3.2 Geology and Soils

This section describes geology and soils within the project site and in the surrounding area, and evaluates the potential for the proposed project to result in significant impacts related to exposing people or structures to unfavorable geologic hazards, soils, and/or seismic conditions. The information in this section is based on the Slope Stability Investigation (CHJ 2018) and Phase I Environmental Site Assessment (RES 2018), which are included as Appendix L and N of this EIR.

3.2.1 Existing Conditions

Natural geologic processes that represent a hazard to life, health, or property are considered geologic hazards. Natural geologic hazards that affect people and property in the County include earthquakes (which can cause surface fault rupture, ground shaking, and liquefaction), expansive soils, weathering, and mass wasting phenomena such as landslides (San Diego County 2007).

3.2.1.1 General Geologic Setting

Regional Geology

The project site is located within a broad river valley formed in bedrock terrain of the Peninsular Ranges Geomorphic Province (CHJ 2018), which is a region characterized by northwest-trending valleys subparallel to faults branching from the San Andreas Fault (Department of Conservation 2002). Many of these faults are considered active. The portion of the province that includes the project site consists generally of uplifted and dissected Cretaceous granitic rock and Jurassic metavolcanic rock (CHJ 2018).

Topography

The project site has topography ranging from relatively level to gently sloping (RES 2018). Surface elevations on the site vary from a low of approximately 415 feet amsl in the San Diego River Channel on the west end of the site, to a high of approximately 490 feet amsl in the eastern limit of the project site just north of El Monte Road. Adjacent to the western boundary of the project site is a currently inactive mine (formerly the Nelson Sloan El Monte Pit) forming a pond with a water surface elevation of approximately 400 feet amsl.

Site Geology

Geologic units encountered or observed during exploration included fill, recent wash deposits, young alluvium, older alluvium, granitic bedrock, metavolcanic rocks, Chiquito Peak monzogranite, and consolidated sediment. General descriptions of these units are provided below (CHJ 2018).

Fill

Minor areas of fill associated with prior site uses are derived from local materials including sand, silt and gravel from alluvium, and soil. The eastern portion of the project site includes fill and disturbed native soils associated with the previously approved golf course project. The entire project site is considered disturbed ground based on its history of agricultural use for ploughing/disking and use for materials storage, borrow, and processing. All fill materials that are currently on the project site are considered undocumented (loose variable soil with miscellaneous debris and materials) and unsuitable for support of any engineered improvements.

Recent Wash Deposits

Wash deposits consisting of sand, silt, and gravel are present in the active San Diego River channel. These sediments are unconsolidated and include clasts of durable bedrock type.

Young Alluvium

Alluvium consisting of unconsolidated sand and silt with gravel forms the elevated bench area adjacent to the river channel. The upper surface of these sediments is commonly a gray-brown, fine-grained sand and micaceous silt that is compressible and soft. This surface is heavily disturbed by burrowing and plant growth. These sediments are derived from weathering and erosion of adjacent bedrock hillsides that include granitic and metavolcanic rock types and reflect the color and mineral composition of the parent materials. Over-bank deposits of fine-grained sand and silt deposited during river flooding are also present locally.

Older Alluvium

An isolated remnant of older alluvium may occur in the northwest portion of the project site; however, field observations suggest that a portion of these materials is either disturbed or imported. These materials consist of strong reddish-brown silty sands that form a bench elevated relative to the Young Alluvium surfaces. The Older Alluvium unit either consists of a natural terrace deposit that was partially altered by clearing and placement of fill, or was imported from an offsite area, dumped, and spread with equipment. This unit is not within the proposed excavation area.

Granitic Bedrock

Granitic bedrock on the project site consists of undivided tonalite and granodiorite of early Cretaceous age. This unit includes lesser gabbro and metavolcanic rocks, underlies the project site, and forms the boulder hillsides along the northwest boundary of the project site.

Metavolcanic Rock

Metavolcanic bedrock on the project site consists of amphibolite-facies tuff, tuffbreccia and volcanic flow rock of andesitic, dacitic, and basaltic composition of early Cretaceous age. These rocks form a more subdued topography along the southern boundary of the project site, are exposed in rock cuts along El Monte Road, and stand at very steep to vertical angles where cut.

Chiquito Peak Monzogranite

Chiquito Peak Monzogranite consists of hornblende-biotite monzogranite, granodiorite, and lesser tonalite of early Cretaceous age. These rocks are exposed in road cuts along El Monte Road at the southeastern portion of the project site.

Consolidated Sediment

As encountered in geotechnical explorations, cemented sediments occur within the alluvial column at elevations below approximately 360 feet amsl. These materials are gray to dark gray, coarse-grained sand, and silty sand with clay and gravel. The density and clay content in this material suggest possible weathered bedrock.

3.2.1.2 Geologic Hazards

Fault Rupture

During earthquakes the ground can rupture, either at or below the surface. Earthquakes can cause large vertical and/or horizontal displacement of the ground along the fault, and any structures built across or in proximity to a fault may experience considerable damage or be completely destroyed in the event of surface fault rupture. Fault rupture is generally experienced along active faults.

The State of California has identified faults that represent a hazard of surface rupture as Alquist-Priolo Earthquake Fault Zones (AP Zones). Two main AP Zones extending from northwest to southeast are located across the northeast half of the County, the Elsinore and San Jacinto fault zones, and present the highest threat of fault-rupture in the unincorporated portion of the County. The project site is not located within or immediately adjacent to either of these AP Zones or to any Special Study Zones identified by the County, as shown on Figure 3.2-1.

Ground Shaking

Ground shaking is the earthquake effect that results in the vast majority of damage. Several factors control how ground motion interacts with structures, making the hazard of ground shaking difficult to predict. Seismic waves propagating through the earth's crust are responsible for the ground vibrations normally felt during an earthquake.

Seismic waves can vibrate in any direction and at different frequencies, depending on the frequency content of the earthquake, its rupture mechanism, the distance from the earthquake source, or epicenter, to an affected site, and the path and material through which the waves are moving. All of San Diego County is located within Seismic Zone 4 [Section 1629.4.1 of the California Building Code (CBC)], which is the highest seismic zone, and like most of Southern California, is subject to ground shaking.

In 1997, the Uniform Building Code (UBC) incorporated Near-Source Zones for calculating base shear, which accounts for high ground motion and damage that have been observed within a few kilometers of historic earthquake ruptures. These Near-Source Zones were developed by the Strong Ground Motion Ad-Hoc Subcommittee of the Seismology Committee of the Structural Engineers Association of California (SEAOC), and several of these zones occur in the County. According to these maps, however, the project site is not located in a Near-Source Zone.

Moderate seismic shaking could occur onsite due to the proposed project's distance to regional faults, as summarized below in Table 2.5-1 (CHJ 2018).

Liquefaction

Liquefaction occurs primarily in saturated, loose, fine to medium-grained soils in areas where the groundwater table is generally 50 feet or less below the surface. When these sediments are shaken during an earthquake, a sudden increase in pore water pressure causes the soils to lose strength and behave as a liquid. Historically, seismic shaking levels within the County have not been sufficient to trigger liquefaction. Within the County, there may be a potential for liquefaction in areas with loose sandy soils combined with a shallow groundwater table, which typically are located in an alluvial river valley/basins and floodplains.

The project site lies within a potential liquefaction area. Due to the loose, granular soils of the alluvium and the presence of relatively shallow groundwater at the project site, there is a potential for liquefaction to occur onsite during or after earthquake shaking (CHJ 2018). Liquefaction could occur in layers at depths ranging from approximately 40 to 75 feet below ground surface (bgs). However, the Iwasaki Liquefaction Potential Index (LPI) and the Tonlin and Taylor Liquefaction Severity Number (LSN) Index indicates that the project site would exhibit little to minor expression of liquefaction (CHJ 2018).

Landslides and Rockfalls

Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activities such as grading and other construction activities, irrigation of slopes, mining activity, and by natural factors such as precipitation, geology/soil types, surface/subsurface flow of water, and topography. Frequently, they may be triggered by other hazards such as floods and earthquakes. Evidence of landslides was not observed in the aerial imagery examined (CHJ 2018). In addition, based on the site reconnaissance, review of published geologic literature, and subsurface evaluation, no landslides or related features underlie or are adjacent to the project site (CHJ 2018).

Rockfalls are usually sudden and occur on steep slopes. In a rock fall, rocks may fall, bounce, or roll down the slope. Granitic regions with steep slopes greater than 25 percent in grade and rock outcrops are particularly susceptible to rockfall hazards. The project site is located in the valley bottom along the San Diego River channel that is characterized by relatively gentle topography; therefore, it is not located in an area that is susceptible to rockfall.

Expansive Soils

Certain types of clay soils expand when they are saturated and shrink when dried. These expansive soils can pose a threat to the integrity of improvements that are built on them without proper engineering. These soils are derived primarily from weathering of feldspar minerals and volcanic ash. Figure 3.1-1 shows the soil types located on the project site. As categorized by the County (San Diego County 2007), no expansive soils are located within the project site.

3.2.1.3 Regulatory Framework

Federal

There are no federal regulations applicable to the proposed project.

State

California Building Code

The CBC has been codified in the CCR as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety, and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures within its jurisdiction. The CBC is based on the International Building Code. In addition, the CBC contains necessary California amendments which are based on reference standards obtained from various technical committees and organizations such as the American Society of Civil Engineers (ASCE), the

American Institute of Steel Construction (AISC), and the American Concrete Institute (ACI).

The currently effective CBC was published in 2010. The 2013 California Building Standards Code was officially published in July of 2013 and went into effect on January 1, 2014. Jurisdictions statewide are currently being prompted to adopt the new code and complete local amendments as necessary. With some minor amendments, the CBC has been adopted by the County.

Local

San Diego County General Plan, Safety Element

The County General Plan Safety Element is intended to identify and evaluate seismic hazards in the County and to provide policies to reduce the loss of life and property damage related to seismic hazards. Related seismic hazard policies are summarized below.

Goal S-8: Reduced Landslide, Mudslide, and Rock Fall Hazards. Minimize personal injury and property damage caused by mudslides, landslides, or rock falls.

Policies

S-8.2: Risk of Slope Instability. Prohibit development from causing or contributing to slope instability.

San Diego County Grading Ordinance, Chapter 4 – Design Standards and Performance Requirements

Section 87.703 of the Grading Ordinance pertains to surface mining and reclamation and states that no person shall conduct surface mining unless a MUP is obtained, a Reclamation Plan is approved according to the Zoning Ordinance and SMARA, and financial assurances for reclamation has been approved by the County. Grading performed pursuant to such MUP or Reclamation Plan shall be in accordance with a plot plan and conditions approved therewith. Where surface mining has been conducted in violation of this or other ordinances, a Reclamation Plan shall be obtained for the restoration of the site.

3.2.2 Analysis of Project Effects and Determination as to Significance

For the purpose of this EIR, the identified significance thresholds are based on criteria provided in the County Guidelines for Determining Significance for Geologic Hazards (County Guidelines for Geologic Hazards), approved July 30, 2007.

3.2.2.1 Issue 1: Fault Rupture

<u>Guidelines for the Determination of Significance</u>

Based on the County Guidelines for Geologic Hazards, a significant impact would occur if the project:

- Proposes any building or structure to be used for human occupancy over or within 50 feet of the trace of an Alquist-Priolo fault or County Special Study Zone fault;

or if the project proposes the following uses within a Alquist-Priolo Zone which are prohibited by the County:

- Uses containing structures with a capacity of 300 people or more. Any use having the capacity to serve, house, entertain, or otherwise accommodate 300 or more persons at any one time.

- Uses with the potential to severely damage the environment or cause major loss of life. Any use having the potential to severely damage the environment or cause major loss of life if destroyed, such as dams, reservoirs, petroleum storage facilities, and electrical power plants powered by nuclear reactors.

- Specific civic uses, such as police and fire stations, schools, hospitals, rest homes, nursing homes, and emergency communication facilities.

<u>Analysis</u>

The faults most susceptible to earthquake rupture are active faults, which are faults that have experienced surface displacement within the last 11,000 years. There are no active faults that cross the project site, and the closest Alquist Priolo fault zone to the project site is the Rose Canyon Fault Zone, located approximately 19 miles to the southwest, as shown on Figure 3.2-1. While fault rupture is not necessarily restricted to the mapped boundaries of the Alquist Priolo fault zones, the likelihood of rupture outside of these zones is considered low. In addition, the proposed project does not include the construction of any permanent structures for human occupancy, or any uses that are prohibited in an Alquist-Priolo Zone by the County. Therefore, the potential impact for a fault rupture hazard would be **less than significant**.

3.2.2.2 Issue 2: Ground Shaking

Guidelines for the Determination of Significance

Based on the County Guidelines for Geologic Hazards, a significant impact would occur if the project site is located within a County Near-Source Shaking Zone or within Seismic Zone 4 and the project does not conform to the UBC.

Analysis

Similar to all of Southern California, the proposed project is located in a seismically active region. The entire County is located within Seismic Zone 4. However, the proposed project is not located within one of the near-source shaking zones as indicated in the County Guidelines for Geologic Hazards. In addition, the proposed project would not construct any permanent structures that would be used for human occupation. The proposed project would include cut slopes excavated and re-contoured at 3H:1V slopes or less steep. The ground surface is sufficient to accommodate the proposed slope angles under static and seismic conditions (CHJ 2018). The proposed reclamation slope configuration is suitably stable against failure, including the effects of seismic shaking. Therefore, the potential impact from ground shaking would be **less than significant.**

3.2.2.3 Issue 3: Liquefaction

Guidelines for the Determination of Significance

Based on the County Guidelines for Geologic Hazards, a significant impact would occur if the project site has the potential to expose people or structures to substantial adverse effects because:

- The project site has potentially liquefiable soils;
- the potentially liquefiable soils are saturated or have the potential to become saturated; and,
- In-situ soil densities are not sufficiently high to preclude liquefaction.

Analysis

According to the physical characteristics of the underlying materials at the project site and the relatively shallow groundwater, the potential for liquefaction is present. Liquefaction could occur in layers at depths ranging from approximately 40 to 75 feet bgs (CHJ 2018). However, the Iwasaki LPI and the Tonlin and Taylor LSN Index indicate that the project site would exhibit little to minor expression of liquefaction (CHJ 2018). According to the Slope Stability Investigation, the results of the liquefaction analysis indicate that the risk of liquefaction effects to the project site is low. As a result, the potential impact from liquefaction would be **less than significant.**

3.2.2.4 Issue 4: Landslides and Soil Stability

Guidelines for the Determination of Significance

Based on the County Guidelines for Geologic Hazards, a significant impact would occur if the project would:

- Expose people or structures to substantial adverse effects, including the risk of loss, injury, or death involving landslides;
- Is located on a geologic unit or soil that is unstable, or would become unstable as a result of the proposed project, potentially resulting in an onsite or offsite landslide; or,
- Lies directly below or on a known area subject to rockfall, which could result in collapse of structures.

Analysis

No landslides or related features underlie or are adjacent to the project site, and it is not located within an area identified as having landslide potential. However, operation of the proposed project would involve mining activities that would create cut slopes excavated and re-contoured at 3H:1V slope, with 20-foot-wide benches. The maximum excavation depth would be approximately 36 to 41 feet below existing ground surface, and the project is proposed to have a minimum setback of 75 feet from the project site boundary. Failure of or damage to the temporary or finished slopes could, at a minimum, cause a disruption in mining operations due to the collapse or blockage of an access road and/or the down-slope loss of aggregate material. The down-slope displacement of alluvial materials could also cause injury to workers or cause equipment to become unstable. Concern would also be raised if failure of mining slopes adversely affected the structural integrity of the channel banks along the San Diego River.

The Slope Stability Investigation concludes that the strength of the alluvial soil is sufficient to accommodate the proposed slope angles under static and seismic conditions. In addition, transient flooding of the excavation pit would not destabilize the slopes cut to 3H:1V or less steep. Additionally, with the implementation of design consideration **DC-GE-1**, listed below, the proposed project would include all of the recommendations within the Slope Stability Investigation (CHJ 2018). Therefore, the proposed project would result in **less than significant impacts** related to landslides and slope stability.

DC-GE-1: The following recommendations listed below are incorporated into the final Reclamation Plan documents. These recommendations address issues including, but not limited to, compacted fills, fill slope construction, periodic observation of mine benches above working areas, and slope protection.

- Overall final cut slopes in soil/alluvial materials should be no steeper than 3h:1v up to the maximum proposed height (approx. 30 feet).
- Periodic observations of mine benches above working areas for indications of potential instability during mine operations.
- If engineered fills are needed, the on-site soils and production by products should provide adequate quality fill material provided they are free from organic matter and other deleterious materials.
- Fills should be spread in near-horizontal layers, approximately 8 in. thick. Thicker lifts may be approved by the geotechnical engineer if testing indicates that the grading procedures are adequate to achieve the required compaction. Each lift should be spread evenly, thoroughly mixed during spreading to attain uniformity of the material and moisture in each layer, brought to near optimum moisture content and compacted to a minimum relative compaction of 90 percent in accordance with ASTM D1557.
- Project slopes should be protected from erosion by establishment of vegetation as soon as possible. Also, slopes should be protected with drainage improvements such as berms and/or levees as necessary to prevent slope erosion.

3.2.2.5 Issue 5: Expansive Soils

Guidelines for the Determination of Significance

Based on the County Guidelines for Geologic Hazards, a significant impact would occur if the project site is located on expansive soil, as defined in Table 18-1-B of the UBC, and does not conform with the UBC.

Analysis

Figure 3.1-1 shows the soil types located on the project site. No expansive soils are located within the project site as categorized by the County (San Diego County 2007). Therefore, impacts associated with expansive soils would be **less than significant**.

3.2.3 Cumulative Impact Analysis

Issue 1: Fault Rupture

Fault rupture is generally site specific and not cumulative in nature. There are no active faults that cross the project site and the closest Alquist Priolo fault zone is approximately 19 miles to the southwest. Cumulative projects, as presented in Table 1-11 in Chapter 1, Project Description, may propose habitable buildings or structures near the project area; however, similar to the proposed project, these structures would not be located within an Alquist Priolo fault zone. Thus, in conjunction with the proposed project, impacts associated with fault rupture hazards **are not considered cumulatively considerable**.

Issue 2: Ground Shaking

The geographic context for the analysis of cumulative impacts in regards to ground shaking is San Diego County. Cumulative projects, as well as the proposed project, are located within a seismically active region. However, similar to the proposed project, cumulative projects are not located within a near-source shaking zone. Furthermore, all cumulative projects would be constructed in accordance with applicable CBC standards which would minimize the potential for seismic related hazards to effect structures. Thus, impacts associated with ground shaking are **not considered cumulatively considerable**.

Issue 3: Liquefaction

Geologic hazards are generally site specific and not cumulative in nature. Liquefaction risk at one site would not be additive with other projects. Nevertheless, similar to the proposed project, all cumulative projects would be required to conform to industry standards and applicable CBC requirements. Based on the Iwasaki LPI and the Tonlin and Taylor LSN Index, it is unlikely that the proposed project would be adversely affected by liquefiable soils. Thus, impacts associated with liquefaction are **not considered cumulatively considerable**.

Issue 4: Landslides and Soil Stability

Geologic hazards are generally site specific and not cumulative in nature. The proposed project would involve mining activities that could create potential for slope instability during mining operations. While the proposed project could result in significant impacts related to landslides and slope instability, the risks are localized and would not affect the immediate area surrounding the project site. Cumulative projects would be constructed in accordance with the CBC seismic safety requirements and recommendations contained in their project specific geotechnical reports. Therefore, impacts associated with landslides and soil stability are **not considered cumulatively considerable**.

Issue 5: Expansive Soils

Geologic hazards are generally site specific and not cumulative in nature. Potential impacts related to expansive soil at one site would not necessarily occur at another. No expansive soils are located within the project site. Similar to the proposed project, cumulative projects would be constructed in accordance with CBC requirements. Thus, impacts associated with expansive soils are **not considered cumulatively considerable**.

3.2.4 Significance of Impacts Prior to Mitigation

As discussed above, no significant impacts related to geology and soil hazards would result from the proposed project. Thus, no mitigation is required.

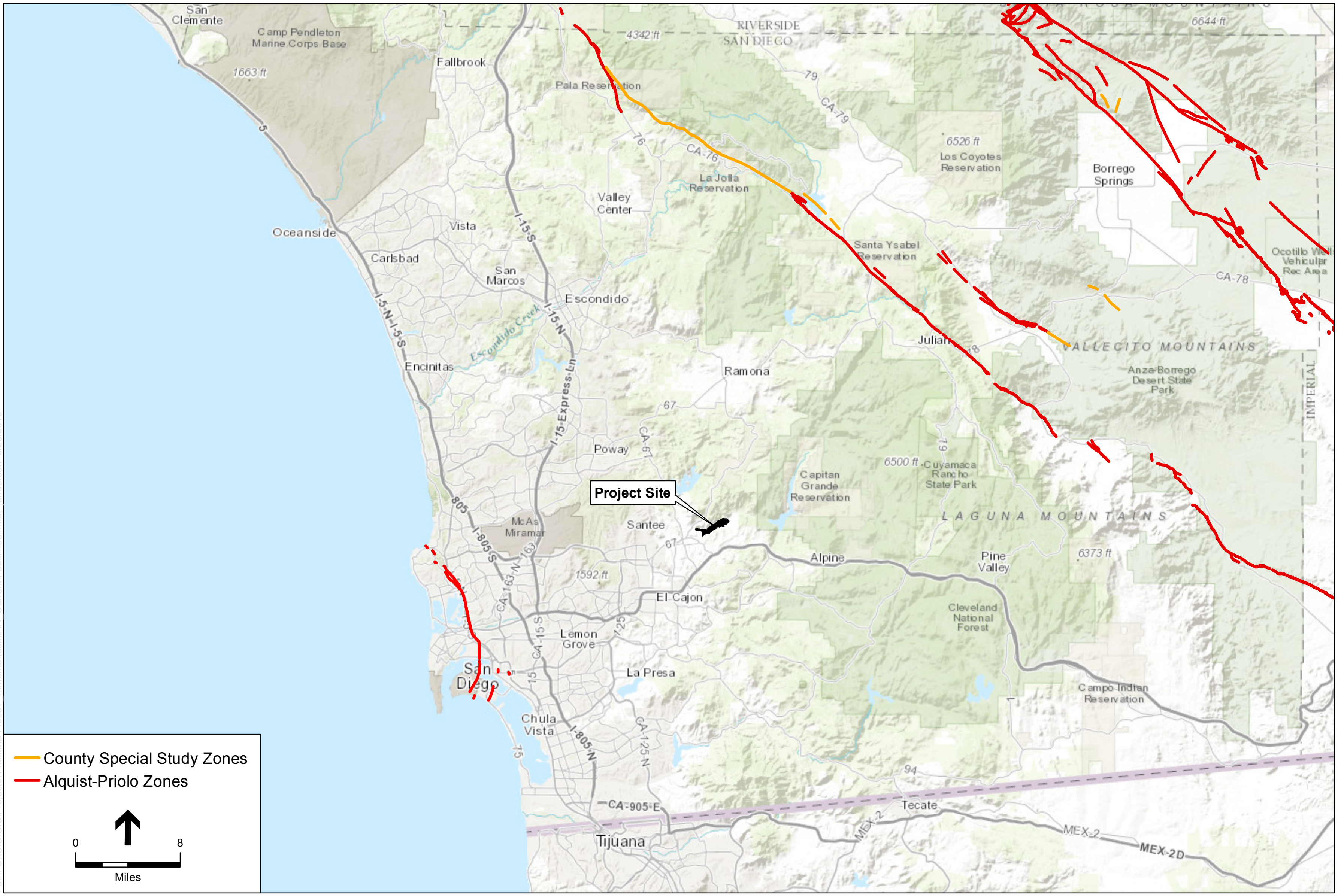
3.2.5 Conclusion

The proposed project is less susceptible to impacts from seismic hazards than typical development projects that are intended for human occupancy. While some damage may be unavoidable in the event of a significant or catastrophic earthquake, the proposed project would not construct any permanent structures that would be used for human occupation. With the implementation of **DC-GE-1**, the proposed project would include all of the recommendations described above, which would minimize any potential impacts associated with slope stability. Therefore, project and cumulative impacts with respect to geology and soils would be **less than significant**.

Table 3.2-1: Regional Fault Summary

Fault Name	Distance (miles)	Direction	Magnitude	PGA (g)*
Rose Canyon	19	SW	6.9	0.14
Elsinore (Julian)	23	NE	7.6	0.16
Coronado Bank	33	SW	7.4	0.11
San Jacinto (Borrego)	48	NE	7.4	0.09

*NOTE: PGA values of 0.16-0.24 indicate moderate-strong shaking; PGA values of 0.09-0.15 indicate moderate-weak shaking (USGS, 2016).
SOURCE: CHJ, 2018.



SOURCE: ESRI; SanGIS

El Monte Sand Mining Project. 140957

Figure 3.2-1
Regional Fault Lines