# 3.9 GEOLOGY/SOILS/SEISMICITY/TOPOGRAPHY

## 3.9.1 Regulatory Setting

### Federal Historic Sites Act

For geologic and topographic features, the key federal law is the Historic Sites Act of 1935, which establishes a national registry of natural landmarks and protects "outstanding examples of major geological features."

### International Building Code and Greenbook Standards

The International Building Code (IBC, which encompasses the former Uniform Building Code [UBC]) is produced by the International Code Council (ICC) to provide standard specifications for engineering and construction activities, including measures to address geologic and soil concerns (ICC 2009). Specifically, these measures encompass issues such as seismic loading (e.g., classifying seismic zones and faults), ground motion, and engineered fill specifications (e.g., compaction and moisture content). The referenced guidelines, while not comprising formal regulatory requirements per se, are widely accepted by regulatory authorities and are routinely included in related standards such as grading codes. The IBC guidelines are regularly updated to reflect current industry standards and practices, including criteria from sources such as the American Society of Civil Engineers (ASCE) and ASTM International (ASTM, formerly known as the American Society for Testing and Materials).

The Greenbook Standard Specifications for Public Works Construction (Greenbook) is produced by a joint committee of the Southern California Chapter of the American Public Works Association and the Southern California Districts of the Associated General Contractors of California. Formal adoption of the Greenbook is through the Greenbook Committee of Public Works Standards, Inc. (Greenbook Committee). The Greenbook is focused on public works projects and includes (among other criteria) geologic and soil standards related to construction materials/methods (e.g., grading and fill/base material placement), utilities, landscaping/irrigation facilities, pipelines, aggregate, and concrete/asphalt pavement (Greenbook Committee 2009).

The principal considerations of this subchapter involve geologic, soil, seismic and topographic concerns as they relate to public safety and the structural integrity of the proposed facilities. These concerns are evaluated in the following analysis within the context of existing geologic/soil and topographic conditions, proposed facility design, and the above noted regulatory considerations.

## 3.9.2 Affected Environment

The study area for geologic issues coincides with the Project Study Area as shown on Figure 1-2. The following analysis incorporates pertinent information from a geotechnical evaluation conducted for a previous development proposal at the San Ysidro LPOE, which encompasses approximately 90 percent of the current Project Study Area (Ninyo & Moore 2005), as well as other applicable sources.

## Geologic/Topographic Setting

The study area is within the coastal portion of the Peninsular Ranges Geomorphic Province (Province), a region characterized by northwest-trending structural blocks and intervening fault zones. The Province extends approximately 920 miles from the Los Angeles Basin to the southern tip of Baja California, and varies in width from approximately 30 to 100 miles. Bedrock units in the Peninsular Ranges Province include Jurassic (approximately 144 million to 206 million years old) metavolcanic and metasedimentary rocks, and Cretaceous (approximately 65 to 144 million years old) igneous rocks of the Southern California Batholith (a large igneous intrusive body). The coastal portion of the Province in San Diego County typically includes a sequence of upper Cretaceous, Tertiary (approximately 2 to 65 million years old), and Quaternary (less than approximately two million years old) marine and non-marine sedimentary strata forming a dissected coastal plain.

Topographically, the Province is composed of generally parallel ranges of steep-sloping hills and mountains separated by alluvial valleys. More recent uplift and erosion has produced the characteristic canyon and mesa topography present today in western San Diego County, as well as the deposition of surficial materials including Quaternary alluvium, colluvium, and topsoil. Topography within the study area is characterized by generally level terrain, with elevations ranging from approximately 60 feet above mean sea level (MSL) near Virginia Avenue at the western study area boundary, to 120 feet above MSL in the eastern portion of the study area. Topography to the west of the study area is characterized by similar, generally level, terrain that slopes gently to the west, while nearby areas to the east encompass relatively steep grades and elevations exceeding 400 feet.

## Stratigraphy

Geologic units mapped and/or encountered within and adjacent to the study area include the Tertiary-age Otay Formation, and Quaternary-age Old Paralic[1] Deposits, Young Alluvial Floodplain Deposits, and Landslide Deposits, Undivided (Figure 3.9-1). The Otay Formation is not mapped on-site, but was encountered at a depth of approximately 15 feet in the eastern portion of the study area during subsurface explorations (borings) conducted as part of the previous geotechnical investigation (Ninyo & Moore 2005, refer to Boring No. B-2 on Figure 3.9-1). This unit consists generally of silty fine-grained sandstone, and coarse-grained sand and gravel deposits with some cobbles in a siltstone matrix. The Old Paralic Deposits were previously mapped locally as the Bay Point Formation, and consist mainly of poorly sorted and moderately permeable beach, estuarine and colluvial deposits comprised of interfingered siltstone, sandstone and conglomerate. This unit is mapped in much of the LPOE site, and was encountered at depths of between approximately 5 and 21.5 feet in the eastern portion of the study area during previous geotechnical investigation (Boring Nos. B-1 and B-2 on Figure 3.9-1). The Young Alluvial Floodplain Deposits consist primarily of permeable, poorly consolidated and poorly sorted alluvial materials derived mainly from fluvial sources (e.g., the Tijuana River). Alluvial deposits are mapped in the southwestern corner of the study area, and were encountered in the southern and western portions of the LPOE site at depths of between approximately 4.5 and 44.5 feet during previous geotechnical investigation (Boring Nos. B-4 and B-5 on Figure 3.9-1). The landslide deposits are mapped in the easternmost portion of the study area, as well as adjacent areas to the north and east. These deposits are characterized

[1] Paralic deposits are generally defined to include interfingered marine and non-marine deposits laid down on the landward side of a coast, or in shallow water subject to marine invasions.

by highly fragmented to largely coherent landslide deposits composed of unconsolidated to moderately well consolidated materials with scarp areas and slide deposits (California Geological Survey [CGS], formerly the California Division of Mines and Geology [CDMG], 2008; Ninyo & Moore 2008).

Because virtually the entire study area has been previously developed, on-site surficial materials are limited predominantly to recent fill deposits. Minor remnants of shallow alluvial materials and/or topsoils may also potentially occur within the study area, either underlying or in association with fill materials (i.e., local deposits that may have been incorporated into engineered fill during development). If present, local topsoils would consist of excessively drained sandy deposits derived from granitic alluvium and associated with the Tujunga Soil Series (U.S. Soil Conservation Service 1973).

### Structure and Seismicity

The study area, like most of southern California, is located within a seismically active region that encompasses several major active faults[2]. No known active faults or State of California Alquist-Priolo Earthquake Fault Zones are located within or adjacent to the Project study area (Ninyo & Moore 2005, CGS 2007). The closest active fault structures and related Earthquake Fault Zone designations to the study area are associated with onshore segments of the Rose Canyon Fault Zone located approximately 12.4 miles to the north-northwest. Additional active faults in the study area region include the Coronado Bank Fault Zone, approximately 15.5 miles to the west, the San Diego Trough Fault Zone approximately 25 miles to the west, and the Elsinore Fault Zone, approximately 50 miles to the northeast (Figure 3.9-2). The potentially active La Nacion Fault Zone is located approximately 1,000 feet east of the study area at its closest point, while several short (up to approximately one miles in length) and presumably inactive fault segments are mapped approximately 1 to 3 miles to the northwest (CDMG 1994).

Estimated horizontal peak ground acceleration values with a 10, 5 and 2 percent chance of being exceeded in the study area during a 50-year period are 0.23g, 0.3g and 0.42g, respectively, where “g” equals the acceleration due to gravity (Ninyo & Moore 2005). These ground acceleration values are based on “firm rock” sites, and may increase or decrease depending on site-specific geologic conditions.

### Groundwater

The western portion of the study area (including much of the LPOE site) is within the mapped areal extent of the Lower Tijuana River Groundwater Basin, which includes an area of approximately 5.6 square miles (refer to Subchapter 3.8, Hydrology and Floodplain, for additional groundwater data). Shallow groundwater was encountered at depths of approximately 16 and 19 feet in the western and southern portions of the LPOE site during previous geotechnical investigation (Ninyo & Moore 2008 and 2005, refer to Boring Nos. B-4 and B-5 on Figure 3.9-1). In addition, shallow perched groundwater could potentially occur on-site, with perched groundwater generally consisting of one or more unconfined aquifers supported by impermeable or semi-permeable strata. Such aquifers are typically limited in volume and extent, but can vary with conditions such as withdrawals or seasonal precipitation.

[2] Active faults are defined as structures that exhibit historic seismicity or displacement of Holocene (less than approximately 11,000 years old) deposits, while potentially active faults have no historic seismicity and displace Pleistocene (approximately 11,000 to 2 million years old) but not Holocene strata.

### National Natural Landmark Status

Based on the noted geologic and topographic information, the study area is not anticipated to contain any rare, high quality, or scientifically significant geologic or topographic resources, and does not encompass any areas designated as National Natural Landmarks (U.S. National Park Service 2009).

## 3.9.3 Environmental Consequences

### Preferred Alternative

Pursuant to the above description of geologic, soil, seismic, and topographic conditions within the study area, no conditions were identified that would be expected to preclude the proposed development, and construction of the Preferred Alternative is considered feasible from a geotechnical perspective. A number of potential geologic issues may be applicable, however, and associated recommendations are provided to address these concerns. Specifically, these recommendations involve conducting a comprehensive geotechnical evaluation of the Project Study Area and Preferred Alternative, including subsurface exploration, laboratory testing, and field inspection/verification by the Project geotechnical engineer prior to final Project design and during construction. These investigations would be intended to further evaluate surface and subsurface geotechnical conditions and provide detailed information regarding the engineering characteristics of earth materials present within the study area. From these data, a detailed geotechnical report would be prepared to provide specific geotechnical recommendations for design and construction of the Preferred Alternative. Based on available information, anticipated potential geotechnical concerns related to implementation of the Preferred Alternative are provided below, with associated avoidance, minimization, and mitigation measures described in Section 3.9.4 (and identified concerns/measures to be updated as appropriate during the described detailed geotechnical investigation).

Seismic Hazards

*Ground Rupture*

Based on the fact that no known active faults are located within or adjacent to the study area, the potential for seismic-related ground rupture hazards on site is generally considered low. The potential for ground rupture and related effects such as ground lurching within the study area cannot be totally discounted, however, as such effects could possibly occur as a result of seismic activity along currently unknown and/or off-site faults. Ground lurching, generally defined as the horizontal displacement of surficial materials from the rolling motion of passing seismic waves, primarily affects facilities such as pavement and utilities, with heavier structures such as buildings typically not adversely impacted. The Preferred Alternative would incorporate appropriate design and construction measures to accommodate ground rupture and related hazards, if applicable, pursuant to associated industry/regulatory standards (e.g., the IBC) and subsequent detailed geotechnical analysis.

*Ground Acceleration*

As previously noted, estimated horizontal peak ground acceleration values with a 10, 5, and 2 percent chance of being exceeded in the study area during a 50-year period are 0.23g, 0.3g, and 0.42g, respectively. These ground acceleration values are representative of similar areas in southern California, and could potentially result in seismic ground acceleration impacts to proposed facilities, such as structures, foundations, and/or utilities. The Preferred Alternative would incorporate appropriate design and construction measures to accommodate projected seismic loading, pursuant to applicable industry/regulatory standards (e.g., the IBC) and subsequent detailed geotechnical analysis.

*Liquefaction and Seismically-induced Settlement*

Liquefaction is the phenomenon whereby soils lose shear strength and exhibit fluid-like flow behavior. Loose, granular soils with relative densities of less than approximately 70 percent are most susceptible to these effects, with liquefaction potential greatest in saturated soils at relatively shallow depths. Liquefaction is most typically associated with seismic ground acceleration, with the resulting loss of support and/or related effects, such as seismically-induced settlement, potentially resulting in impacts to surface and subsurface facilities including pavement, foundations, and underground utilities. The majority of the study area is underlain by alluvial and/or fill soils, with relatively shallow groundwater present locally. Based on these conditions, the potential for seismically-induced liquefaction and settlement within the study area is generally considered high (Ninyo & Moore 2005). The Preferred Alternative would incorporate appropriate design and construction measures to address liquefaction effects, pursuant to applicable industry/regulatory standards (e.g., the IBC) and subsequent detailed geotechnical analysis.

*Tsunamis and Seiches*

Tsunamis (commonly referred to as tidal waves) consist of a series of ocean waves produced by events such as submarine earthquakes or volcanic eruptions that rapidly displace large volumes of water. Such events can generate impacts in coastal areas related to inundation and surges of debris-filled water. Seiches are defined as wave-like oscillatory movements in enclosed or semi-enclosed bodies of water such as lakes or reservoirs. Potential effects from seiches include flooding damage and related hazards (e.g., erosion) in surrounding areas from spilling or sloshing water, as well as increased pressure on containment structures. Because the study area is located approximately 5.1 miles inland, exhibits elevations of between approximately 60 and 120 feet above MSL, and is not adjacent to or in close proximity to any large upstream water bodies, no impacts related to tsunami or seiche hazards are anticipated from implementation of the Preferred Alternative.

<u>Non-seismic Hazards</u>

*Landslides*

The occurrence of landslides and other types of slope failures (e.g., rock falls) is influenced by a number of factors, including slope grade, geologic and soil characteristics, moisture levels, and vegetation cover. Landsliding can be triggered by a variety of potentially destabilizing conditions or events, such as gravity, fires, precipitation, grading and seismic activity. Based on the generally level nature of the study area, no impacts related to landslide hazards originating on site would be associated with the Preferred Alternative.

As previously described, landslide deposits are mapped within and adjacent to the eastern portion of the study area, with these deposits assumed to be associated with previous landslide events originating along the steeper slopes to the east. While the presence of previous landslide deposits and steeper topography within the study area and/or vicinity result in some inherent potential for on-site landslide hazards from off-site slope failures, the potential for such effects is considered generally low due to the intervening distances involved (i.e., approximately 700 to 1,000 feet between proposed development and nearby slopes to the east). Despite this conclusion, the Preferred Alternative would incorporate appropriate design and construction measures to address landslide hazards, if applicable, pursuant to associated industry/regulatory standards (e.g., the IBC) and subsequent detailed geotechnical analysis.

Additional potential concerns related to the stability of surficial deposits include construction-related erosion and sedimentation. These potential issues are discussed in Subchapter 3.8, Water Quality and Storm Water Runoff, and would be addressed through the implementation of appropriate construction BMPs in conformance with applicable regulatory standards.

*Expansive or Compressible Soils*

Expansive (or shrink-swell) behavior is attributable to the water-holding capacity of certain clay minerals, and can affect the integrity of facilities such as pavement, foundations or utilities. Compressible soils are typically associated with loose and unconsolidated deposits including alluvium and native topsoils. While surficial or shallow alluvial and topsoil deposits are generally not anticipated to occur on-site due to the predominantly developed nature of the study area, they could potentially be present as previously described. Such materials could be subject to expansive behavior or settlement under load, with associated impacts to proposed facilities, such as pavement, structures and utilities. The Preferred Alternative would incorporate appropriate design and construction measures to address potential effects related to expansive or compressible soils, pursuant to applicable industry/regulatory standards (e.g., the IBC) and subsequent detailed geotechnical analysis.

*Excavation/Generation of Oversize Materials*

While it is anticipated that most or all surficial and geologic materials expected to be encountered during implementation of the Preferred Alternative would be subject to excavation and ripping with standard construction methods and equipment, such activities could potentially generate oversize materials. The generation of such oversize rock fragments (i.e., greater than approximately 8 in) could pose potential development hazards if improperly handled or placed. Specifically, the presence of oversize materials in engineered fills can result in effects such as differential settlement (i.e., varying degrees of settlement over short distances), with associated impacts to overlying structures or pavement. The Preferred Alternative would incorporate appropriate measures to address potential effects related to the generation of oversize materials, pursuant to applicable industry/regulatory standards (e.g., the IBC) and subsequent detailed geotechnical analysis.

*National Natural Landmarks*

As previously noted, the study area does not encompass any rare, high quality, or scientifically significant geologic or topographic resources, and is not within any areas designated as National Natural Landmarks. Accordingly, no associated impacts would occur from implementation of the Preferred Alternative.

### Pedestrian Crossing Alternative

Although the Pedestrian Crossing Alternative would entail a different cross-border pedestrian circulation scheme, it would occur within the same Project Study Area as the Preferred Alternative. Therefore, the study area for geologic issues under the Pedestrian Crossing Alternative would be the same as the Preferred Alternative, and construction, operation, and maintenance activities would be similar. The analysis presented above for the Preferred Alternative would apply equally to the Pedestrian Crossing Alternative, and potential impacts with respect to geology, soils, seismicity, and topography would be the same.

### No Build Alternative

Under the No Build Alternative, the development actions described for the Preferred Alternative at the San Ysidro LPOE would not occur, and no impacts related to geologic, soil, seismic, or topographic conditions would result.

## 3.9.4 Avoidance, Minimization, and/or Mitigation Measures

### Preferred Alternative

As previously described, a comprehensive geotechnical evaluation would be conducted prior to final design and during construction of the Preferred Alternative. This evaluation would include subsurface exploration, laboratory testing, and field inspection/verification by the Project geotechnical engineer, and would be intended to further evaluate surface and subsurface geotechnical conditions and provide detailed information regarding the engineering characteristics of earth materials present within the study area. From these data, specific recommendations would be generated for applicable geotechnical issues to ensure conformance with associated regulatory and design requirements. The following types of standard design and construction measures may be considered in the noted geotechnical evaluation, along with additional or revised recommendations identified during detailed investigations. Implementation of these or other appropriate measures, in conformance with applicable regulatory requirements, would avoid, minimize or mitigate any potential impacts related to geologic, soil, seismic, or topographic conditions.

- Potential impacts related to seismically-induced ground rupture or related effects (if applicable) may be addressed through measures such as: (1) conformance with applicable seismic design criteria from sources including the IBC; (2) implementation of design efforts for ground rupture hazards (e.g., inclusion of buffer zones or set-backs from on-site faults) if determined appropriate during detailed geotechnical investigation; and (3) use of properly engineered fill and reinforced concrete and masonry.
- Potential impacts related to seismic ground acceleration may be addressed through measures such as the use of: (1) applicable seismic design criteria from sources including the IBC; (2) proper fill composition, moisture content, placement, and compaction parameters; (3) appropriate foundation and pavement design; (4) reinforced concrete and masonry; and (5) appropriate structure and utility design.
- Potential liquefaction and seismically-induced settlement effects may be addressed through efforts such as: (1) conformance with applicable seismic design criteria from sources including the IBC; (2) removal and recompaction or replacement of materials susceptible to liquefaction and/or seismic settlement with properly engineered fill; (3)

in-place soil and/or structural modifications such as compaction grouting, soil mixing, dynamic compaction, or driving piles below liquefiable layers; and (4) use of positive surface drainage and/or subdrains in appropriate areas to avoid saturation of surficial deposits.

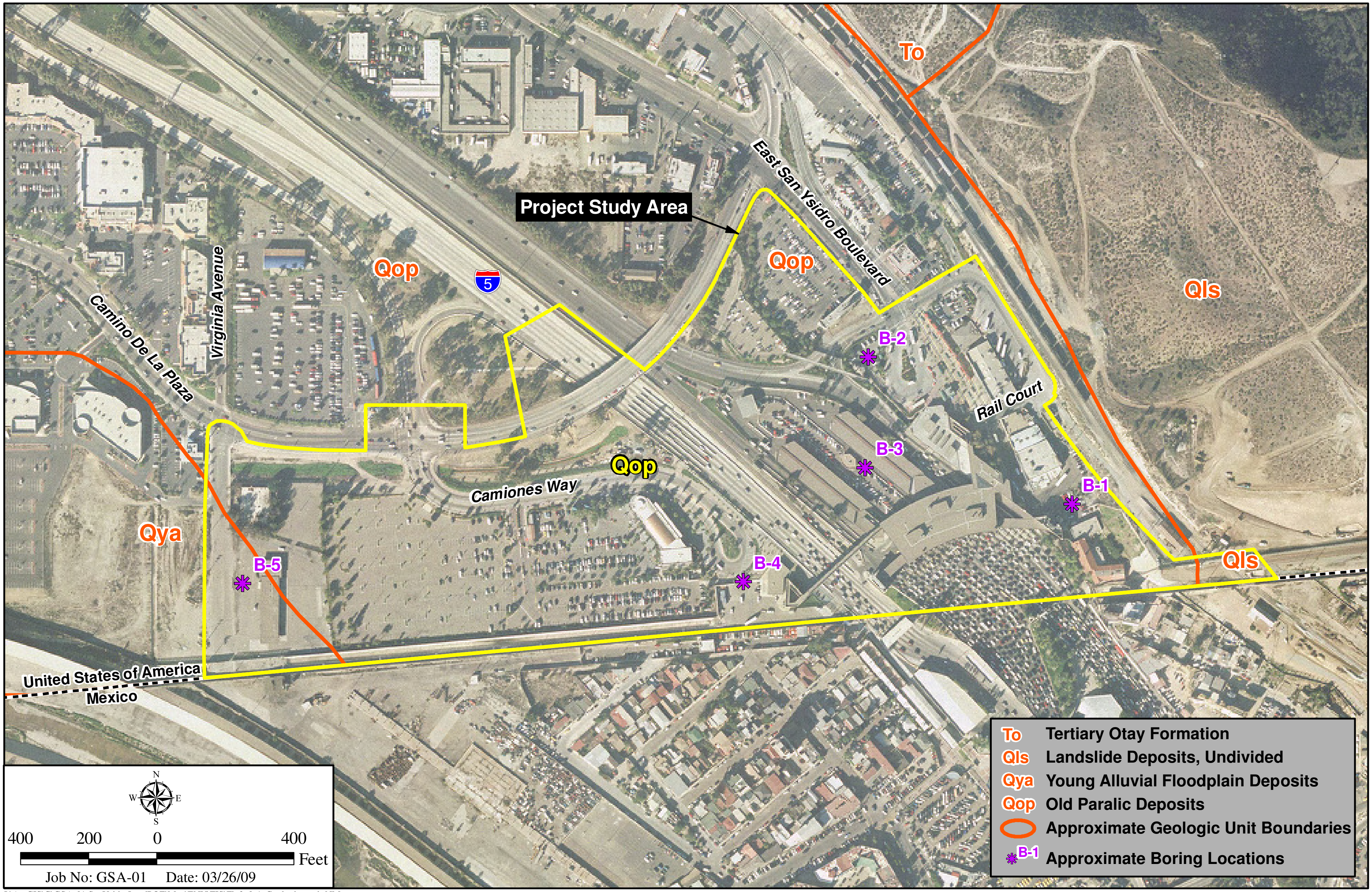
- Potential impacts related to landslide/slope stability hazards originating in off-site areas (if applicable) may be addressed through efforts such as selective facility locations (i.e., to avoid hazard-prone areas), and/or the use of protective barriers (e.g., perimeter walls or fences).
- Expansive or compressive characteristics in surficial materials (if present) may be addressed through efforts such as: (1) removal and recompaction or replacement of unsuitable soils with properly engineered fill; (2) selective placement and/or capping of expansive soils; (3) use of subdrains and moisture conditioning in areas of expansive soils; (4) soil mixing and use of specially designed foundations or slabs in areas of expansive deposits; (5) use of in-place soil modifications in areas of compressible soils (as described above for liquefaction/seismic settlement); (6) surcharging of compressible materials left in place to accelerate consolidation rates; and (7) settlement monitoring in areas of compressible soils.
- Potential impacts related to oversize materials may be addressed through efforts such as off-site removal/disposal, selective burial in deeper fills, or crushing.

**Pedestrian Crossing Alternative**

Avoidance, minimization, and mitigation recommendations related to geology, soils, seismicity, and topography issues for the Pedestrian Crossing Alternative would be the same as those described above for the Preferred Alternative. The use of such measures and considerations would avoid or effectively address all potential impacts related to geology, soils, seismicity and topography.

**No Build Alternative**

Because no impacts were identified for the No Build Alternative, no associated avoidance, minimization, or mitigation measures are required.

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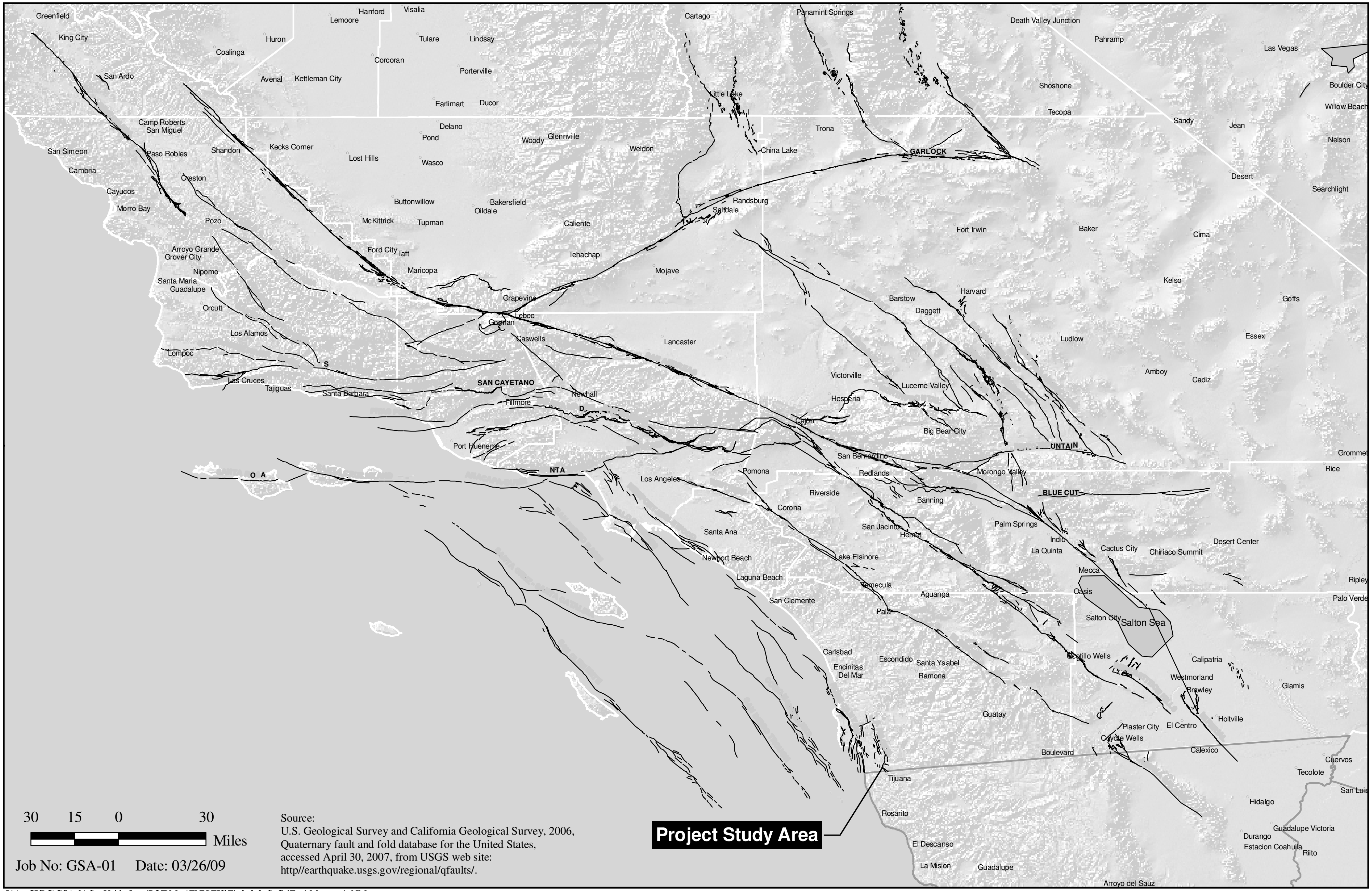
# Generalized Geologic Map

SAN YSIDRO LAND PORT OF ENTRY IMPROVEMENTS

Figure 3.9-1

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# Regional Fault Map

SAN YSIDRO LAND PORT OF ENTRY IMPROVEMENTS

Figure 3.9-2

# 3.10 PALEONTOLOGY

## 3.10.1 Regulatory Setting

Paleontology is the study of life in past geologic time based on fossil plants and animals. The principal federal statute that addresses paleontological resources, their treatment, and funding for mitigation as a part of federally authorized or funded projects, is the Federal Antiquities Act of 1906 (16 USC 431-433). The Antiquities Act provides general protection for historic and prehistoric cultural and natural resources (collectively referred to as objects of antiquity), and specifically precludes unauthorized appropriation, excavation, injury, or destruction of such resources on lands owned or controlled by the U.S. Government.

## 3.10.2 Affected Environment

The study area for paleontological issues includes the Project Study Area as shown on Figure 1-2. As described in Chapter 3.9 of this EIS (Geology/Soils/Seismic/Topography), geologic formations underlying the Project Study Area include the Tertiary-age Otay Formation, Quaternary-age Old Paralic Deposits (Bay Point Formation), Young Alluvial Floodplain Deposits, and Landslide Deposits. Based on information provided in local assessments of paleontological resource potential, the Otay Formation and Old Paralic Deposits are assigned a high potential sensitivity rating for paleontological resources, while the Young Alluvial Floodplain and Landslide Deposits are both assigned a low sensitivity rating (City of San Diego 2007, Demere and Walsh 1993). A high sensitivity rating is generally defined to include geologic formations known to contain paleontological resources with rare, well-preserved, critical fossil materials for stratigraphic or paleoenvironmental interpretation; or fossils providing important information about the paleoclimatic, paleobiological, and/or evolutionary history of animal or plant groups. A low sensitivity rating is assigned to geologic formations that, based on their relatively young age and/or high-energy depositional history, are judged unlikely to produce scientifically significant or unique fossil remains (County of San Diego 2007). The high sensitivity ratings for the Otay Formation and Old Paralic Deposits (Bay Point Formation) are based on the previous recovery of important fossil resources from these units, including terrestrial vertebrates from the Otay Formation (e.g., various mammals, reptiles and birds), and marine vertebrate (sharks rays and bony fishes) and invertebrate (mollusks) fossils from the Old Paralic Deposits (Demere and Walsh 1993).

Surficial materials that occur (or potentially occur) within the Project Study Area include fill deposits, topsoils and alluvium. Paleontological resource potential and sensitivity for alluvium is considered low as noted above, while artificial fill and topsoil deposits exhibit zero potential for the occurrence of sensitive paleontological resources due to their recent age and destructive mode of formation and deposition relative to paleontological resources.

## 3.10.3 Environmental Consequences

### Preferred Alternative

Grading and excavation activities associated with the Preferred Alternative could potentially affect previously undisturbed portions of the high sensitivity Otay Formation and Old Paralic Deposits. Such activities could result in the destruction of unique or significant paleontological resources due to the described sensitivity level of the associated geologic units. No impacts would be associated with potential disturbance of fill, topsoils, or alluvial deposits due to their described low level (or lack) of paleontological resource potential.

### Pedestrian Crossing Alternative

As described in Chapter 2.0, the Pedestrian Crossing Alternative would occur within the same Project Study Area as the Preferred Alternative, but would entail a different cross-border pedestrian circulation scheme. Therefore, the study area for paleontological issues under the Pedestrian Crossing Alternative would be the same as the Preferred Alternative. Like the Preferred Alternative, this alternative could potentially affect previously undisturbed portions of the high sensitivity Otay Formation and Old Paralic Deposits, potentially resulting in the destruction of unique or significant paleontological resources. No impacts would be associated with potential disturbance of fill, topsoils, or alluvial deposits due to their described low level (or lack) of paleontological resource potential.

### No Build Alternative

Under the No Build Alternative, the development activities described for the Preferred Alternative would not occur, and no impacts related to paleontological resources would result.

## 3.10.4 Avoidance, Minimization, and/or Mitigation Measures

### Preferred Alternative

Avoidance, minimization, and mitigation recommendations related to paleontology for the Preferred Alternative would involve preparing and implementing a Paleontological Monitoring Plan to be approved by the Project applicant. The Paleontological Monitoring Plan would likely include the following types of measures in accordance with standard construction practices in southern California, with detailed requirements to be determined during the plan preparation and approval process:

- A Qualified Paleontologist should be present at pre-grading meetings to consult with grading/excavation contractors regarding the potential location and nature of paleontological resources and associated monitoring/recovery operations. A Qualified Paleontologist is defined as an individual with an M.S. or Ph.D. in paleontology or a related field, and who has knowledge of local paleontological resources and documented experience in field identification and collection of fossil materials.
- A Qualified Paleontologist or Paleontological Monitor (working under the direction of the Qualified Paleontologist), should be on site to monitor for paleontological resources during all original grading/excavation activities involving previously undisturbed areas of the Otay Formation and/or Old Paralic Deposits. A Paleontological Monitor is defined as an individual with at least one year of experience in field identification and collection of fossil materials.
- If paleontological resources are discovered, the Qualified Paleontologist (or Paleontological Monitor) should implement appropriate salvage operations, potentially including simple excavation, plaster-jacketing of large and/or fragile specimens, or quarry excavations for richly fossiliferous deposits. The Qualified Paleontologist and Paleontological Resources Monitor should be authorized to halt or divert construction work in salvage areas to allow for the timely recovery of fossil remains.

- Paleontological resources collected during the monitoring and salvage portion of the mitigation program should be cleaned, repaired, sorted, and cataloged pursuant to accepted industry methods.
- Prepared fossils, along with copies of all pertinent field notes, photos and maps, should be deposited in an approved scientific institution with paleontological collections.
- A final report should be prepared by the Qualified Paleontologist to describe the results of the mitigation program, including field and laboratory methods, stratigraphic units encountered, and the nature and significance of recovered paleontological resources.

### Pedestrian Crossing Alternative

As in the case of the Preferred Alternative, avoidance, minimization, and mitigation recommendations related to paleontology for the Pedestrian Crossing Alternative would involve preparing and implementing a Paleontological Monitoring Plan, as described above.

### No Build Alternative

Because no impacts were identified for the No Build Alternative, no associated avoidance, minimization, or mitigation measures are required.

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