4.5 GEOLOGY AND SOILS

This Subsection assesses the existing surface and subsurface geologic conditions and features of the Project site and determines the potential for impacts associated with these features. The analysis is based in part on information contained in the report titled "Report of Slope Stability Investigation, Proposed Nichols Mine Expansion, Lake Elsinore, California (Project No. 15082-8)" prepared by CHJ Consultants and dated April 15, 2015 (CHJ, 2015). The slope stability report is provided as *Technical Appendix F* to this EIR. Information used to support the analysis in this subsection also was obtained from the City of Lake Elsinore General Plan Update Final Recirculated Program Environmental Impact Report, Section 3.11, Geology and Soils (State Clearinghouse No. 2005121019), certified December 13, 2011.

4.5.1 SCOPE OF REVIEW

The Nichols Canyon Mine, as discussed in Section 2.0, Environmental Setting, is an existing, ongoing surface mining operation operating pursuant to vested mining rights and an approved reclamation plan (RP 2006-01A1), which was analyzed in a prior MND. Although the City has chosen to prepare an EIR for the Project here, the scope of review addresses those impacts resulting from the Project as described in Section 3.0, Project Description, and not impacts related to existing, approved operations, which form the environmental baseline, as discussed in Section 2.7, *Existing Physical Site Conditions.* Accordingly, this Subsection analyzes geology and soils impacts related to the Project specifically. This Subsection does not analyze geology and soils impacts related to existing, approved operations, except as part of the cumulative impacts analysis, where required

4.5.2 EXISTING CONDITIONS

D. Regional Geology

The City of Lake Elsinore is located in the northern part of the Peninsular Ranges geomorphic province and includes parts of two structural subdivisions of the province. The northern extent of the Peninsular Ranges province is the Santa Monica Mountains and the southern extent is the tip of Baja California. The Peninsular Ranges include plutonic and metamorphic crystalline rocks of Cretaceous and older age. The crystalline basement rocks are locally mantled by colluvial soils and older sediments. The Project site is situated in an uplifted and dissected bedrock terrain and geologic units include metasedimentary and metavolcanic rocks coeval with the plutonic rocks of the Peninsular Ranges batholith, intrusive granitics, and older alluvial fan sediments mantling uplifted flats. (CHJ, 2015, p. 5)

E. Site Topography

The Nichols Canyon Mine property consists of a surface mine and undisturbed vacant property. Under existing conditions, areas that were previously subject to mining on the Nichols North site contain stockpiles, dirt roadways, and processing equipment, while the upper elevations of the hillsides are undisturbed. The Nichols South site consists of a mostly disturbed site where overburden has been removed and much of the area is subject to regular disking as part of on-going fire abatement activities, with a drainage (Stovepipe Creek) traversing the southeastern portion of the Nichols South site. The Project's proposed 24-acre expanded disturbance area (EDA) is generally undeveloped hillside land formed in bedrock terrain that includes surface rock outcrops. The EDA is dissected by a southwest-trending ravine and smaller drainages to the southeast. The topography rises in elevation from southwest to northeast and is formed in a crystalline bedrock unit of the Perris

Structural Block. Natural slopes generally slope at angles less than 30 degrees; however, locally steeper slopes are present in drainages and within and near bedrock outcrops. (CHJ, 2015, p. 3)

F. *Geotechnical Conditions of the Project Site*

As discussed in EIR Subsection 2.5, *Aggregate Mining Context in the Temescal Valley Production Area*, the Nichols Canyon Mine extracts and exports material that is classified as Portland Cement Concrete (PCC) grade aggregate material. The geologic condition of the Project site supports use of the property as a surface mine. According to the California Department of Conservation, California Geologic Survey (CGS) report titled "Update of Mineral Land Classification for Portland Cement Concrete-Grade Aggregate in the Temescal Valley, dated 2014, from an aggregate materials supply and demand context, the Nichols Canyon Mine is located in the near center of the Temescal Valley Production Area, as shown previously on Figure 2-3, *General Location Map of the Temescal Valley Production Area*. (CGS, 2014) The Production Area supplies needed aggregate materials to a five-county region.

CHJ Consultants performed a field investigation, laboratory testing, and slope stability analysis of the Project site in March 2015. The geotechnical conditions at the time of subsurface exploration are described generally below and in more detail in *Technical Appendix F*. West-dipping joints of moderate continuity were observed by CHJ in the quarry and in native outcrop exposures. These features form daylighted faces in quarry cuts. The approximately 24-acre EDA in which expanded mining activities are proposed is generally undeveloped hillside land formed in bedrock terrain that includes surface outcrops. (Lake Elsinore, 2011a, p. 3) The EDA is underlain by crystalline bedrock units including metavolcanics/ metasedimentary and intrusive tonalite. The bedrock is mantled by a soil residuum derived from weathering and alteration of bedrock material on flats, accumulation of colluvium on slopes, and deposition of alluvium in drainages. The geologic units reported in *Technical Appendix F* as a result of CHJ's field investigation are described below. (CHJ, 2015, pp. 5-6)

- **Fill (f).** Fill associated with the mine stockpiles and dirt roads is derived from local materials including surface soil and bedrock. Fill materials are considered undocumented and unsuitable for support of permanent engineered improvements.

- **Young Alluvial Fan Deposits (Qyf).** Young alluvial fan deposits consisting of sand, silt and gravel, including small boulders and cobbles, are present across the flat area in the southern portion of the Project site.

- **Hypabyssal Tonalite (Kgh).** Massive tonalite and lesser granodiorite comprise the resource rock of the quarry and form the majority of outcrops within the Project site. Hand samples collected by CHJ revealed euhedral quartz and white feldspar crysts. Soils formed on the tonalite are reddish brown.

- **Intermixed Estelle Mountain Volcanics and Sedimentary Rocks (Ksv).** Intermixed volcanic and sedimentary rocks that include foliated and folded quartzite, schist, argillite, and shale with colors varying from brown to black crop out in the northwest portion of the quarry area. This area lies outside the proposed EDA.

- **Metasedimentary Rocks (Jbc)** These rocks form poorly exposed outcrops in the southeastern portion of the proposed EDA. They are typically brown to dark gray in color with some whitish zones, exhibit foliation (repetitive layering), and erode to form a dark brown residual soil that contains abundant angular rock chips. The contact with the granitic Kgh unit is poorly exposed with most areas suggesting Kgh-derived, rounded terrace deposits resting on Jbc. It appears that some granitic Kgh outcrops on the lower slopes are boulders that have rolled down onto the Jbc surface, giving the appearance of original location.

G. *Seismic Hazards - Faults*

According to Riverside County GIS, the Nichols Canyon Mine site is not mapped in an Alquist-Priolo Fault Zone and no known fault zones underlie the property. (RCIT, 2015) Therefore, there is no potential for the Mine site to be ruptured by a fault. The San Andreas Fault forms the boundary between the Pacific and the North American tectonic plates, which slide past each other. As a result, southern California, including areas near the Project site, contains numerous regional and local faults and experiences substantial ground movement during frequent seismic events. (Lake Elsinore, 2011b, p. 3.11-1) The Working Group on California Earthquake Probabilities tentatively assigned a 28 percent probability to a major earthquake occurring on the San Bernardino Mountains segment of the San Andreas Fault between 1994 and 2024. The San Andreas Fault zone is the major surface expression of the tectonic boundary and accommodates most transform slip between the Pacific and North American Plates. Some slip is accommodated by other northwest-trending strike-slip faults related to the San Andreas system, such as the San Jacinto and the Elsinore faults. (CHJ, 2015, p. 8) Each of the local fault zones and blind thrust faults are described briefly below.

- **Elsinore Fault Zone.** The Glen Ivy North segment of the Elsinore fault zone is the nearest major active fault to the Nichols Canyon Mine, located about 1.8 miles southwest. To the north, it splays into the Whittier and Chino faults. The Elsinore is primarily a strike-slip fault zone and most Elsinore fault traces are demonstrably active. The southern segment of the northwest-trending Chino-Central Avenue fault, a northern splay of the Elsinore fault zone, is approximately 22 miles northwest of the Project site. The west- to northwest-trending Whittier fault is approximately 23 miles northwest of the Project site. (CHJ, 2015, p. 9)

- **San Jacinto Fault Zone.** The San Jacinto fault zone is a system of northwest-trending, right-lateral, strike-slip faults. The San Jacinto Valley segment is approximately 18.5 miles northeast of the Nichols Canyon Mine. More large historic earthquakes have occurred on the San Jacinto fault than any other fault in Southern California. A portion of the San Jacinto fault may accommodate most of the slip between the Pacific and the North American Plates. Research suggests that this motion is transferred to the San Andreas Fault in the Cajon Pass region by "stepping over" to parallel fault strands that include the Glen Helen fault. (CHJ, 2015, p. 9)

- **San Andreas Fault Zone.** The San Andreas fault zone is located along the southwest margin of the San Bernardino Mountains, approximately 30 miles north-northeast of the Nichols Canyon Mine. The mountain front in the San Bernardino area approximately marks the active trace of the San Andreas Fault. (CHJ, 2015, p. 10)

- **Blind Thrust Faults.** A blind thrust earthquake occurs along a thrust fault that does not show signs on the Earth's surface. Such faults, being invisible at the surface, are not mapped by standard surface geological mapping, and are typically inferred to be present based on other evidence. The San Joaquin Hills Thrust fault is an inferred blind thrust beneath the San Joaquin Hills in coastal Orange County. The vertical surface projection of this thrust is approximately 26 miles west-southwest of the Project site. The Puente Hills Blind-Thrust is a system of buried thrust fault ramps that extend from beneath Los Angeles to the Puente Hills of eastern Los Angeles County and Orange County. Fault segments of this thrust are the Los Angeles, Santa Fe Springs, and Coyote Hills. (CHJ, 2015, p. 10)

H. Seismic Hazards – Ground Shaking

From a ground shaking standpoint, a seismic event on the Elsinore fault zone, located about 1.8 miles to the southwest of the Nichols Canyon Mine, would produce the most substantial effects to the Mine site. (CHJ, 2015, p. 11) Hazards from ground shaking at the Mine site were evaluated by CHJ from a deterministic standpoint for use as a guide to formulate an appropriate seismic coefficient for analyzing slope stability. A summary of the deterministic evaluation of seismic hazard is provided in Table 4.5-1, *Summary of Regional Seismic Sources*.

Table 4.5-1 Summary of Regional Seismic Sources

Fault (Segments)	Magnitude	Distance (km)	Peak Ground Acceleration (g)
Elsinore	7.3	2.9	0.48
San Jacinto	7.4	30	0.16
San Andreas	7.6	48	0.12
San Joaquin Hills	7.1	42	0.11
Puente Hills	7.1	53	0.09

Km= kilometers, W=Whittier, GI=Glen Ivy, SBV=San Bernardino Valley, SJV=San Jacinto Valley, SM=South Mojave, NSB=North San Bernardino, SSB=South San Bernardino
(CHJ, 2015, Table 1)

I. Seismic Hazards – Liquefaction

Liquefaction is a phenomenon in which loose, saturated, relatively cohesion-less soil deposits lose shear strength during strong ground motions, which causes the soil to behave as a viscous liquid. Liquefaction is generally limited to the upper 50 feet of subsurface soils. Research and historical data indicate that loose granular soils of Holocene to late Pleistocene age below a near-surface groundwater table are most susceptible to liquefaction, while the stability of most clayey material is not adversely affected by vibratory motion (SCEC, 1999, pp. 5-6). Therefore, in order for the potential effects of liquefaction to be manifested at the ground surface, soils generally must be of Holocene to late Pleistocene age, granular, loose to medium dense, relatively saturated near the ground surface and subjected to a sufficient magnitude and duration of ground shaking.

A preliminary report of rock slope stability evaluation was conducted on the Nichols Canyon Mine Site by Hilltop Geotechnical (Hilltop) for Chandler Aggregates in March 2014. Hilltop reported finding no surface water, shallow groundwater, or water-bearing sediments. (CHJ, 2015, p. 4) Similarly, CHJ Consultants did not observe any surface water on the Mine site during their field work in 2015. CHJ reported that the EDA is underlain at shallow depth by crystalline bedrock that does not form a groundwater table. No seepage, springs, or other evidence for a groundwater table was observed within the quarry boundary during CJH's geologic mapping. (CHJ, 2015, pp. 12-13)

Based on the presence of non-liquefiable bedrock, the potential for liquefaction and other shallow groundwater-related hazards within the EDA is very low.

J. Slope Stability

For the purposes of analysis of slope stability, the term "landslide" refers to deep-seated slope failures that involve mine pitscale features that have the potential to reduce the long-term stability of finished quarry reclamation slopes. Landslides in rock are typically related to structure in the parent material. No evidence for existing deep-seated landslides with the potential to affect the mine slopes was observed by CHJ during their field work or from their examination of aerial photographs. CHJ reported that although the Mine's quarry bottom may be exposed to periodic ponding of surface water after locally heavy precipitation, such ponding would be shallow and short-lived—lasting only as long as evaporation/infiltration occurs; therefore, this transient water is inconsequential to slope stability calculations. Because groundwater is not present at the Mine site, there is no potential for groundwater to affect slope stability. (CHJ, 2015, p. 13) (CHJ, 2015, p. 13)

K. Applicable Regulatory Requirements

1. Alquist-Priolo Earthquake Fault Zoning Act (CA Pub. Res. Code § 2621 et Seq.)

The Alquist-Priolo Special Studies Zone Act was signed into law in 1972 and renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994. The primary purpose of the Alquist-Priolo Act is to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault. The Nichols Canyon Mine Site is not located in a designated Alquist-Priolo Earthquake Fault Zone. (RCIT, 2015)

2. Seismic Hazards Mapping Act (CA Pub. Res. Code § 2690 et Seq.)

The Seismic Hazards Mapping Act of 1990 is a statewide seismic hazard mapping and technical advisory program in California to assist cities and counties in fulfilling their responsibilities for protecting the public health and safety from the effects of strong ground shaking, liquefaction, landslides, other ground failure, and other seismic hazards caused by earthquakes. The California Geologic Survey (CGS) is the principal State implementing agency which has mapped out seismic zones requiring the completion of site-specific geotechnical investigations prior to construction of a project.

3. California Building Standards Code, Title 24

The California Building Standards Code (CBSC) (California Code of Regulations, Title 24) is the standard from which California buildings derive appropriate building design standards related to building foundation support, protection from seismic ground motion, and soil and slope instability. The International Building Code (IBC) used by the International Code Council establishes design and construction standards for buildings and facilities. The California Building Code (CBC), California Code of Regulations, Title 24, Part 2 component of the CBSC incorporates the IBC as well as other uniform codes into its code standards.

4. South Coast Air Quality Management District, Rule 403

The South Coast Air Quality Management District (SCAQMD) is responsible for enforcing air pollution control measures in the South Coast Air Basin (SCAB), within which the Project site is located. Rule 403 addresses blowing dust and is applicable to the Project due to its potential to result in wind erosion during grading and/or mining activities.

5. Federal Water Pollution Control Act (Clean Water Act)

The Federal Water Pollution Control Act (also known as the Clean Water Act [CWA]) is the principal federal statute that addresses water resources. The provision of the CWA applicable to geology and soils is CWA Section 402, which applies to all construction sites of over one acre in size and, in part, serves to control the potential impacts of erosion. CWA Section 402 authorizes the National Pollutant Discharge Elimination System (NPDES) permit program that covers point sources of pollution discharging to a water body. The NPDES program requires operators of construction sites one acre or larger to prepare a Stormwater Pollution Prevention Plan (SWPPP) and obtain authorization to discharge stormwater under an NPDES construction stormwater permit. In addition, the NPDES program requires Municipal Separate Storm Sewer System (MS4) permits to regulate storm water discharges from municipal sewer systems.

6. California Surface Mining and Reclamation Act of 1975 (SMARA)

California's Surface Mining and Reclamation Act (SMARA) (Public Resources Code § 2710-2796) is a comprehensive surface mining and reclamation policy that regulates surface mining operations to ensure that adverse environmental impacts are minimized and that mined lands are reclaimed to a condition in which they can be re-used. In addition, SMARA encourages the production, conservation, and protection of the mineral resources in California. SMARA requires the State Mining and Geology Board to adopted State policy for the conservation of mineral resources and the reclamation of lands that have been mined (DOC, 2013)

7. State Mining and Geology Board Regulations for Surface Mining and Reclamation Practice

State Mining and Geology Board regulations for surface mining and reclamation practice are set forth in California Code of Regulations (CCR), Title 14, Division 2, Chapter 8, Subchapter 1, Section 3500 et seq. The purpose of regulating surface mining and reclamation practices is to establish state policy for the reclamation of mined lands and the conduct of surface mining operations in accord with the general provisions set forth in SMARA. (Westlaw, 2015)

8. Lake Elsinore Municipal Code § 14.04

Due to the nature of the proposed Project, Chapter 14.04, *Surface Mining and Reclamation*, of the City's Municipal Code would apply. The intent of this chapter is to ensure the continued availability of important mineral resources, while regulating surface mining operations as required by California's Surface Mining and Reclamation Act of 1975 and State Mining and Geology Board Regulations. This chapter of the City's Municipal Code is to ensure that: 1) adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition which is readily adaptable for alternative land uses; 2) the production and conservation of minerals are encouraged, while giving consideration to values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment; and 3) residual hazards to the public health and safety are eliminated. (Lake Elsinore, 2015)

4.5.3 BASIS FOR DETERMINING SIGNIFICANCE

The proposed Project would result in a significant impact to geology and soils if the Project or any Project-related component would:

a. *Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:*
   i. *Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42.*
   ii. *Strong seismic ground shaking.*
   iii. *Seismic-related ground failure, including liquefaction.*
   iv. *Landslides.*
b. *Result in substantial soil erosion or the loss of topsoil.*
c. *Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.*
d. *Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (since renamed as the California Building Code), creating substantial risks to life or property.*
e. *Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.*

The above-listed thresholds are derived directly from Section VI of Appendix G to the CEQA Guidelines and address typical adverse effects due to geologic conditions. (OPR, 2009).

[Note: Threshold d. is based on Appendix G of the CEQA Guidelines and references Table 18-1-B of the 1994 Uniform Building Code (UBC) which has been superseded by the current building code, the 2013 CBSC. The 2013 CBSC references ASTM D-4829, a standard procedure for testing and evaluating the expansion index (or expansion potential) of soils established by ASTM International, which was formerly known as the American Society for Testing and Materials (ASTM).]

4.5.4 IMPACT ANALYSIS

Threshold a:	***Would the Project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:*** ***i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?; Refer to Division of Mines and Geology Special Publication 42.*** ***ii. Strong seismic ground shaking?***

iii.	***Seismic-related ground failure, including liquefaction?***
iv.	***Landslides?***

1. Potential for Earthquake Fault Rupture

There are no known active or potentially active faults on the Mine site, as determined by CHJ Consultants' review of published and unpublished literature and maps, stereoscopic aerial photographs, and field mapping. Accordingly, there is no potential for ground fault rupture to occur on the Project site or as a result of the proposed Project. (CHJ, 2015, p. 11) No impact would occur and mitigation is not required.

2. Potential for Strong Seismic Ground Shaking

The Project site is located in a seismically active area of southern California and is expected to experience moderate to severe ground shaking during the lifetime of the Mine's operation and reclamation. This risk is not considered substantially different than the risk to other properties in the southern California area. Ground shaking potential was considered by CHJ in their analyses and evaluation of slope stability, and CHJ determined that ground shaking at the Mine site would not result in mine slope failure and would therefore not expose people or structures to adverse effects involving injury or death. (CHJ, 2015, p. 21) For additional information, refer to *Technical Appendix F*. A less than significant impact would occur and mitigation is not required.

3. Potential for Seismic-Related Ground Failure

As detailed in the *Technical Appendix F,* the potential for liquefaction and other shallow groundwater hazards within the Mine site is low; therefore, ground failure impacts would be less than significant (CHJ, 2015, p. 21)). Based on the field investigation and slope stability analyses conducted by CHJ Consultants, the proposed slope excavations and reclamation are feasible from geotechnical engineering and engineering geologic standpoints, provided the recommendations contained in the *Report of Slope Stability Investigation* are implemented during mining. (CHJ, 2015, p. 20) Thus, this EIR recommends mitigation to ensure that the Project would be implemented in accordance with the recommendations included in the Project's April 15, 2015 *Report of Slope Stability Investigation* (refer to Mitigation Measure MM 4.5-1 in Subsection 4.5.7, below) to further reduce the potential low risk of seismic-related ground failure.

4. Landslide Potential

The Project proposes the approval of a surface mining permit (SMP) No. 2015-01 and the second amendment to an existing approved Reclamation Plan (Reclamation Plan No. 2006-01A1 [RP 2006-01A1]) which would, among other items, allow mining activities to expand by approximately 24 acres (the EDA). The EDA is located east of the currently permitted mining area and would entail creation of new southwest-facing reclaimed slopes of up to approximately 440 feet high. Slope benching is proposed at 25-foot-wide with 25-foot-high inter-bench verticals (faces), resulting in an overall slope ratio of 1 horizontal to 1 vertical (45 degrees). Inclusion of service benches in the taller slopes would result in overall slope angles flatter than 45 degrees. (CHJ, 2015, p. 2)

During field investigations, CHJ noted surficial failures, typically involving the soil mantle, in steeper canyon slopes as soil/debris flows. CHJ considered these surficial failures to be a slope management/maintenance issue that would be relieved with the Mine's proposed grading and drainage improvements. (CHJ, 2015, p. 13) The *Report of Slope Stability Investigation* (EIR *Technical Appendix F*) recommends that slopes should be protected with berms or drainage improvements as necessary to prevent slope erosion in the areas where natural slopes drain onto the reclaimed slopes. (CHJ, 2015, p. 22) Mitigation is included to ensure that this recommendation from the report is followed. Mitigation Measure 4.5-1 in Subsection 4.5.7, below, would ensure that the recommendations from the Project's *Report of Slope Stability Investigation* (including grading and drainage improvements) are incorporated into grading plans for the Project. With implementation of this mitigation measure, potential impacts regarding seismically induced landslides would be less than significant.

Threshold b. Would the Project result in substantial soil erosion or the loss of topsoil?

Earth moving associated with mining activities would expose underlying soils, which could increase erosion susceptibility. However, mining activities under the proposed Project would include use of water, soil-binding chemicals, and alternative stabilization measures for dust control and aggregate processing (refer to EIR Figure 3-5). The expansion of the mining area would result in an expansion of existing dust control efforts, including the use of water for dust control measures. The proposed SMP 2015-01 requires that a portion of the Mine's dust control measures include water-reducing chemicals, such as $Soil_2O$®, which aids in dust control by saturating into the ground, keeping the ground moist. The Project also would pave potions of the vehicle routes to aid with dust suppression. With incorporation of dust control measures, which are a part of the proposed Project, a less-than-significant impact would occur regarding soil erosion. Furthermore, all soil erosion that would happens on-site during on-going mining would be detained within the on-site detention basin, thereby precluding sediments from impacting downstream water bodies.

Upon completion of mining activities and once the final grades pursuant to RP 2006-01A2 are achieved, runoff on the Nichols North site would be conveyed to a proposed sediment basin located in the southwestern portion of the Nichols North site, and eventually conveyed westerly beneath an existing culvert underneath I-15. Similarly, the Nichols South site also would achieve the final grades specified by RP 2006-01A2 upon completion of mining activities, and the majority of drainage from this portion of the site would be conveyed to a proposed sedimentation basin located in the northwestern portion of the Nichols South site and ultimately west beneath I-15. Runoff from the portions of the Nichols South and Nichols North sites that are not subject to mining activities would continue to be conveyed by Stove Pipe Creek, located in the southeast corner of the Nichols South site, and ultimately west beneath I-15. (J.E. B&A, 2015, Exhibit H) Thus, the Project is designed to handle sediments and would result in a less-than-significant impact regarding soil erosion or the loss of topsoil.

Following the completion of mining activities, the Project proposes to install a reclamation seed mix, which would aid in revegetation of the slopes on the mine. An erosion control grass mix would be utilized on the pads of both the Nichols North and Nichols South sites to ensure that revegetation of the site does not cause or contribute to increased erosion rates post-reclamation. Thus, implementation of the Project would result in less than significant impacts regarding long-term erosion and loss of topsoil.

Threshold c. Would the Project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

Based on slope stability analyses conducted by CHJ Consultants, the whole rock strength in the proposed slope areas of the Mine is sufficient to accommodate the proposed overall slope angles. Based on the analyses, the proposed overall approximate 45-degree mine and cut-slopes up to approximately 480 feet in height are suitably stable against gross failure for the long-term conditions, including the effects of seismic shaking. (CHJ, 2015, p. 20) Thus, the proposed Project would have a less-than-significant impact regarding landslides, subsidence, or collapse. As noted above under the discussion of Threshold a., the potential for liquefaction within the reclamation area is also low. (CHJ, 2015, p. 21)

A. Geologic Structure-Slope Stability Evaluation

Geologic mapping of the Project site by CHJ included measurement of the orientation of bedrock structures (discontinuities) in outcrop exposures. Based on these observations and the results of the CHJ investigation, deep-seated landsliding would not occur in the proposed Mine slopes. (CHJ, 2015, p. 14)

The kinematic (geometrically feasible failure modes) and global slope stability of the proposed slopes was evaluated for representative material types. Rock strength properties for global stability calculations were modeled using Hoek Brown criteria and the ultimate mining depths (highest slopes) in the mine. Inclusion of service benches on portions of the taller slopes (not included in the slope profiles analyzed) were determined by CHJ to produce flatter (and more stable) overall slope angles. (CHJ, 2015, p. 14)

B. Kinematic Analysis

Kinematic analysis involves the evaluation of geometrically feasible failure modes in bedrock based on the orientation of structural discontinuities including joints, faults, shear zones, bedding (i.e. the presence of layers), and foliation (repetitive layering in metamorphic rocks). (CHJ, 2015, p. 15)

Stereonet analysis for selected representative slope aspects was performed by CHJ utilizing the data compiled from examination of geologic structures within the site. Refer to *Technical Appendix F* for details on the stereonet analysis (CHJ, 2015, p. 15). The stereonet evaluation provides results as a percentage of points in a data set. In general, the percentage value relates to probability of a particular failure mode for planar or wedge sliding. Probabilities below 5 percent suggest low failure potential, 5 percent to 20 percent a low to moderate potential, and values above 20 percent a moderate or higher potential.

The results of the kinematic evaluation for the proposed southwest-facing slopes suggest a low to moderate potential for planar failure and moderate to high potential for wedge failures to form in the maximum 70-degree slope faces. Flatter slope angles are expected to exhibit similar or lesser potential for sliding. Observations of existing quarry faces by CHJ indicate that scaling of loose blocks during excavation provides a suitable mitigation of potential rock fall from planar or wedge structures. Inclusion of safety benches can also help to mitigate rock fall hazards. Scaling and inclusion of safety benches can effectively mitigate planar and wedge related rock fall in the final reclaimed slope face. (CHJ, 2015, p. 17) Although the Project is designed to ensure slope stability and would have a less-than-significant impact, Mitigation Measure 4.5-1 is recommended by this EIR to ensure that then design approaches for scaling and benched slope faces occur per the recommendations of the *Report of Slope Stability Investigation*.

Native outcrops occur on the Mine site under existing conditions and field observations suggest a high potential for topple failure of columnar blocks in the native outcrops. Native outcrops exhibit an abundance of southwest-leaning columns within the proposed EDA formed by a system of steep, northeast dipping joints cut by low-angle, west- and southwest-dipping, planar joints. In existing quarry exposures, topple potential is removed/mitigated by scaling of loose blocks during excavation. Scaling and inclusion of safety benches would effectively mitigate topple-related rock fall in the final reclaimed slope face, and the Project is designed to address this topple potential. Thus, impacts would be less than significant. (CHJ, 2015, p. 17) Nonetheless, Mitigation Measure 4.5-1 is included in this EIR to ensure that the recommendations made in the *Report of Slope Stability Investigation*, are implemented.

C. Global Stability Calculations

The global stability of Mine slopes, as depicted on the proposed Revised Reclamation Plan (RP 2006-01A2), was analyzed by CHJ using Spencer's method under both static and seismic conditions for rotational and composite failure surfaces using the SLIDE computer program, version 6.032. (CHJ, 2015, p. 17) Representative cross sections of the proposed rock slopes derived from proposed RP 2006-01A2 were modeled by CHJ as follows:

- 480-foot-high 1:1 cut slope in Kgh (Section A)
- 110-foot-high 1:1 cut slope in Jbc/Kgh (Section B)

Groundwater was not considered in the stability evaluation due to the lack of seepage or groundwater in the generally arid site environment. (CHJ, 2015, p. 18) The results of the global slope stability analyses are summarized in Table 4.5-2, *Summary of Slope Stability Results*. Details of stability calculations including material type boundaries, strength parameters utilized, and the minimum factor of safety and critical slip surface are included in *Technical Appendix F*.

Table 4.5-2 Summary of Slope Stability Results

Cross Section	Slope Configuration	Static F.S.	Seismic F.S. (Kh=0.20)
Section A	480-foot high 1:1 cut	2.51	1.86
Section B	110-foot high 1:1 cut	1.63	1.25

Note: F.S. = factors of safety
(CHJ, 2015, Table 4)

As indicated in the table above, sufficient static factors of safety (f.s.) in excess of 1.5 and seismic f.s. in excess of 1.1 were indicated for the modeled proposed rock slope configurations and satisfy Office of Mine Reclamation (OMR) criteria and slope construction standards for building code compliant developments. The global rock slope configurations appear suitably stable for excavation/reclamation of the proposed slopes according to regulatory and building code requirements. (CHJ, 2015, p. 20) Therefore, stability impacts would be less than significant.

Threshold d.	***Would the Project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (since renamed as the California Building Code), creating substantial risks to life or property?***

Note: Appendix G of the California Environmental Quality Act (CEQA) Guidelines references Table 18-1-B of the 1994 Uniform Building Code (UBC). This Table no longer exists. The adopted 2001 California Building Code included a "Classification of Expansive Soil" that correlated an expansion index with the potential for soil expansion. The subsequent updates to the California Building Code (2007 and 2010), contained information on expansive soils, but no longer included a reference to Table 18-1-B. The Building Code currently in effect, the 2013 CBC, references ASTM D-4829, a standard procedure for testing and evaluating the expansion index (or expansion potential) of soils established by ASTM International, which was formerly known as the American Society for Testing and Materials (ASTM).

Due to the nature of the proposed activity on site (a surface mine), a less-than-significant impact associated with expansive soil would occur because soils would be removed during mining activities. Any future use of the Project site for other land uses would require environmental review and a separate analysis regarding potential impacts from expansive soils. Thus, the Project would have a less than significant impact in this regard.

Threshold e.	***Would the Project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?***

The Project does not propose the use of septic tanks or alternative waste water disposal systems. The Project would utilize portable toilets, as is the case with the existing mining operation. Accordingly, no impact associated with septic tanks or alternative waste water systems would occur and mitigation is not required.

4.5.5 CUMULATIVE IMPACT ANALYSIS

As noted in the foregoing analysis of the Project's direct impacts, all potential Project-specific impacts related to geology and soils would be below the thresholds of significance identified in Subsection 4.5.3 through conformance with the recommendations contained within the Project's *Report of Slope Stability Investigation*, dated April 15, 2015 by CHJ Consultants (*Technical Appendix F*).

With exception of erosion hazards, potential geologic and soils effects are inherently restricted to the areas proposed for mining and would not contribute to cumulative impacts associated with other existing, planned, or proposed development. That is, issues including fault rupture, seismic ground shaking, liquefaction, landslides, and expansive soils would involve effects to (and not from) the proposed mining activities, and are specific to on-site conditions. Accordingly, addressing these potential hazards for the proposed mining on the Project site have no relationship to, or impact on, off-site areas. Due to the site-specific nature of these potential hazards and the measures to address them, there would be no connection to similar potential issues or cumulative effects to or from other properties.

As discussed under Threshold b., during both mining and after mining has completed, measures are incorporated into the Project's design (such as soil stabilization and detaining all water on-site during mining activities, and revegetation of the site and retaining the detention basin after mining) to ensure that substantial erosion hazards do not occur. Development projects within the cumulative study area would be required to comply with regulatory requirements, such as the need to obtain a National Pollutant Discharge Elimination System (NPDES) permit and mandatory compliance with Storm Water Pollution Prevention Plans (SWPPPs) and Water Quality Management Plans (WQMPs). All projects involving earth movement in the cumulative study area also would be required to comply with SCAQMD Rule 403 and grading requirements of the local governing body, which would preclude wind-related erosion hazards during construction. Development projects within the cumulative study area also would be required to comply with other applicable codes and regulations. Therefore, because the Project would result in less than significant erosion impacts, and because development projects within the cumulative study area would be subject to mandatory regulatory requirements to control erosion hazards during construction and long-term operation, cumulative impacts associated with wind and water erosion hazards would be less than significant and the Project's contribution would be less than cumulatively considerable.

4.5.6 SIGNIFICANCE OF IMPACTS BEFORE MITIGATION

Threshold a: Less-than-Significant Impact. The Project would not expose people or structures to substantial adverse seismic risks. No active faults are located on the Mine site so there is no potential for fault surface rupture. As with all properties in southern California, the Project site is subject to seismic ground shaking associated with earthquakes. With implementation of the recommendations contained in the Project's *Report of Slope Stability Investigation*, potential seismically induced hazard impacts would be reduced to less than significant levels.

Threshold b: Less-than-Significant Impact. The Project would have a less-than-significant impact regarding soil erosion and the loss of topsoil. Dust control is proposed during mining, the site would be revegetated as mining activities conclude, and a sedimentation basin is proposed as part of the Mine's revised reclamation plan.

Threshold c: Less-than-Significant Impact. The potential for the Project to cause rock falls and soil instability during mining activities would be reduced to less-than-significant levels with design approaches for scaling and benched slope faces per the recommendations of the Project's *Report of Slope Stability Investigation*.

Threshold d: Less-than-Significant Impact. Soils would be removed during mining activities, and no structures are proposed as part of the Project that would require structural stabilization by soil material. Thus, a less than significant soil stability impact would occur.

Threshold e: No Impact. The Project would not install septic tanks or alternative wastewater disposal systems. Accordingly, no impact would occur associated with soil compatibility for wastewater disposal systems.

4.5.7 MITIGATION

Although potential impacts associated with slope stability and topple-related rock fall during mining operations would be less than significant with the required implementation of the recommendations contained in the Project's *Report of Slope Stability Investigation* (EIR *Technical Appendix F*), the following measures are included to ensure that the recommendations are implemented.

MM 4.5-1 Prior to mining activities in the +/- 24-acre EDA, the Director of the City of Lake Elsinore Engineering Division (or his/her designee) shall verify that all of the recommendations given in the Project's April 15, 2015 "*Report of Slope Stability Investigation Proposed Nichols Mine Expansion, Lake Elsinore, California*" (Job No. 15082-8) by CHJ Consultants are incorporated into the mining specifications for SMP 2015-01 and Reclamation Plan No. 2006-01A2, including but not limited to the recommendation to have periodic observation of mine benches for indications of potential instability above working areas during mine operations.

4.5.8 SIGNIFICANCE OF IMPACTS AFTER MITIGATION

<u>Thresholds a and c: Less-than-Significant Impact</u>. Although potential impacts associated with slope stability and topple-related rock fall during mining operations would be less than significant with the required implementation of the recommendations contained in the Project's *Report of Slope Stability Investigation* (EIR *Technical Appendix F*), Mitigation Measure MM 4.5-1 would ensure that the Project would be implemented in accordance with the recommendations included in the report. Impacts would remain less than significant.