakes causing seismic shaking will occur in the future. The significant geological hazard at the HBEP site is strong ground-shaking due to an earthquake. Ground shaking from a magnitude 7.4 earthquake could occur within an approximately 50-mile radius of the project site (Blake, 2004).

Using the U.S. Geological Survey ground motion calculator, the probabilistic peak ground acceleration maximum credible earthquake (PGA_{MC}) for the project site was calculated as 0.69g. The design peak ground acceleration design basis earthquake (PGA_{DBE}) was estimated to be 0.46g using the USGS ground motion calculator. These estimates of ground motion do not include near-source factors that may be applicable to the design of structures onsite. The guidelines of the governing jurisdictions and the 2010 California Building Code (CBC) will be considered in the project design. These potential levels of ground shaking could affect the HBEP facility without appropriate design mitigation, and will be considered during the detailed design phase of the project (Ninyo and Moore, 2011).

5.4.1.4.3 Liquefaction

During strong ground shaking, loose, saturated, cohesionless soils can experience a temporary loss of shear strength and act as a fluid. This phenomenon is known as liquefaction. Liquefaction depends on the depth to water, grain size distribution, relative soil density, degree of saturation, and intensity and duration of the earthquake. The potential hazard associated with liquefaction is seismically induced settlement.

The HBEP site is mapped in a State of California Seismic Hazard Zone as potentially liquefiable. The evaluation of the potential for liquefaction included the results of cone penetrometer (CPT) soundings, exploratory borings, and laboratory test results of representative soil samples. The liquefaction analysis was based on the National Center for Earthquake Engineering Research procedure developed from the methods originally recommended by Seed and Idriss (1982) using the computer program LiquefyPro. A depth to groundwater of 5 feet was used in the analysis. A PGA_{DBE} of 0.46g was used in the analysis for a design earthquake magnitude of 7.1. The analysis of soil profiles at the four CPT locations indicated that scattered saturated sandy alluvial layers located between depths of approximately 5 and 40 feet are potentially liquefiable during the design basis earthquake event (Ninyo and Moore, 2011).

The project site includes free-face slopes along the Huntington Beach Channel on the north and east sides of the site. Based on analysis of sampler blow counts and the generally discontinuous nature of the underlying soil layers, the project site is not considered susceptible to significant seismically induced lateral spread. Analyses indicates that liquefaction induced settlement at the project site would be approximately 1¼ inch or less (Ninyo and Moore, 2011).

5.4.1.4.4 Mass Wasting

Mass wasting depends on steepness of the slope, underlying geology, surface soil strength, and moisture in the soil. Significant excavating, grading, or fill work during construction might introduce mass wasting hazards at the project site. HBEP construction will result in ground surface disruption during demolition, excavation, grading, and trenching that would create the potential for erosion to occur. However, a stormwater pollution prevention program incorporating best management practices for erosion control will be prepared prior to the start of construction. In addition, the topographic gradients at the project site are relatively gentle, which would tend to reduce the potential for offsite runoff and erosion. During long-term operation of the HBEP, surface drainage design provisions and site maintenance will manage soil erosion at the site. Therefore, the potential impacts due to mass wasting and erosion are considered to be relatively low (Ninyo and Moore, 2011).

5.4.1.4.5 Subsidence

Subsidence can be caused by natural phenomena during tectonic movement, consolidation, hydrocompaction, or rapid sedimentation. Subsidence also can occur from human activities, such as withdrawal of water or hydrocarbons in the subsurface soils. Historical oil and gas withdrawal has resulted in significant ground subsidence in areas of the city of Long Beach. Ground subsidence has also occurred in the Huntington Beach Oil
Field area (approximately 5 miles southeast of the project site) (City of Huntington Beach, 1996). The project site is not located in an area of known historic subsidence. Therefore, the potential for subsidence is relatively low.

**5.4.1.4.6 Expansive Soils**

Expansive soils shrink and swell with wetting and drying. The shrink-swell capacity of expansive soils can result in differential movement beneath foundations. Based on subsurface exploration, the near-surface soils at the HBEP site are predominantly composed of fine-grained sand with silt, clay, sandy silt, and clayey silt. These soils are typically low to moderately expansive. The site-specific potential for expansive soils at the HBEP site will be evaluated during the detailed design stage of the project to provide recommendations to mitigate the potential impacts of expansive soils (Ninyo and Moore, 2011).

**5.4.1.4.7 Seiches and Tsunamis**

Tsunamis are seismically induced ocean waves with very long periods. Tsunamis may be manifested in the form of wave bores or a gradual upwelling of sea level and can be caused by landslides or earthquakes. The offshore area of Orange County contains many faults and fault scarps capable of producing tsunamis; however, seismically induced sea waves are uncommon or rare. The project site is located in a State of California Tsunami Inundation Area mapped for susceptibility run-up hazard. Tsunamis are relatively uncommon hazards in California. In the historic past, seven tsunamis have been recorded in California. In southern California, a significant tsunami was associated with the 1960 Chile Earthquake. Damage occurred in the Long Beach-Los Angeles harbor, where 5-foot-high waves surged back and forth in channels, causing damage to small boats and yachts. Tsunami tidal surge occurred in the Long Beach Harbor due to the magnitude 8.8 Chile Earthquake in February 2010, and minor effects were reported in the Long Beach Harbor due to the March 2011 Japan Tsunami.

Because the HBEP site is in an area mapped as susceptible to tsunami run-up hazards, the potential for tsunami run-up hazard at the project site and possible mitigation techniques will be evaluated during the detailed design phase of the project.

Seiches are defined as oscillations in confined or semi-confined bodies of water due to earthquake shaking. In the general project area, seiches may be caused by tsunamis that are captured and reflected within the enclosed area of an inner harbor. Because of the coastal project location (open ocean and no enclosed bay or harbor that affects the project site), there is no project risk associated with seiches.

**5.4.1.5 Geologic Resources of Recreational, Commercial, or Scientific Value**

At the HBEP site, the geologic units at the surface and in the subsurface are widespread alluvial deposits that occur throughout the Huntington Beach area; these units are not unique in terms of recreational, commercial, or scientific value. The Huntington Beach area has been the site of the extraction of oil and gas, sand and gravel, and peat products over many years. Large-scale oil and gas production has occurred since the 1920s and continues to the present time. Significant mineral deposits are not present in the project area as identified in the Orange County General Plan (Resources Element) (Orange County, 2011).

According to online maps of the California Division of Oil, Gas and Geothermal Resources (2012), oil and natural gas deposits are present in the wider project area. The city of Huntington Beach lies over several oil producing areas, comprising the Talbert, Sunset Beach, West Newport, and Huntington Beach oil fields. These oil fields and several others associated with the NIFZ have produced more than five billion barrels of oil. Oil and gas wells in Huntington Beach are scattered throughout much of the city. Most are concentrated along the coastal areas and mesas of the city. Recently, oil production has decreased due to dwindling capacity in local oil reserves and the expenses incurred in oil extraction. The HBEP site specifically overlies the West Newport oil field. Within this field, there are mainly plugged or abandoned wells located near the project site. Active wells and the underlying well fields within 2 miles of the project site are shown on Figure 5.4-1.

In 1982, the California Division of Mines and Geology published a comprehensive mineral land classification for aggregate materials in the Orange County area. Based on this investigation, the HBEP site is mapped as an area with no aggregate significance. Based on the Orange County General Plan (Orange County, 2011) and the City of
Huntington Beach General Plan (City of Huntington Beach, 1996), no known active areas of mining for mineral resources occur near the HBEP site.

R.W. McClellan and Sons operated a peat production facility from 1941 to 1954. Their operation ceased when the City of Huntington Beach acquired the property in 1954. No further mining of peat or other soil conditioners is known to occur at the present time (City of Huntington Beach, 1996)

Thus, HBEP would have no effect on oil and gas production or on other geologic resources of commercial value or on the availability of such resources.

5.4.2 Environmental Analysis
The potential effects from HBEP construction and operation, and the demolition of the existing Units 1-5 at Huntington Beach Generating Station on geologic resources and risks to life and property from geological hazards are presented in the following sections. With the implementation of the mitigation measures presented below, HBEP will not result in significant direct, indirect, or cumulative geology-related impacts.

5.4.2.1 Significance Criteria
According to Appendix G of the California Environmental Quality Act, a project would have a significant environmental impact in terms of geological hazards and resources if it would do the following:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault (Alquist-Priolo Fault Zone)
  - Strong seismic ground shaking
  - Seismic-related ground failure, including liquefaction
- 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 offsite landslide, lateral spreading, subsidence, liquefaction, or collapse
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local plan, specific plan, or other land use plan

5.4.2.2 Geological Hazards
There is significant potential for seismic groundshaking to affect the HBEP site in the event of a large-magnitude earthquake occurring on fault segments near the project site. HBEP, however, is not located within an Alquist-Priolo Special Studies Zone or within the trace of any known active fault. HBEP would, therefore, not be likely to cause direct human exposure to ground rupture. Seismic hazards will be minimized by conformance with the recommended seismic design criteria of the 2010 CBC. Liquefaction potential present at the project site will be considered during project design.

The probability of mass wasting, subsidence, or flooding at the project site is low to negligible.

In summary, compliance with the 2010 CBC requirements (and other state and local LORS) will reduce the exposure of people to the risks associated with large seismic events, liquefaction potential, and expansive soils to less-than-significant levels. Additionally, major structures will be designed to withstand the strong ground motion of a design basis earthquake (DBE), as defined by the 2010 CBC. Through compliance with CBC standards, impacts associated with geological hazards will be less than significant.

5.4.2.3 Geological Resources
The HBEP will not result in a loss of availability of a known mineral resource that would be of value to the region and the residents of the state. Additionally, HBEP will not result in the loss of availability of a locally important
mineral resource recovery site delineated on a local plan, specific plan, or other land use plan. No such resources have been identified on or near the site; therefore, there will be no adverse impacts on geological resources.

5.4.3 Cumulative Effects
A cumulative impact refers to a proposed project’s incremental effect together with other closely related past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed project (Public Resources Code § 21083; California Code of Regulations, Title 14, § 15064(h), 15065(c), 15130, and 15355).

Because structures will be designed to meet seismic requirements of the 2010 CBC, HBEP will not cause adverse impacts on geological resources and will not cause an exposure of people or property to geological hazards. Additionally, there are no minor impacts that could combine cumulatively with those of other projects. Thus, the project will not result in a cumulatively considerable impact.

5.4.4 Mitigation Measures
To address potential impacts related to geological hazards, the following mitigation measures are proposed for HBEP:

- Structures will be designed to meet seismic requirements of the 2010 CBC. Moreover, the design of plant structures and equipment will be in accordance with 2010 CBC earthquake design requirements to withstand the ground motion of a DBE.
- A geotechnical engineer will be assigned to the project to carry out the duties required by the CBC to assess geologic conditions during construction and approve actual mitigation measures used to protect the facility from geological hazards.

With the implementation of these mitigation measures, HBEP will not result in significant direct, indirect, or cumulative geology-related impacts.

5.4.5 Laws, Ordinances, Regulations, and Standards
LORS that may apply the HBEP related to geologic resources and hazards are summarized in Table 5.4-2. The local LORS discussed in this section are ordinances, plans, or policies of Orange County. There are no federal LORS that apply to geological hazards and resources.

5.4.5.1 State LORS
5.4.5.1.1 California Building Code
The CBC provides specific and acceptable design criteria for excavations and structures for static and dynamic loading conditions. The CBC is based on the Federal Uniform Building Code. The project will comply with the CBC by ensuring that HBEP design and construction meet the criteria for the seismic design and load-bearing capacity (see Section 5.4.2).

5.4.5.1.2 Alquist-Priolo Earthquake Fault Zoning Act
The main purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. Although the project is subject to the Alquist-Priolo Earthquake Fault Zoning Act, the project features are not located within areas identified as subject to surface rupture from active faults (see Section 5.4.2).

5.4.5.1.3 Seismic Hazards Mapping Act
The purpose of the Seismic Hazards Mapping Act is to ensure public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The project will conform to this Act by conducting analysis for potential seismic hazards at the HBEP site (see Section 5.4.2).
5.4.5.2 Local LORS

5.4.5.2.1 City of Huntington Beach

The Environmental Hazards Element of the City’s General Plan is intended to protect the public from the effects of natural geologic hazards. According to the City General Plan, new construction must comply with the Uniform Building Code to withstand geologic hazards including groundshaking and liquefaction. The project will conform to this element of the City’s General Plan (see Section 5.4.2).

<table>
<thead>
<tr>
<th>Table 5.4-2</th>
<th>Laws, Ordinances, Regulations, and Standards for Geological Hazards and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State</strong></td>
<td><strong>Requirements/Applicability</strong></td>
</tr>
<tr>
<td>CBC, 2010</td>
<td>Acceptable design criteria for structures with respect to seismic design and load-bearing capacity</td>
</tr>
<tr>
<td>Alquist-Priolo Earthquake Fault Zoning Act (Title 14, Division 2, Chapter 8, Subchapter 1, Article 3, California Code of Regulations)</td>
<td>Identifies areas subject to surface rupture from active faults</td>
</tr>
<tr>
<td>The Seismic Hazards Mapping Act (Title 14, Division 2, Chapter 8, Subchapter 1, Article 10, California Code of Regulations.)</td>
<td>Identifies non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides</td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td><strong>Requirements/Applicability</strong></td>
</tr>
<tr>
<td>City of Huntington Beach General Plan (City of Huntington Beach, 1996), Environmental Hazards Element</td>
<td>Compliance with Uniform Building Code for new building construction to withstand ground shaking and liquefaction</td>
</tr>
</tbody>
</table>

5.4.6 Agencies and Agency Contacts

There are no agencies or contacts associated with geologic hazards and resources.

5.4.7 Permits and Permit Schedule

Because the project falls under the exclusive jurisdiction of the California Energy Commission, no permits are required for compliance with geological LORS.

5.4.8 References


City of Huntington Beach. 1996. City of Huntington Beach General Plan. December.