

3.8 GEOLOGY AND SOILS

3.8.1 INTRODUCTION

This discussion provides an evaluation of K Line Northern Extension (KNE) as it relates to geology, soils, seismicity, and mineral resources. It includes descriptions of the federal, state, and local regulatory setting, existing conditions, and the impacts from construction and operation of the proposed alignments and stations, the design option, and the maintenance and storage facility (MSF), as well as mitigation measures where applicable. For more detailed information, refer to the KNE Geology and Soils Technical Report (Appendix 3.8-A).

3.8.2 REGULATORY FRAMEWORK

3.8.2.1 FEDERAL

3.8.2.2 STATE

The following state laws and regulations are relevant to construction and operation of the project:

- Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code [PRC] 2621 et seq.)
- Seismic Hazards Mapping Act of 1990 (PRC Chapter 7.8, Section 2690-2699.6)
- California Building Code (California Code of Regulations [CCR] Title 24)
- National Pollutant Discharge Elimination System (NPDES)¹
- Surface Mining and Reclamation Act of 1975 (PRC 2710 et seq.)²
- California Division of Occupational Safety and Health Administration (Cal/OSHA) Regulations (CCR, Title 8)

3.8.2.3 REGIONAL

No regional regulations are applicable to the project regarding geology, soils, seismicity, and mineral resources.

3.8.2.4 LOCAL

All Metro rail projects must be designed in accordance with the most recent Metro Rail Design Criteria (MRDC). MRDC Section 5 applies to geotechnical and seismic design (Metro 2017).

¹ Administered by the California State Water Resources Control Board

² The Surface Mining and Reclamation Act requires mineral deposits to be mapped and classified in Mineral Resource Zones (MRZ) as follows: (1) MRZ-1: areas where available data indicate that there is little or no likelihood for the presence of significant mineral deposits; (2) MRZ-2: areas where significant mineral deposits are present based on the available data or there is high likelihood that such mineral deposits are present; (3) MRZ-3: areas containing mineral deposits the significance of which cannot be determined from available data; and (4) MRZ-4: areas of no known mineral occurrences, where available data does not exclude the presence or absence of significant mineral resources.

The City of Los Angeles and City of West Hollywood have codes, ordinances, and general plans that regulate permitting, design, construction, and operational activities as they pertain to seismic and soil conditions, as well as drilling and other activities related to oil and gas wells. These policies generally pertain to public health and safety, the preservation of buildings and other structures, and to the protection of valuable resources.

3.8.3 METHODOLOGY

3.8.3.1 CEQA METHODOLOGY

The purpose of this analysis is to evaluate the project against California Environmental Quality Act (CEQA) thresholds of significance as the basis for determining the level of impacts related to geology, soils, seismicity, and mineral resources.

3.8.3.2 SIGNIFICANCE THRESHOLDS

In accordance with Appendix G of the 2022 CEQA Guidelines, the project would have a significant impact related to geology, soils, seismicity, and mineral resources if it would:³

- **Impact GEO-1:** Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - ▶ 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)
 - ▶ Strong seismic ground shaking
 - ▶ Seismic-related ground failure, including liquefaction
 - ▶ Landslides
- **Impact GEO-2:** Result in substantial soil erosion or the loss of topsoil.
- **Impact GEO-3:** 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.⁴

³ In addition to the geology and seismicity thresholds identified in this section of the Draft EIR, Appendix G of the State CEQA Guidelines includes a significance threshold for impacts relating to the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater. However, this threshold is not applicable because the project is located in an urban environment with an existing sewer system with no existing septic tanks, and no septic tanks are proposed.

⁴ *Lateral spreading* is a phenomenon where large blocks of intact soil move downslope in a rapid fluid-like movement as a result of liquefaction. *Land subsidence* is the progressive settling of the ground surface due to several sources, such as extraction of oil, groundwater, or gas. *Liquefaction* occurs when saturated, low relative density materials are transformed from a solid to a near-liquid state. *Collapse* is an abrupt depression of ground surface and can also be caused by extraction of subsurface fluids or mining.

- **Impact GEO-4:** Be located on expansive soil, as defined in Section 1803.5.3 of the California Building Code (CBC), creating substantial direct or indirect risks to life or property.
- **Impact GEO-5:** Directly or indirectly destroy a unique geologic feature.
- **Impact MR-1:** Result in the loss of availability of a known mineral resource that would be a value to the region and the residents of the state.
- **Impact MR-2:** Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

3.8.4 RESOURCE STUDY AREA

The resource study area (RSA) for the geology, soils, seismicity, and mineral resources analysis is delineated as a 300-foot radius around the alignments and stations, the design option, and the MSF.

3.8.5 EXISTING SETTING

This existing setting discussion summarizes current conditions related to geology, soils, seismicity, and mineral resources within and near the KNE RSA.

3.8.5.1 REGIONAL SETTING

3.8.5.1.1 REGIONAL GEOLOGIC SETTING

The project is located within a seismically active area of Southern California. Strong to moderate ground shaking is a common hazard for every project in the region. The project is primarily located within the Los Angeles Basin in the northern end of the Peninsular Ranges Geomorphic Province and near the southern boundary of the Transverse Ranges Geomorphic Province of California (Jennings 1938). The dominant structural features of the Transverse Ranges are characterized by east-west trending mountain ranges, such as the Santa Monica Mountains that were uplifted during the Miocene and early Pliocene times. The Peninsular Ranges are characterized by northwesterly trending mountain ranges and intervening valleys extending from the Los Angeles Basin to the southern tip of the Baja California Peninsula. At the northern boundary of the Los Angeles Basin, the Transverse and Peninsular Ranges are bordered along the Santa Monica and Hollywood Faults.

3.8.5.1.2 REGIONAL PHYSIOGRAPHY AND TOPOGRAPHY

The ground surface in the project vicinity is generally flat across the alignments, gently sloping to the south and west toward the coast. The design option extends into the foothills of the Santa Monica Mountains. Elevations in the RSA ranges from 100 feet at the MSF site, 110 feet at the southern end of the alignments near the Crenshaw/Adams Station, and 395 feet at the northern terminus of the alignments near the Hollywood/Highland Station. The design option reaches elevations up to 560 feet.

3.8.5.2 GEOLOGIC UNITS

This discussion identifies the main geologic units in the RSA. Relevant units for most of the alignments and stations and the MSF site include alluvium and sedimentary rock formations. Considering the depths, bedrock is not anticipated, except near the northern end of the RSA.

3.8.5.2.1 SURFICIAL DEPOSITS

As shown in Figure 3.8-1, the following surficial geologic units are present in the project vicinity:

- Young Alluvial Valley Deposits (Qya) underlie all three alignments
- Young Alluvial Fan Deposits (Qyf) underlie all three alignments
- Old Alluvial Valley Deposits (Qoa) underlie the MSF site
- Old Eolian and Dune Deposits (Qoe) underlie the MSF site
- Old Alluvial Fan Deposits (Qof) underlie all three alignments

3.8.5.2.2 FILL

Fill is typically composed of deposits resulting from human construction, including engineered fill for buildings and roads. While not depicted on the geologic maps, fill is likely to underlie each alignment, the design option, and the MSF site.

3.8.5.2.3 FORMATIONS

Beneath the fill and alluvium, three subsurface geologic units are anticipated to cross the RSA:

- Lakewood Formation (Qlw)
- San Pedro Formation (Qsp)
- Fernando Formation (Tf)

3.8.5.3 STRATIGRAPHY

In general, the sequence of the geologic units underlying the alignments and stations, from top to bottom, consists of fill, younger and older alluvium, and Qsp and Tf bedrock. Topanga Group bedrock units are present near the northern end of the alignments. The distribution of surficial geologic units is characterized by Quaternary alluvial sediments that were shed from the south flank of the Santa Monica Mountains and late tertiary sedimentary rock. The geologic unit underlying the MSF site consists of both Qoa and Qoe.

3.8.5.4 GROUNDWATER

For additional information related to groundwater quality, refer to Section 3.12, Hydrology and Water Quality.

3.8.5.4.1 ALIGNMENTS AND DESIGN OPTION

From the southern terminus of the alignments to Venice Boulevard, the depth to the highest groundwater level varies from 10 to 60 feet below ground surface (bgs). Between Venice Boulevard and 3rd Street, depth to groundwater is relatively flat and at about 10 to 20 feet bgs (California Geological Survey [CGS] 1998a, 1998b). Beyond this point to the northern end of the alignments, groundwater depth significantly varies between 10 to 100 feet bgs. This historical high groundwater map may differ from actual water tables measured at particular times. Groundwater levels at the site are subject to variations in groundwater basin management, seasonal variation, nearby construction, irrigation, and other artificial and natural influences.

3.8.5.4.2 MAINTENANCE AND STORAGE FACILITY

The highest historical groundwater level in the MSF RSA is approximately 50 feet bgs (CGS 1998c, 1998d). Inspection of groundwater records from historic soil borings and observation wells within 300 feet of the site shows that the depth to groundwater generally ranged from approximately 90 feet bgs near Arbor Vitae Street to approximately 115 feet bgs or more near Manchester Boulevard, except for a limited perched groundwater area that was observed south of Arbor Vitae Street to the east of the MSF. Localized perched water conditions, which are common in the alluvial deposits in the Los Angeles Basin, may be encountered at the site.

3.8.5.5 FAULTING AND SEISMICITY

3.8.5.5.1 ALIGNMENTS AND DESIGN OPTION

The active Hollywood Fault, identified as an Alquist-Priolo Earthquake Fault Zone (APEFZ), runs roughly east-west along the base of the Santa Monica Mountains from Sunset Boulevard and Doheny Drive in the west to Franklin Avenue and Vine Street in the east. Other active faults that are identified as APEFZs and located within five miles of the RSA include the Santa Monica and Newport-Inglewood Faults. The Santa Monica Fault extends westward from Beverly Hills across West Los Angeles and Santa Monica to Pacific Palisades. The Santa Monica Fault has been interpreted to extend eastward as the Hollywood Fault. The

Santa Monica and Hollywood Faults form the southern boundary of the Transverse Ranges that extends eastward for more than 150 miles through the northern part of the Los Angeles metropolitan region and to the west offshore and sit about 500 feet to one mile from the alignments.

The Newport-Inglewood Fault is located about 1.5 miles west of the southern end of the RSA. The Newport-Inglewood Fault Zone is composed of a series of discontinuous northwest-trending parallel to sub-parallel faults extending from Ballona Gap southwestward to the area offshore from Newport Beach. This fault separates the central and southwestern blocks of the Los Angeles Basin (Reichard et al. 2003).

Figure 3.8-2 shows seismic hazards in the vicinity of the alignments and stations and identifies APEFZs, liquefaction zones, and earthquake-induced landslide zones in the RSA. Figure 3.8-3 shows faults in the project vicinity, as well as the locations of past earthquakes.

3.8.5.5.2 MAINTENANCE AND STORAGE FACILITY

The closest potentially active fault to the MSF is the Charnock Fault, located roughly 0.5 mile west of the MSF site. The nature and existence of the Charnock Fault in the MSF vicinity is uncertain. The fault may extend toward and possibly beneath Los Angeles International Airport in the vicinity of the east end of Runways 25R and 25L (Camp, Dresser, & McKee 2001). The Charnock Fault is considered to have low potential for fault rupture.

In addition, the Overland Fault and the Newport-Inglewood-Rose Canyon Fault Zone are parallel to the Charnock Fault to the southwest. The Newport-Inglewood-Rose Canyon Fault Zone is located about 2.3 to 2.9 miles to the northeast of the MSF site, and the Overland Fault is 1.3 to 1.8 miles to the north of the MSF site. The Overland Fault is considered potentially active.

FIGURE 3.8-2. SEISMIC HAZARDS IN PROJECT VICINITY



Source: CGS 1998a, 1998b, 1998c, 1998d; Connect Los Angeles Partners 2024

3.8.5.6 SEISMIC HAZARDS

3.8.5.6.1 FAULT RUPTURE

California state law prohibits the construction of structures for human occupancy in an APEFZ unless the absence of Holocene faulting can be demonstrated by geologic studies. Based on the current project plans, the tail tracks of each alignment at the Hollywood/Highland Station are in a portion of the APEFZ associated with the Hollywood Fault. The design option would traverse the Hollywood Fault zone in the vicinity of Franklin Avenue, a designated APEFZ.

3.8.5.6.2 SEISMIC GROUND SHAKING

In accordance with MRDC Section 5 (Metro 2017), Metro rail structures need to be designed to sustain seismic effects based on the 2,500-year criteria. The probabilistic maximum design earthquake (MDE) response spectrum should be 4 percent probability of exceedance in 100 years. A repairable damage level should be considered for the MDE level in lieu of “significant damage” sometimes used for other projects. The probabilistic operating design earthquake (ODE) response spectrum should be 50 percent probability of exceedance in 100 years. Designing for the lower-level ground motions reduces the likelihood of future repair and maintenance costs by minimizing damage during more frequently occurring earthquakes. The ODE service level damage is considered to be none to minimal.

3.8.5.6.3 LIQUEFACTION

3.8.5.6.3.1 ALIGNMENTS AND STATIONS

As shown in Figure 3.8-2, portions of all alignments, including several stations, are located in a mapped liquefaction zone from Exposition Boulevard to Interstate (I-) 10. The KNE San Vicente–Fairfax Alignment is located in a mapped liquefaction zone between the intersection of Fairfax Avenue and 1st Street and Croft Avenue and Santa Monica Boulevard. The KNE Fairfax Alignment is located in a mapped liquefaction zone between 1st Avenue and Rosewood Avenue. The historic highest groundwater levels in the vicinity of the alignments range between 10 and 100 feet deep.

3.8.5.6.3.2 DESIGN OPTION

The design option is located in mapped liquefaction zones from Franklin Avenue to its alignment termini at the Hollywood Bowl, as shown in Figure 3.8-2. The historic highest groundwater levels in the vicinity of the design option range between 10 to 100 feet bgs.

3.8.5.6.3.3 MAINTENANCE AND STORAGE FACILITY

The MSF site is not located in the mapped liquefaction hazard areas. Based on the highest historical groundwater contour map (CGS 1998c, 1998d) and a review of existing borings performed in 2004 near the MSF site, groundwater is approximately 50 feet bgs or deeper.

3.8.5.6.4 SEISMICALLY INDUCED SETTLEMENT

Seismically induced settlement typically occurs in loose, unsaturated granular soils. Fill located above the groundwater table in the RSA could be considered loose and susceptible to seismic-induced settlement. Additionally, some alluvial soils in the RSA are anticipated to be loose to medium density and susceptible to seismically induced settlement.

Settlement can also occur post-liquefaction when the excess pore-water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose hazards to structures founded on shallow foundations.

3.8.5.6.5 SEISMICALLY INDUCED LANDSLIDES

As shown on Figure 3.8-2, the design option, north of the Hollywood/Highland Station, is in proximity to or within an identified landslide zone. Neither the alignments nor the MSF site is located within or in proximity to mapped seismically induced landslide potential zones.

3.8.5.7 NON-SEISMIC HAZARDS

3.8.5.7.1 SLOPE STABILITY

Some parts of the alignments and the design option may be in areas with high landslide susceptibility (Wills et al. 2011), as shown in Figure 3.8-4. In addition, weak, highly weathered rocks along steep slopes may be susceptible to landslides induced by extreme events such as heavy rainstorms or seismic shaking. The MSF site is not located in an area with potential landslide susceptibility.

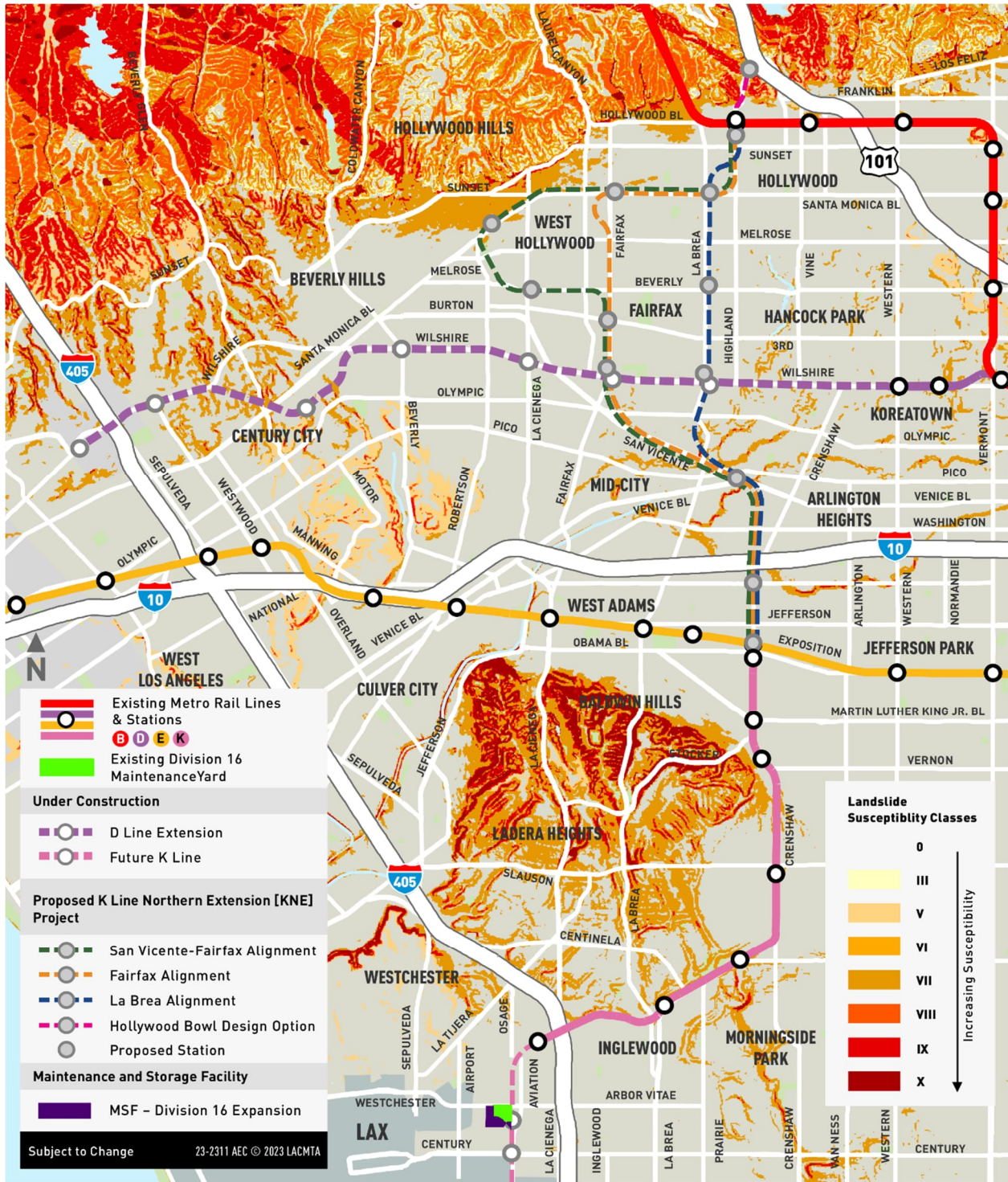
3.8.5.7.2 EXPANSIVE SOILS

Expansive soils are clay-rich soils that have the potential to shrink and swell when they dry out or become saturated. The shrink-swell capacity of expansive soils can result in differential movement below or adjacent to a structure. This differential movement can result in significant damage to pavements, as well as foundations and associated structures. Subsurface clay-rich soils may exist locally within alluvial soils present in the RSA.

3.8.5.7.2.1 ALIGNMENTS AND STATIONS

The alignments and stations would be constructed within areas of alluvial deposits. Clay-rich soils are most likely to be encountered within the portions of the alignments and some of the stations underlain by Qya deposits; clay-rich soils may exist locally within alluvial deposits present within the RSA (Bedrossian et al. 2012).

FIGURE 3.8-4. LANDSLIDE SUSCEPTIBILITY IN PROJECT VICINITY



Source: Wills et al. 2011; Connect Los Angeles Partners 2024

3.8.5.7.2.2 DESIGN OPTION

The design option is located in an area of Qof, as well as tertiary-age bedrock of the Topanga Group (Tt). The Tt may include sandstone, siltstone, shale, chert, basalt, conglomerate, and breccia (Campbell et al. 2014). Based on the soil matrix in these predominant alluvial units (Bedrossian et al. 2012), Qof are not expected to be clay-rich and therefore are not expected to have high expansion potential. However, clay-rich soils may exist locally within alluvial soils. In addition, some of the tertiary-age bedrock units, such as shale, typically contain clay minerals and might exhibit expansive behavior.

Available ratings for surficial soils in the area of the design option indicate low shrink-swell potential. These surficial soils are reported along the eastern portion of the design option along Highland Avenue and Cahuenga Boulevard and the northwestern portion along Cahuenga Boulevard. This finding should be verified and updated through site-specific exploration in the subsequent project design phases.

3.8.5.7.2.3 MAINTENANCE AND STORAGE FACILITY

The MSF site is underlain by Qoa and Qoe. Based on the soil matrix in this predominant geologic unit (Bedrossian et al. 2012), Qoa are likely to contain clayey soils, while Qoe are expected to contain primarily sands and, therefore, are not expected to exhibit expansive behavior. However, Qoa might contain clayey soils. The MSF site may be subject to expansive soil behavior effects. There is no available information in the United States Department of Agriculture (USDA) soil survey database on the shrink-swell potential of the surficial soils across the MSF site.

3.8.5.7.3 GROUND SETTLEMENT AND COLLAPSIBLE SOILS

Ground settlement occurs when new loading is applied to soil or soil support is removed. New loading can come in the form of structural loading or a reduction in the groundwater table elevation. In tunneling applications, ground settlement can occur from soil relaxation due to excavation of material at the tunnel face. Deep excavations can cause settlement of retained soil if excavation support is not rigid.

Collapsible soil is typically a loose, porous, dry natural soil deposit that undergoes a drastic rearrangement of particles upon wetting or loading that causes a significant decrease in volume. Based on review of the available data, no known collapsible soils are in the RSA. This finding should be verified through site-specific field investigation in the subsequent project design phases.

3.8.5.7.4 NON-FUEL RESOURCES

Mineral resources are commercially viable aggregate or mineral deposits, such as sand, gravel, and other construction aggregate (Los Angeles County 2022). California is a major consumer and producer of aggregates, with the Los Angeles metropolitan area consuming the largest quantities of construction aggregates in the country. The areas where geologic information indicates the presence of significant mineral resources are designated as MRZ-2. The RSA is not located within any of the major MRZ-2 areas identified within Los Angeles County. Los Angeles County regulations protect MRZ-2s and access to MRZ-2s from development and discourage incompatible land uses that could compromise accessibility for future extraction.

Parts of the project within the City of Los Angeles are within areas designated as MRZ-3 (i.e., areas containing known or inferred resources of undetermined mineral resource significance) (CGS 1994; 2010; 2021). The portion of the RSA within the City of West Hollywood is in an area designated as MRZ-1 (i.e., areas where available information indicates that little likelihood exists for the presence of significant mineral resources), with the exception of the westernmost curve of the KNE San Vicente–Fairfax Alignment, which lies or borders an MRZ-3 zone. The alignments and stations, the design option, and the MSF are within an urbanized area that has been previously disturbed by development; therefore, these areas are essentially unavailable for future mineral extraction.

3.8.5.7.5 OIL AND GAS

Extensive oil and gas exploration and petroleum extraction (pumping) from proven reserves have occurred within the RSA. Most wells within the RSA and vicinity are idle, abandoned, or dry. An idle well is a well that has not been in operation for two years or more and has not yet been properly plugged or abandoned. The approximate locations and operational status of known wells and oil/gas fields, include the following:

- The KNE San Vicente–Fairfax Alignment transverses the Las Cienegas, Salt Lake (South), Salt Lake, Beverly Hills, and Sherman (Abandoned) oil/gas fields. The KNE San Vicente–Fairfax Alignment is located along Beverly Boulevard, passing next to the Beverly Center, the site of active oil wells.
- The KNE Fairfax Alignment crosses the Las Cienegas, Salt Lake (South), Salt Lake, and Beverly Hills oil/gas fields. Based on available data, no active wells are in the vicinity of the KNE Fairfax Alignment.
- The KNE La Brea Alignment transverses the Las Cienegas and Salt Lake oil/gas fields and is not near any active wells.
- There are no known active wells or oil/gas fields near the design option.
- No known active wells or oil/gas fields are documented within the footprint of or within 0.5 mile of the MSF site.

The approximate locations of known wells and oil/gas fields, as well as status (active/idle/plugged) relative to the alignments and stations, the design option, and the MSF site, are shown on Figure 3.8-5 (City of Los Angeles 2020). For additional information related to oil and gas resources, refer to Section 3.11, Hazards and Hazardous Materials.

FIGURE 3.8-5. OIL AND GAS WELLS IN RESOURCE STUDY AREA



Sources: City of Los Angeles 2020; Connect Los Angeles Partners 2024

3.8.6 PROJECT MEASURES

Project measures are design features, best management practices (BMPs), or other commitments that Metro would implement as part of all proposed alignments, the design option, and the MSF to reduce or avoid environmental effects associated with project construction and operation. Project measures are not the same as mitigation measures, which are used to reduce an environmental impact's significance level. Where applicable, project measures are also discussed in Section 3.8.7 as part of the evaluation of environmental impacts.

3.8.6.1 PM GEO-1: DESIGN AND CONSTRUCT PROJECT PER THE METRO RAIL DESIGN CRITERIA (MOST RECENT VERSION)

The MRDC incorporates various design specifications from the Federal Highway Administration, California Department of Transportation (Caltrans), the State of California, Los Angeles County, and other sources by reference. Key compliance sections of the MRDC relative to geology and soils are Sections 5.3, 5.4, and 5.6, and the MRDC Section 5 Appendix, Metro Supplemental Seismic Design Criteria (Metro 2017). Section 5.6 of the MRDC provides detailed requirements for planning and conducting a geotechnical investigation, geotechnical design methodologies, and reporting. In addition, Caltrans and the Los Angeles County Building Code (based on the CBC) have independent design criteria for building structures (Los Angeles County) that are required. In accordance with the MRDC, geotechnical report recommendations shall be incorporated into project plans and specifications. These recommendations shall be a product of final design and shall address potential subsurface hazards. Without these report recommendations, the project plans and specifications shall not be approved, and the project alignments shall not be allowed to advance into the final design stage or into construction.

3.8.7 IMPACT EVALUATION AND MITIGATION MEASURES

This analysis presents the construction and operational impacts for geology, soils, seismicity, and mineral resources, as well as any applicable mitigation measures associated with KNE. A summary of the impact conclusions and applicable mitigation measures is found in Table 3.8-1 in Section 3.8.7.9.

3.8.7.1 IMPACT GEO-1: EXPOSURE TO SEISMIC HAZARDS

Impact GEO-1: Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

- Rupture of a known earthquake fault, as delineated on the most recent APEFZ 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)?
- Strong seismic ground shaking?
- Seismic-related ground failure, including liquefaction?
- Landslides?

3.8.7.1.1 KNE SAN VICENTE–FAIRFAX ALIGNMENT

3.8.7.1.1.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE San Vicente–Fairfax Alignment would be located within a seismically active area of Southern California. Strong to moderate ground shaking is a common hazard for every project in the area; therefore, the alignment would be subject to the impacts of seismic shaking. Potential impacts include, but are not limited to, human loss or injury, as well as structural damage.

The only known active fault with surface rupture potential in the RSA is the Hollywood Fault, located north of the Hollywood/Highland Station. The portion of the alignment along Highland Avenue, between Yucca Street and Franklin Avenue, lies within an established APEFZ associated with the Hollywood Fault. Therefore, the alignment would be subject to the impacts of a potential ground rupture. While it is possible that an unmapped fault also crosses the alignment, based on the available data, the probability of a surface fault rupture along the remaining portion of the alignment is low.

Seismic-related ground failures include liquefaction, post-liquefaction settlements, and landslides. Portions of the alignment lie within a mapped CGS liquefaction zone. More specifically, the areas within the liquefaction potential zones include an area between the southern terminus of the alignment (the connection with the existing Metro K Line at the Expo/Crenshaw Station at Exposition Boulevard) and I-10, and an area between the intersection of Fairfax Avenue and 1st Street and Croft Avenue and Santa Monica Boulevard. The former area is primarily underlain by Qyf and Qya deposits, and the historical high groundwater in this area is relatively shallow (10 to 20 feet bgs) (CGS 1998b). The area between the intersections of Fairfax Avenue and 1st Street and Croft Avenue and Santa Monica Boulevard is also underlain by Qya deposits, as well as Qof deposits along Beverly Boulevard, with a shallow historical high groundwater table reported at about 10 feet bgs (CGS 1998b). The KNE San Vicente–Fairfax Alignment would likely be subject to adverse effects of liquefaction and liquefaction-induced settlements in these areas. Additionally, it could be subject to post-seismic settlement due to densification of loose, unsaturated alluvial soils, if present.

The KNE San Vicente–Fairfax Alignment is not located within a mapped earthquake-induced landslide zone; therefore, it would not be subject to impacts related to earthquake-induced landslides.

The impacts of ground rupture, seismic ground shaking, and earthquake-induced ground instabilities for construction of the alignment would be addressed with implementation of project measure PM GEO-1 and conformance with the applicable regulatory framework (see Section 3.8.2). The regulatory framework includes MRDC, the most recent version of the CBC, Metro’s standard specifications, and Cal/OSHA and industry standards. All underground design and construction would be reviewed by the Metro Tunnel Advisory Panel and the Metro Fire Life Safety Committee. When necessary, traffic and pedestrian control during construction activities shall comply with the local jurisdiction guidelines and the Manual of Uniform Traffic Control Devices standards. Strict compliance with health and safety regulations would lower the risks to construction personnel. In addition, as part of final design, geotechnical construction recommendations and instrumentation and monitoring plans would be developed by a qualified engineer. These recommendations would be documented in the geotechnical design reports and incorporated in structural design and construction drawings, as required by the MRDC. Adherence

and implementation of the recommendations that typically address temporary conditions during construction would reduce the impacts of seismic hazards to humans and structures.

As described above, construction of the alignment would not directly or indirectly cause potential substantial adverse effects related to rupture of a known earthquake fault, strong seismic ground shaking, seismic ground failure, including liquefaction, or landslides. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during construction.

3.8.7.1.1.2 OPERATIONAL IMPACTS

Less than Significant Impact. The KNE San Vicente–Fairfax Alignment would be located within a seismically active area of Southern California. Strong to moderate ground shaking is a common hazard for every project in the area; therefore, the alignment would be subject to the impacts of seismic shaking. Potential impacts include, but are not limited to, human loss or injury, as well as structural damage.

The only known active fault with surface rupture potential in the RSA is the Hollywood Fault, located north of the Hollywood/Highland Station. The portion of the alignment along Highland Avenue, between Yucca Street and Franklin Avenue, lies within an established APEFZ associated with the Hollywood Fault. Therefore, the alignment would be subject to the impacts of a potential ground rupture. While it is possible that an unmapped fault also crosses the alignment, based on the available data, the probability of a surface fault rupture along the remaining portion of the alignment is low.

Seismic-related ground failures include liquefaction, post-liquefaction settlements, and landslides. Portions of the alignment lie within a mapped CGS liquefaction zone. More specifically, the areas within the liquefaction potential zones include an area between the southern terminus of the alignment (the connection with the existing Metro K Line at the Expo/Crenshaw Station at Exposition Boulevard) and I-10, and an area between the intersection of Fairfax Avenue and 1st Street and Croft Avenue and Santa Monica Boulevard. The former area is primarily underlain by Qyf and Qya deposits, and the historical high groundwater in this area is relatively shallow (10 to 20 feet bgs) (CGS 1998b). The area between the intersections of Fairfax Avenue and 1st Street and Croft Avenue and Santa Monica Boulevard is also underlain by Qya deposits, as well as Qof deposits along Beverly Boulevard, with a shallow historical high groundwater table reported at about 10 feet bgs (CGS 1998b). The KNE San Vicente–Fairfax Alignment would likely be subject to adverse effects of liquefaction and liquefaction-induced settlements in these areas. Additionally, it could be subject to post-seismic settlement due to densification of loose, unsaturated alluvial soils, if present.

The KNE San Vicente–Fairfax Alignment is not located within a mapped earthquake-induced landslide zone; therefore, it would not be subject to impacts related to earthquake-induced landslides.

Project measure PM GEO-1 would address the operational impacts of ground rupture on the alignment. The MRDC states that a detailed fault study should be performed to determine the location and extents of the fault zones, fault activity, and fault rupture characteristics (e.g., amount of displacement, distribution of slip across the zone, vertical and horizontal displacement components), in accordance with the requirements set by CGS Special Publication 42 (CGS 2018) for structures lying within an established APEFZ. The primary purpose of the CGS Special Publication is to detect potentially active faults in the vicinity of the mapped faults and to assess

the recency of their activity. The evaluation of the surface rupture hazard may include available data collection, surficial field investigations (e.g., remote sensing, Lidar-imagery, field-based observations), subsurface site-specific investigations (e.g., trenching, boring, and sampling; cone penetration tests; geophysical techniques), and age-dating methods. The portions of the KNE San Vicente–Fairfax Alignment in the vicinity of the Hollywood Fault would be designed and constructed in compliance with the MRDC (including performance-based standards in MRDC Section 5 Appendix – Metro Supplemental Seismic Design Criteria, Rev. 12 [Metro 2017]), which states that Metro rail structures need to be designed to sustain seismic effects based on the MDE with a return period of 2,500 years, and all additional regulatory requirements. The required site-specific investigations would assist in the determination of the level of ground rupture hazard, including the extents of the fault zone and magnitude of anticipated fault displacement to be accommodated by the components of the alignment.

Although it is generally safer to be in a tunnel, in the event of an earthquake during operation, as stated above, there is risk for human loss or injury of commuters and damage to structures due to potential ground rupture, ground shaking, or seismically induced ground instability, with major disruptions in operation while damage is repaired. In addition, project components might experience permanent deformation after a significant seismic event. In order to address the operational impact from seismic ground motion, the alignment would be designed and constructed in conformance with MRDC and CBC requirements, which are incorporated into project measure PM GEO-1.

Structures would be designed per MRDC and to account for earthquake-induced ground instability, liquefaction potential, and anticipated total and differential deformations. The implementation of a comprehensive geotechnical exploration program, as required by the MRDC, would provide information about the subsurface conditions, including groundwater level and the depths and extents of the soils susceptible to liquefaction, and would assist in the determination of the liquefaction and lateral spreading potential, as well as estimates of the seismically induced settlements. If the estimated seismically induced settlements cannot be accommodated by the structures, ground improvement may be implemented to mitigate the impacts of the liquefaction-induced settlements on project structures. Ground improvement methods may include, but are not limited to, compaction grouting, compensation grouting, jet grouting, dynamic compaction, and stone columns. The selection of the appropriate method would be made based on subsurface conditions, site accessibility and space limitations, performance requirements, and cost effectiveness.

As described above, conformance with design requirements would reduce the risk of human loss or injury, as well as reduce the potential for structural damage to project structures and for interruptions in the normal operating conditions in the event of ground rupture or an earthquake event. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during operation.

3.8.7.1.2 KNE FAIRFAX ALIGNMENT

3.8.7.1.2.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE Fairfax Alignment would be located within a seismically active area of Southern California. Strong to moderate ground shaking is a common hazard for every project in the area; therefore, the alignment would be subject to the impacts of seismic shaking. Potential impacts include, but are not limited to, human loss or injury, as well as structural damage.

The only known active fault with surface rupture potential in the RSA is the Hollywood Fault, located north of the Hollywood/Highland Station. The portion of the alignment along Highland Avenue, between Yucca Street and Franklin Avenue, lies within an established APEFZ associated with the Hollywood Fault. Therefore, the alignment would be subject to the impacts of a potential ground rupture. While it is possible that an unmapped fault also crosses the alignment, based on the available data, the probability of a surface fault rupture along the remaining portion of the alignment is low.

Seismic-related ground failures include liquefaction, post-liquefaction settlements, and landslides. Portions of the alignment lie within a mapped CGS liquefaction zone. More specifically, the areas within the liquefaction potential zones include an area between the southern terminus of the alignment (the connection with the existing Metro K Line at the Expo/Crenshaw Station at Exposition Boulevard) and I-10, and an area along Fairfax Avenue between 1st Street and Rosewood Avenue. The former area is primarily underlain by Qyf and Qya deposits, and the historical high groundwater in this area is relatively shallow (10 to 20 feet bgs) (CGS 1998b). The area between 1st Street and Rosewood Avenue is underlain by Qya deposits, as well as Qof deposits, with a shallow historical high groundwater table reported between 10 and 30 feet bgs (CGS 1998b). The KNE Fairfax Alignment would likely be subject to adverse effects of liquefaction and liquefaction-induced settlements in these areas. Additionally, it could be subject to post-seismic settlement due to densification of loose, unsaturated alluvial soils, if present.

The KNE Fairfax Alignment is not located within a mapped earthquake-induced landslide zone; therefore, it would not be subject to impacts related to earthquake-induced landslides.

The impacts of ground rupture, seismic ground shaking, and earthquake-induced ground instabilities for construction of the alignment would be addressed with implementation of project measure PM GEO-1 and conformance with the applicable regulatory framework (see Section 3.8.2). The regulatory framework includes MRDC, the most recent version of the CBC, Metro's standard specifications, and Cal/OSHA and industry standards. All underground design and construction would be reviewed by the Metro Tunnel Advisory Panel and the Metro Fire Life Safety Committee. When necessary, traffic and pedestrian control during construction activities shall comply with the local jurisdiction guidelines and the Manual of Uniform Traffic Control Devices standards. Strict compliance with health and safety regulations would lower the risks to construction personnel. In addition, as part of final design, geotechnical construction recommendations and instrumentation and monitoring plans would be developed by a qualified engineer. These recommendations would be documented in the geotechnical design reports and incorporated in structural design and construction drawings, as required by the MRDC. Adherence and implementation of the recommendations that typically address temporary conditions during construction would reduce the impacts of seismic hazards to humans and structures.

As described above, construction of the alignment would not directly or indirectly cause potential substantial adverse effects related to rupture of a known earthquake fault, strong seismic ground shaking, seismic ground failure, including liquefaction, or landslides. Therefore, the KNE Fairfax Alignment would have a less than significant impact during construction.

3.8.7.1.2.2 OPERATIONAL IMPACTS

Less than Significant Impact. The KNE Fairfax Alignment would be located within a seismically active area of Southern California. Strong to moderate ground shaking is a common hazard for every project in the area; therefore, the alignment would be subject to the impacts of seismic shaking. Potential impacts include, but are not limited to, human loss or injury, as well as structural damage.

The only known active fault with surface rupture potential in the RSA is the Hollywood Fault, located north of the Hollywood/Highland Station. The portion of the alignment along Highland Avenue, between Yucca Street and Franklin Avenue, lies within an established APEFZ associated with the Hollywood Fault. Therefore, the alignment would be subject to the impacts of a potential ground rupture. While it is possible that an unmapped fault also crosses the alignment, based on the available data, the probability of a surface fault rupture along the remaining portion of the alignment is low.

Seismic-related ground failures include liquefaction, post-liquefaction settlements, and landslides. Portions of the alignment lie within a mapped CGS liquefaction zone. More specifically, the areas within the liquefaction potential zones include an area between the southern terminus of the alignment (the connection with the existing Metro K Line at the Expo/Crenshaw Station at Exposition Boulevard) and I-10, and an area along Fairfax Avenue between 1st Street and Rosewood Avenue. The former area is primarily underlain by Qyf and Qya deposits, and the historical high groundwater in this area is relatively shallow (10 to 20 feet bgs) (CGS 1998b). The area between 1st Street and Rosewood Avenue is underlain by Qya deposits, as well as Qof deposits, with a shallow historical high groundwater table reported between 10 and 30 feet bgs (CGS 1998b). The KNE Fairfax Alignment would likely be subject to adverse effects of liquefaction and liquefaction-induced settlements in these areas. Additionally, it could be subject to post-seismic settlement due to densification of loose, unsaturated alluvial soils, if present.

The KNE Fairfax Alignment is not located within a mapped earthquake-induced landslide zone; therefore, it would not be subject to impacts related to earthquake-induced landslides.

Project measure PM GEO-1 would address the operational impacts of ground rupture on the alignment. The MRDC states that a detailed fault study should be performed to determine the location and extents of the fault zones, fault activity, and fault rupture characteristics (e.g., amount of displacement, distribution of slip across the zone, vertical and horizontal displacement components), in accordance with the requirements set by CGS Special Publication 42 (CGS 2018) for structures lying within an established APEFZ. The primary purpose of the CGS Special Publication is to detect potentially active faults in the vicinity of the mapped faults and to assess the recency of their activity. The evaluation of the surface rupture hazard may include available data collection, surficial field investigations (e.g., remote sensing, Lidar-imagery, field-based observations), subsurface site-specific investigations (e.g., trenching, boring, and sampling; cone penetration tests; geophysical techniques), and age-dating methods. The portions of the KNE Fairfax Alignment in the vicinity of the Hollywood Fault would be designed and constructed in compliance with the MRDC (including

performance-based standards in MRDC Section 5 Appendix – Metro Supplemental Seismic Design Criteria, Rev. 12 [Metro 2017]), which states that Metro rail structures need to be designed to sustain seismic effects based on the MDE with a return period of 2,500 years, and all additional regulatory requirements. The required site-specific investigations would assist in the determination of the level of ground rupture hazard, including the extents of the fault zone and magnitude of anticipated fault displacement to be accommodated by the components of the alignment.

Although it is generally safer to be in a tunnel, in the event of an earthquake during operation, as stated above, there is risk for human loss or injury of commuters and damage to structures due to potential ground rupture, ground shaking, or seismically induced ground instability, with major disruptions in operation while damage is repaired. In addition, project components might experience permanent deformation after a significant seismic event. In order to address the operational impact from seismic ground motion, the alignment would be designed and constructed in conformance with MRDC and CBC requirements, which are incorporated into project measure PM GEO-1.

Structures would be designed per MRDC and to account for earthquake-induced ground instability, liquefaction potential, and anticipated total and differential deformations. The implementation of a comprehensive geotechnical exploration program, as required by the MRDC, would provide information about the subsurface conditions, including groundwater level and the depths and extents of the soils susceptible to liquefaction, and would assist in the determination of the liquefaction and lateral spreading potential, as well as estimates of the seismically induced settlements. If the estimated seismically induced settlements cannot be accommodated by the structures, ground improvement may be implemented to mitigate the impacts of the liquefaction-induced settlements on project structures. Ground improvement methods may include, but are not limited to, compaction grouting, compensation grouting, jet grouting, dynamic compaction, and stone columns. The selection of the appropriate method would be made based on subsurface conditions, site accessibility and space limitations, performance requirements, and cost effectiveness.

As described above, conformance with design requirements would reduce the risk of human loss or injury, as well as reduce the potential for structural damage to project structures and for interruptions in the normal operating conditions in the event of ground rupture or an earthquake event. Therefore, the KNE Fairfax Alignment would have a less than significant impact during operation.

3.8.7.1.3 KNE LA BREA ALIGNMENT

3.8.7.1.3.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE La Brea Alignment would be located within a seismically active area of Southern California. Strong to moderate ground shaking is a common hazard for every project in the area; therefore, the alignment would be subject to the impacts of seismic shaking. Potential impacts include, but are not limited to, human loss or injury of workers, as well as structural damage.

The only known active fault with surface rupture potential in the RSA is the Hollywood Fault, located north of the Hollywood/Highland Station. The portion of the alignment along Highland Avenue, between Yucca Street and Franklin Avenue, lies within an established APEFZ associated with the Hollywood Fault. Therefore, the alignment would be subject to the impacts of a potential ground rupture. While it is

possible that an unmapped fault also crosses the alignment, based on the available data, the probability of a surface fault rupture along the remaining portion of the alignment is low.

Seismic-related ground failures include liquefaction, post-liquefaction settlements, and landslides. Portions of the alignment lie within a mapped CGS liquefaction zone. More specifically, the areas within the liquefaction potential zones include an area between the southern terminus of the alignment (the connection with the existing Metro K Line at the Expo/Crenshaw Station at Exposition Boulevard) and I-10. This area is underlain by Qyf and Qya deposits, and the historically high groundwater in this area is relatively shallow (between 10 and 20 feet bgs) along most of its length (CGS 1998b). The KNE La Brea Alignment would likely be subject to adverse effects of liquefaction and liquefaction-induced settlements in this area. Additionally, it could be subject to post-seismic settlement due to densification of loose, unsaturated alluvial soils, if present.

The KNE La Brea Alignment is not located within a mapped earthquake-induced landslide zone; therefore, it would not be subject to impacts related to earthquake-induced landslides.

The impacts of ground rupture, seismic ground shaking, and earthquake-induced ground instabilities for construction of the alignment would be addressed with implementation of project measure PM GEO-1 and conformance with the applicable regulatory framework (see Section 3.8.2). The regulatory framework includes MRDC, the most recent version of the CBC, Metro's standard specifications, and Cal/OSHA and industry standards. All underground design and construction would be reviewed by the Metro Tunnel Advisory Panel and the Metro Fire Life Safety Committee. When necessary, traffic and pedestrian control during construction activities shall comply with the local jurisdiction guidelines and the Manual of Uniform Traffic Control Devices standards. Strict compliance with health and safety regulations would lower the risks to construction personnel. In addition, as part of final design, geotechnical construction recommendations and instrumentation and monitoring plans would be developed by a qualified engineer. These recommendations would be documented in the geotechnical design reports and incorporated in structural design and construction drawings, as required by the MRDC. Adherence and implementation of the recommendations that typically address temporary conditions during construction would reduce the impacts of seismic hazards to humans and structures.

As described above, construction of the alignment would not directly or indirectly cause potential substantial adverse effects related to rupture of a known earthquake fault, strong seismic ground shaking, seismic ground failure, including liquefaction, or landslides. Therefore, the KNE La Brea Alignment would have a less than significant impact during construction.

3.8.7.1.3.2 OPERATIONAL IMPACTS

Less than Significant Impact. The KNE La Brea Alignment would be located within a seismically active area of Southern California. Strong to moderate ground shaking is a common hazard for every project in the area; therefore, the alignment would be subject to the impacts of seismic shaking. Potential impacts include, but are not limited to, human loss or injury, as well as structural damage.

The only known active fault with surface rupture potential in the RSA is the Hollywood Fault, located north of the Hollywood/Highland Station. The portion of the alignment along Highland Avenue, between

Yucca Street and Franklin Avenue, lies within an established APEFZ associated with the Hollywood Fault. Therefore, the alignment would be subject to the impacts of a potential ground rupture. While it is possible that an unmapped fault also crosses the alignment, based on the available data, the probability of a surface fault rupture along the remaining portion of the alignment is low.

Seismic-related ground failures include liquefaction, post-liquefaction settlements, and landslides. Portions of the alignment lie within a mapped CGS liquefaction zone. More specifically, the areas within the liquefaction potential zones include an area between the southern terminus of the alignment (the connection with the existing Metro K Line at the Expo/Crenshaw Station at Exposition Boulevard) and I-10. This area is underlain by Qyf and Qya deposits, and the historically high groundwater in this area is relatively shallow (between 10 and 20 feet bgs) along most of its length (CGS 1998b). The KNE La Brea Alignment would likely be subject to adverse effects of liquefaction and liquefaction-induced settlements in this area. Additionally, it could be subject to post-seismic settlement due to densification of loose, unsaturated alluvial soils, if present.

The KNE La Brea Alignment is not located within a mapped earthquake-induced landslide zone; therefore, it would not be subject to impacts related to earthquake-induced landslides.

Project measure PM GEO-1 would address the operational impacts of ground rupture on the alignment. The MRDC states that a detailed fault study should be performed to determine the location and extents of the fault zones, fault activity, and fault rupture characteristics (e.g., amount of displacement, distribution of slip across the zone, vertical and horizontal displacement components), in accordance with the requirements set by CGS Special Publication 42 (CGS 2018) for structures lying within an established APEFZ. The primary purpose of the CGS Special Publication is to detect potentially active faults in the vicinity of the mapped faults and to assess the recency of their activity. The evaluation of the surface rupture hazard may include available data collection, surficial field investigations (e.g., remote sensing, Lidar-imagery, field-based observations), subsurface site-specific investigations (e.g., trenching, boring, and sampling; cone penetration tests; geophysical techniques), and age-dating methods. The portions of the KNE La Brea Alignment in the vicinity of the Hollywood Fault would be designed and constructed in compliance with the MRDC (including performance-based standards in MRDC Section 5 Appendix – Metro Supplemental Seismic Design Criteria, Rev. 12 [Metro 2017]), which states that Metro rail structures need to be designed to sustain seismic effects based on the MDE with a return period of 2,500 years, and all additional regulatory requirements. The required site-specific investigations would assist in the determination of the level of ground rupture hazard, including the extents of the fault zone and magnitude of anticipated fault displacement to be accommodated by the components of the alignment.

Although it is generally safer to be in a tunnel, in the event of an earthquake during operation, as stated above, there is risk for human loss or injury of commuters and damage to structures due to potential ground rupture, ground shaking, or seismically induced ground instability, with major disruptions in operation while damage is repaired. In addition, project components might experience permanent deformation after a significant seismic event. In order to address the operational impact from seismic ground motion, the alignment would be designed and constructed in conformance with MRDC and CBC requirements, which are incorporated into project measure PM GEO-1.

Structures would be designed per MRDC and to account for earthquake-induced ground instability, liquefaction potential, and anticipated total and differential deformations. The implementation of a comprehensive geotechnical exploration program, as required by the MRDC, would provide information about the subsurface conditions, including groundwater level and the depths and extents of the soils susceptible to liquefaction, and would assist in the determination of the liquefaction and lateral spreading potential, as well as estimates of the seismically induced settlements. If the estimated seismically induced settlements cannot be accommodated by the structures, ground improvement may be implemented to mitigate the impacts of the liquefaction-induced settlements on project structures. Ground improvement methods may include, but are not limited to, compaction grouting, compensation grouting, jet grouting, dynamic compaction, and stone columns. The selection of the appropriate method would be made based on subsurface conditions, site accessibility and space limitations, performance requirements, and cost effectiveness.

As described above, conformance with design requirements would reduce the risk of human loss or injury, as well as reduce the potential for structural damage to project structures and for interruptions in the normal operating conditions in the event of ground rupture or an earthquake event. Therefore, the KNE La Brea Alignment would have a less than significant impact during operation.

3.8.7.1.4 HOLLYWOOD BOWL DESIGN OPTION

3.8.7.1.4.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The known Hollywood Fault trace of the Latest Quaternary era crosses the Hollywood Bowl Design Option near Franklin Avenue. The portion of the design option between Yucca Street and north of the western projection of Bonair Place is within the established APEFZ associated with the Hollywood Fault. The Hollywood Bowl Design Option would be subject to the impacts of a potential ground rupture at this location. While it is possible that an unmapped fault also crosses the design option, based on the available data, the probability of a surface fault rupture along the remaining portion of the design option is low.

Regarding seismic-related ground failures, including liquefaction, post-liquefaction settlements, and landslides, the design option is expected to encounter primarily Qof and tertiary-age Tt. Historical groundwater data in this area indicate that south of Franklin Avenue the highest groundwater level ranges between 80 and 100 feet bgs (CGS 1998b); the availability of groundwater data is limited for the highest groundwater level north of this area. Preliminarily, it can be concluded that the design option would be subject to the adverse effects of liquefaction and liquefaction-induced settlements, pending results of site-specific investigations. The design option is not expected to be subject to post-seismic settlement due to densification of loose, unsaturated alluvial soils because it is underlain primarily by older alluvial soils. In addition, the design option north of the Hollywood/Highland Station would be close to or within a mapped earthquake-induced landslide zone and would be subject to effects related to earthquake-induced landslides.

Construction activities required for the Hollywood Bowl Design Option may be subject to seismic hazards during an earthquake event that could result in potential human loss or injury for workers, as well as damage to structures. The impacts of ground rupture, seismic ground shaking, and earthquake-induced ground

instabilities on construction of the design option would be addressed with implementation of project measure PM GEO-1 and conformance with the applicable regulatory framework.

The Hollywood Bowl Design Option would not directly or indirectly cause potential substantial adverse effects related to rupture of a known earthquake fault, strong seismic ground shaking, seismic ground failure, including liquefaction, or landslides. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during construction.

3.8.7.1.4.2 OPERATIONAL IMPACTS

Less than Significant Impact. The Hollywood Bowl Design Option would be located within a seismically active area of Southern California. Strong to moderate ground shaking is a common hazard for every project in the area; therefore, the design option would be subject to the impacts of seismic shaking. Potential impacts include, but are not limited to, human loss or injury, as well as structural damage.

As stated above, the Hollywood Fault crosses the design option. Therefore, the design option would be subject to the impacts of a potential ground rupture. While it is possible that an unmapped fault also crosses the design option, based on the available data, the probability of a surface fault rupture along the remaining portion of the design option is low.

Project measure PM GEO-1 and conformance with the applicable regulatory framework would address impacts of ground rupture on the design option. The required site-specific investigations would assist in the determination of the level of ground rupture hazard, including the extents of the fault zone and magnitude of anticipated fault displacement to be accommodated by the components of the design option. Where the design option tunnel would cross the Hollywood Fault, additional design features would likely be required. The MRDC recognizes that at fault crossings, should the maximum design earthquake-induced displacement occur, the tunnel should still be of “sufficient diameter to fulfill its function after repairs.”

Although it is generally safer to be in a tunnel, in the event of an earthquake during operation of the Hollywood Bowl Design Option, there is risk for human loss or injury of commuters, as well as damage to structures due to potential ground rupture, ground shaking, or seismically induced ground instability, and including subsequent disruptions in the regular operating schedules while damage is repaired. In addition, project components might experience permanent deformation after a significant seismic event.

A widely accepted approach is “overboring” the tunnel through the fault zone with transition zones narrowing to the regular tunnel diameter and backfilling with easily re-minable and crushable material (such as “cellular” concrete). This approach was used in the Metro B Line Segment 3 Hollywood Fault crossing. Use of ductile lining is another approach that allows for the accommodation of the fault ruptured-induced deformations.

The MRDC provides guidance for the determination of the displacement demand and analytical procedures for the evaluation of fault displacement impacts to Metro structures. Structures would be designed per MRDC and to account for earthquake-induced ground instability, liquefaction potential, and anticipated total and differential deformations. The implementation of a comprehensive geotechnical exploration program, as required by the MRDC, would provide information about the subsurface conditions,

including groundwater level and the depths and extents of the soils susceptible to liquefaction, and would assist in the determination of the liquefaction and lateral spreading potential, as well as estimates of the seismically induced settlements. If the estimated seismically induced settlements cannot be accommodated by the structures, ground improvement may be implemented to mitigate the impacts of the liquefaction-induced settlements on project structures. Ground improvement methods may include, but are not limited to, compaction grouting, compensation grouting, jet grouting, dynamic compaction, and stone columns. The selection of the appropriate method would be made based on subsurface conditions, site accessibility and space limitations, performance requirements, and cost effectiveness.

As described above, conformance with design requirements would reduce the risk of human loss or injury, as well as reduce the potential for structural damage to project structures and for interruptions in the normal operating conditions in the event of ground rupture or an earthquake event. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during operation.

3.8.7.1.5 MAINTENANCE AND STORAGE FACILITY

3.8.7.1.5.1 CONSTRUCTION IMPACTS

Less than Significant Impact. No known active faults cross the MSF site. The nearest mapped fault is the Charnock Fault, which is of Late Quaternary age and is located a minimum of approximately 0.5 mile west of the MSF RSA. In addition, according to the mapped APEFZ, the Overland Fault is approximately 1.3 miles north of the MSF site and the Newport-Inglewood-Rose Canyon Fault Zone is approximately 1.8 miles northeast of the site; both have surface rupture potential. While it is possible that an unmapped fault crosses the MSF site, based on the available data, the probability of surface fault rupture within the MSF site is low. Therefore, the MSF is not expected to be subject to ground rupture impacts.

Regarding seismic-related ground failures, including liquefaction, post-liquefaction settlements, and landslides, the MSF RSA is within the mapped CGS liquefaction zone. The historic highest groundwater level in the vicinity ranges from 40 to 50 feet bgs (CGS 1998c; 1998d), and the MSF would likely not be subject to the adverse effects of liquefaction and liquefaction-induced settlements, pending results of a site-specific investigation. The MSF is not expected to be subject to post-seismic settlements due to densification of loose, unsaturated alluvial soils because the site is underlain by older alluvial deposits.

The MSF site is not within a mapped earthquake-induced landslide zone. Therefore, it would not be subject to impacts related to earthquake-induced landslides.

The MSF would use conventional methods for construction of trackwork and buildings for maintenance and storage of light rail vehicles. Construction activities may also include, but are not limited to, demolition of existing facilities, site preparation, grading, utility installation, fencing installation, paving, and landscaping. These construction activities might be subject to seismic hazards during an earthquake event that could result in potential human loss or injury for workers, as well as damage to structures.

The impacts of seismic ground shaking on construction of the MSF would be addressed with the implementation of project measure PM GEO-1 and conformance with the applicable regulatory framework. Therefore, the MSF would have a less than significant impact during construction.

3.8.7.1.5.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described for construction impacts above, no known active faults with surface rupture potential cross the MSF site. In addition, the site is not located within a liquefaction or landslide zone. Therefore, the MSF would not be subject to the adverse effects of seismically induced ground instability or surface rupture during operation.

The MSF components and workers would be subject to ground shaking that could lead to human loss or injury, damage to structures, and major disruptions in operation. Implementation of project measure PM GEO-1 would address the impacts of ground shaking on the MSF. Design of MSF surface structures would comply with MRDC Section 5.5 and with the Metro Supplemental Seismic Design Criteria and the applicable sections of the CBC. The MRDC Section 5 Appendix – Metro Supplemental Seismic Design Criteria, Rev. 12 (Metro 2017) adopts a two-level performance-based seismic design associated with the MDE (4 percent probability of exceedance in 100 years) and ODE (50 percent probability of exceedance in 100 years). Metro structures, including buildings, are required to be designed to sustain repairable damage for the MDE. For the ODE, Metro structures must sustain no structure damage to minimal structural damage and need to remain in service for general use immediately after a post-earthquake inspection, including all systems (mechanical, electrical, plumbing, and fire life safety). MRDC Section 5.5.3 requires site-specific recommendations for the seismic design parameters needed per the CBC to be included in the geotechnical design reports.

Conformance with design requirements would lower the risk of human loss or injury and reduce the potential of damage to MSF structures and for interruptions in normal operating conditions in the event of ground rupture or an earthquake event. Therefore, the MSF would have a less than significant impact during operation.

3.8.7.2 IMPACT GEO-2: SOIL EROSION

Impact GEO-2: Would the project result in substantial soil erosion or the loss of topsoil?

3.8.7.2.1 KNE SAN VICENTE–FAIRFAX ALIGNMENT

3.8.7.2.1.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE San Vicente–Fairfax Alignment is contained within an urban setting and the topsoil in the RSA has been previously disturbed or concealed by human activities. The only exposed topsoil is typically in landscaped medians, planters, setbacks, athletic fields, or residential yards. Construction activities would temporarily expose surficial soils to erosion by wind and hydraulic forces, increasing the potential for erosion and topsoil loss when compared to existing conditions. Additionally, a rainstorm event concurrent with construction activities could accelerate the rate of erosion and topsoil loss. The increase in erosion potential for the alignment would primarily be limited to the construction of shafts, stations, and cut-and-cover excavations. Underground construction activities related to tunnel excavation and construction would not affect erosion potential or topsoil loss.

Existing regulatory requirements limit erosion and topsoil loss during construction activities. These requirements include implementation of BMPs, stormwater pollution prevention plans, and erosion and sedimentation control measures that would ensure excavation, grading, and other earth-moving activities would not have a significant impact. Erosion control BMPs might include the implementation and use of detention ponds or infiltration pits to collect and reduce erosion, using barriers to slow the rate of runoff, or controlling the use of water irrigation. BMPs are discussed in Section 3.12, Hydrology and Water Quality. An erosion and sedimentation control plan would be prepared by the contractor in compliance with applicable NPDES permits.

All earthwork and grading activities require grading permits from the Los Angeles Department of Buildings and Safety that include requirements and standards designed to limit impacts to acceptable levels. All on-site grading and site preparation must comply with applicable provisions of Chapter IX, Division 70 of the Los Angeles Municipal Code (LAMC), which addresses grading, excavations, and fill placement. It also requires the preparation of a site-specific geotechnical report to evaluate soils issues. The City of West Hollywood also requires a grading permit and plan check prior to commencement of grading activities. All grading and excavation shall be performed in accordance with the CBC Section 1804 as adopted and amended by the City of West Hollywood.

Upon completion of construction activities, it is anticipated that surficial soil previously concealed by pavements and structures would be restored to an impervious condition. The potential for erosion and topsoil loss would be temporary, and while the potential would increase during construction, compliance with regulatory requirements would keep that potential to a minimum.

As described above, the impact of construction on soil erosion and topsoil loss would be minimal. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during construction.

3.8.7.2.1.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described for construction impacts above, the KNE San Vicente–Fairfax Alignment is contained within an urban setting and the topsoil in the RSA has been previously disturbed or concealed by human activities. The only exposed topsoil is typically in landscaped medians, planters, setbacks, athletic fields, or residential yards. Operation of the alignment would not result in ground disturbance or an increase of the exposed area of soils when compared to existing conditions. The alignment would comply with applicable post-construction NPDES permits⁵ and any permit requirements of the Cities of Los Angeles and West Hollywood, which minimize erosion impacts from development projects. As described above, the impact of operation on soil erosion and topsoil loss would be minimal. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during operation.

⁵ NPDES permits are discussed in more detail in Section 3.12, Hydrology and Water Quality.

3.8.7.2.2 KNE FAIRFAX ALIGNMENT

3.8.7.2.2.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE Fairfax Alignment is contained within an urban setting and the topsoil in the RSA has been previously disturbed or concealed by human activities. The only exposed topsoil is typically in landscaped medians, planters, setbacks, athletic fields, or residential yards. Construction activities would temporarily expose surficial soils to erosion by wind and hydraulic forces, increasing the potential for erosion and topsoil loss when compared to existing conditions. Additionally, a rainstorm event concurrent with construction activities could accelerate the rate of erosion and topsoil loss. The increase in erosion potential for the alignment would primarily be limited to the construction of shafts, stations, and cut-and-cover excavations. Underground construction activities related to tunnel excavation and construction would not affect erosion potential or topsoil loss.

Existing regulatory requirements limit erosion and topsoil loss during construction activities. These requirements include implementation of BMPs, stormwater pollution prevention plans, and erosion and sedimentation control measures that would ensure excavation, grading, and other earth-moving activities would not have a significant impact. Erosion control BMPs might include the implementation and use of detention ponds or infiltration pits to collect and reduce erosion, using barriers to slow the rate of runoff, or controlling the use of water irrigation. BMPs are discussed in Section 3.12, Hydrology and Water Quality. An erosion and sedimentation control plan would be prepared by the contractor in compliance with applicable NPDES permits.

All earthwork and grading activities require grading permits from the Los Angeles Department of Buildings and Safety that include requirements and standards designed to limit impacts to acceptable levels. All on-site grading and site preparation must comply with applicable provisions of Chapter IX, Division 70 of the LAMC, which addresses grading, excavations, and fill placement. It also requires the preparation of a site-specific geotechnical report to evaluate soils issues. The City of West Hollywood also requires a grading permit and plan check prior to commencement of grading activities. All grading and excavation shall be performed in accordance with the CBC Section 1804 as adopted and amended by the City of West Hollywood.

Upon completion of construction activities, it is anticipated that surficial soil previously concealed by pavements and structures would be restored to an impervious condition. The potential for erosion and topsoil loss would be temporary, and while the potential would increase during construction, compliance with regulatory requirements would keep that potential to a minimum.

As described above, the impact of construction on soil erosion and topsoil loss would be minimal. Therefore, the KNE Fairfax Alignment would have a less than significant impact during construction.

3.8.7.2.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described for construction impacts above, the KNE Fairfax Alignment is contained within an urban setting and the topsoil in the RSA has been previously disturbed or concealed by human activities. The only exposed topsoil is typically in landscaped medians, planters, setbacks, athletic fields, or residential yards. Operation of the alignment would not result in ground disturbance or an increase of the exposed area of soils when compared to existing conditions. The alignment would comply with applicable post-construction NPDES permits⁶ and any permit requirements of the Cities of Los Angeles and West Hollywood, which minimize erosion impacts from development projects. As described above, the impact of operation on soil erosion and topsoil loss would be minimal. Therefore, the KNE Fairfax Alignment would have a less than significant impact during operation.

3.8.7.2.3 KNE LA BREA ALIGNMENT

3.8.7.2.3.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE La Brea Alignment is contained within an urban setting and the topsoil in the RSA has been previously disturbed or concealed by human activities. The only exposed topsoil is typically in landscaped medians, planters, setbacks, athletic fields, or residential yards. Construction activities would temporarily expose surficial soils to erosion by wind and hydraulic forces, increasing the potential for erosion and topsoil loss when compared to existing conditions. Additionally, a rainstorm event concurrent with construction activities could accelerate the rate of erosion and topsoil loss. The increase in erosion potential for the alignment would primarily be limited to the construction of shafts, stations, and cut-and-cover excavations. Underground construction activities related to tunnel excavation and construction would not affect erosion potential or topsoil loss.

Existing regulatory requirements limit erosion and topsoil loss during construction activities. These requirements include implementation of BMPs, stormwater pollution prevention plans, and erosion and sedimentation control measures that would ensure excavation, grading, and other earth-moving activities would not have a significant impact. Erosion control BMPs might include the implementation and use of detention ponds or infiltration pits to collect and reduce erosion, using barriers to slow the rate of runoff, or controlling the use of water irrigation. BMPs are discussed in Section 3.12, Hydrology and Water Quality. An erosion and sedimentation control plan would be prepared by the contractor in compliance with applicable NPDES permits.

All earthwork and grading activities require grading permits from the Los Angeles Department of Buildings and Safety that include requirements and standards designed to limit impacts to acceptable levels. All on-site grading and site preparation must comply with applicable provisions of Chapter IX, Division 70 of the LAMC, which addresses grading, excavations, and fill placement. It also requires the preparation of a site-specific geotechnical report to evaluate soils issues. The City of West Hollywood also requires a grading permit and plan check prior to commencement of grading activities. All grading and excavation shall be performed in accordance with the CBC Section 1804 as adopted and amended by the City of West Hollywood.

⁶ NPDES permits are discussed in more detail in Section 3.12, Hydrology and Water Quality.

Upon completion of construction activities, it is anticipated that surficial soil previously concealed by pavements and structures would be restored to an impervious condition. The potential for erosion and topsoil loss would be temporary, and while the potential would increase during construction, compliance with regulatory requirements would keep that potential to a minimum.

As described above, the impact of construction on soil erosion and topsoil loss would be minimal. Therefore, the KNE La Brea Alignment would have a less than significant impact during construction.

3.8.7.2.3.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described for construction impacts above, the KNE La Brea Alignment is contained within an urban setting and the topsoil in the RSA has been previously disturbed or concealed by human activities. The only exposed topsoil is typically in landscaped medians, planters, setbacks, athletic fields, or residential yards. Operation of the alignment would not result in ground disturbance or an increase of the exposed area of soils when compared to existing conditions. The alignment would comply with applicable post-construction NPDES permits⁷ and any permit requirements of the Cities of Los Angeles and West Hollywood, which minimize erosion impacts from development projects. As described above, the impact of operation on soil erosion and topsoil loss would be minimal. Therefore, the KNE La Brea Alignment would have a less than significant impact during operation.

3.8.7.2.4 HOLLYWOOD BOWL DESIGN OPTION

3.8.7.2.4.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The Hollywood Bowl Design Option is contained within an urban setting and the topsoil in the RSA has been previously disturbed or concealed by human activities. The only exposed topsoil is typically in landscaped medians, planters, setbacks, or residential yards. Construction activities would temporarily expose surficial soils to erosion by wind and hydraulic forces, increasing the potential for erosion and topsoil loss when compared to existing conditions. Additionally, a rainstorm event concurrent with construction activities could accelerate the rate of erosion and topsoil loss. In addition, the tail tracks at the terminus of the design option north of Pilgrimage Bridge would require grading of the hillside west of Cahuenga Boulevard. The topsoil of the hillside is largely undisturbed by human activity. Underground construction activities related to tunnel excavation and construction would not affect erosion potential or topsoil loss.

Existing regulatory requirements limit erosion and topsoil loss during construction activities. These requirements include implementation of BMPs, stormwater pollution prevention plans, and erosion and sedimentation control measures that would ensure excavation, grading, and other earth-moving activities would not have a significant impact. Erosion control BMPs might include the implementation and use of detention ponds or infiltration pits to collect and reduce erosion, using barriers to slow the rate of runoff, or controlling the use of water irrigation. BMPs are discussed in Section 3.12, Hydrology and Water

⁷ NPDES permits are discussed in more detail in Section 3.12, Hydrology and Water Quality.

Quality. An erosion and sedimentation control plan would be prepared by the contractor in compliance with applicable NPDES permits.

Earthwork and grading activities require grading permits from the Los Angeles Department of Buildings and Safety that include requirements and standards designed to limit impacts to acceptable levels. All on-site grading and site preparation must comply with applicable provisions of Chapter IX, Division 70 of the LAMC, which addresses grading, excavations, and fill placement. It also requires the preparation of a site-specific geotechnical report to evaluate soils issues. In addition, the grading required for the design option would occur in a designated hillside area. Therefore, the design option grading would be considered engineered grading per LAMC Section 91.7004 and would require a grading permit and grading design to be performed by a licensed civil engineer. The designated hillside areas generally contribute to greater erosion and require additional sedimentation controls. Metro and the contractor would comply with the relevant codes and permits.

Upon completion of construction activities, it is anticipated that surficial soil previously concealed by pavements and structures would be restored to an impervious condition. The potential for erosion and topsoil loss would be temporary, and while the potential would increase during construction, compliance with regulatory requirements would minimize that potential.

As described above, the impact of construction on soil erosion and topsoil loss would be minimal. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during construction.

3.8.7.2.4.2 OPERATIONAL IMPACTS

Less than Significant Impact. Operation of the Hollywood Bowl Design Option would not result in ground disturbance or an increase of the exposed area of soils when compared to existing conditions. The design option would comply with applicable post-construction NPDES permits⁸ and any standards required by the City of Los Angeles, which minimize erosion impacts from development projects, and the impact of construction on soil erosion and topsoil loss would be minimal. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during operation.

3.8.7.2.5 MAINTENANCE AND STORAGE FACILITY

3.8.7.2.5.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The MSF site is within an urban setting and the topsoil in the RSA has been previously disturbed or concealed by human activities. The only exposed topsoil is typically in landscaped medians, planters, setbacks, athletic fields, or residential yards. Construction activities would temporarily expose surficial soils to erosion by wind and hydraulic forces, increasing the potential for erosion and topsoil loss when compared to existing conditions. Additionally, a rainstorm event concurrent with construction activities could accelerate the rate of erosion and topsoil loss.

⁸ NPDES permits are discussed in more detail in Section 3.12, Hydrology and Water Quality.

Existing regulatory requirements limit erosion and topsoil loss during construction activities. These requirements include implementation of BMPs, stormwater pollution prevention plans, and erosion and sedimentation control measures that would ensure excavation, grading, and other earth-moving activities would not have a significant impact. Erosion control BMPs might include the implementation and use of detention ponds or infiltration pits to collect and reduce erosion, using barriers to slow the rate of runoff, or controlling the use of water irrigation. BMPs are discussed in Section 3.12, Hydrology and Water Quality. An erosion and sedimentation control plan would be prepared by the contractor in compliance with applicable NPDES permits.

All earthwork and grading activities require grading permits from the Los Angeles Department of Buildings and Safety that include requirements and standards designed to limit impacts to acceptable levels. All on-site grading and site preparation must comply with applicable provisions of Chapter IX, Division 70 of the LAMC, which addresses grading, excavations, and fill placement. It also requires the preparation of a site-specific geotechnical report to evaluate soils issues.

Upon completion of construction activities, it is anticipated that surficial soil previously concealed by pavements and structures would be restored to an impervious condition. The potential for erosion and topsoil loss would be temporary, and while the potential would increase during construction, compliance with regulatory requirements would keep that potential to a minimum.

As described above, the impact of construction on soil erosion and topsoil loss would be minimal. Therefore, the MSF would have a less than significant impact during construction.

3.8.7.2.5.2 OPERATIONAL IMPACTS

Less than Significant Impact. Operation of the MSF would not result in ground disturbance or an increase of the exposed area of soils when compared to existing conditions. The MSF would comply with applicable post-construction NPDES permits⁹ and any standards required by the City of Los Angeles, which minimize erosion impacts from development projects, and the impact of construction on soil erosion and topsoil loss would be minimal. Therefore, the MSF would have a less than significant impact during operation.

3.8.7.3 IMPACT GEO-3: SOIL STABILITY

Impact GEO-3: 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?

⁹ NPDES permits are discussed in more detail in Section 3.12, Hydrology and Water Quality.

3.8.7.3.1 KNE SAN VICENTE–FAIRFAX ALIGNMENT

3.8.7.3.1.1 CONSTRUCTION IMPACTS

Less than Significant Impact. Construction of the KNE San Vicente–Fairfax Alignment would involve excavation for shafts and stations, temporary excavation support, tunneling, and dewatering that could affect soil stability and lead to ground movements (lateral or vertical) and subsidence. Dewatering to provide dry working conditions could affect soil stability by changing the in-situ soil stresses that can propagate to the surface and could manifest as surface settlement. Excavation for shafts and stations could negatively impact soil stability by reducing the self-support capacity of the retained soil and subsequently increase the loading demands on the temporary shoring. Furthermore, movement of temporary shoring could result in surface settlement and soil collapse. Tunneling with a tunnel boring machine (TBM) could cause volume loss through over-excavation and lead to settlement or sinkholes at the surface.

The KNE San Vicente–Fairfax Alignment would comply with regulatory and design requirements, as well as with project measure PM GEO-1, and construction of the alignment would not result in loss of soil stability. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during construction.

3.8.7.3.1.2 OPERATIONAL IMPACTS

Less than Significant Impact. The KNE San Vicente–Fairfax Alignment RSA is located on relatively level or gently sloping ground. There are no mapped landslide-susceptible areas in the RSA.

As shown in Figure 3.8-2, part of the alignment is in a mapped liquefaction zone. Areas of historically high, shallow groundwater and loose, coarse-grained alluvial soils could cause seismic-induced liquefaction and settlement, including lateral spreading. Lateral spreading is a phenomenon where large blocks of intact soil move downslope in a rapid fluid-like movement as a result of liquefaction. The mass moves toward an unconfined area or free-face, such as a descending slope or stream-cut bluff, and can move on slope gradients as gentle as one degree. While the conditions for liquefaction potential are present in the RSA, the free-face condition required for inducement of lateral spreading is not present.

Subsidence or settlement could be caused by ongoing oil and gas extraction near the alignment. Within the RSA, there are active oil wells at the Beverly Center at the corner of San Vicente Boulevard and Beverly Boulevard, which are estimated to be approximately 300 feet from the alignment. While subsidence in the vicinity of the wells due to hydrocarbon extraction is a possibility, LAMC Section 13.01 contains provisions for subsidence monitoring and mitigation of permitted hydrocarbon extraction, and it is assumed that any active well would comply with these regulations. Furthermore, the alignment is not in an area of known land subsidence mapped by the United States Geological Survey (USGS) Areas of Land Subsidence in California (USGS n.d.).

Operation of the alignment would not exacerbate or cause conditions leading to landslides, liquefaction, lateral spreading, subsidence, or collapse. Implementation of project measure PM GEO-1 during design and construction would include design measures to stabilize soils, such as compaction grouting, compensation grouting, jet grouting, dynamic compaction, and stone columns, and operation of the

alignment would not result in loss of soil stability. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during operation.

3.8.7.3.2 KNE FAIRFAX ALIGNMENT

3.8.7.3.2.1 CONSTRUCTION IMPACTS

Less than Significant Impact. Construction of the KNE Fairfax Alignment would involve excavation for shafts and stations, temporary excavation support, tunneling, and dewatering that could affect soil stability and lead to ground movements (lateral or vertical) and subsidence. Dewatering to provide dry working conditions could affect soil stability by changing the in-situ soil stresses that can propagate to the surface and could manifest as surface settlement. Excavation for shafts and stations could negatively impact soil stability by reducing the self-support capacity of the retained soil and subsequently increase the loading demands on the temporary shoring. Furthermore, movement of temporary shoring could result in surface settlement and soil collapse. Tunneling with a TBM could cause volume loss through over-excavation and lead to settlement or sinkholes at the surface.

The KNE Fairfax Alignment would comply with regulatory and design requirements, as well as with project measure PM GEO-1, and construction of the alignment would not result in loss of soil stability. Therefore, the KNE Fairfax Alignment would have a less than significant impact during construction.

3.8.7.3.2.2 OPERATIONAL IMPACTS

Less than Significant Impact. The KNE Fairfax Alignment RSA is located on relatively level or gently sloping ground. There are no mapped landslide-susceptible areas in the RSA.

As shown in Figure 3.8-2, part of the alignment is in a mapped liquefaction zone. Areas of historically high, shallow groundwater and loose, coarse-grained alluvial soils could cause seismic-induced liquefaction and settlement, including lateral spreading. Lateral spreading is a phenomenon where large blocks of intact soil move downslope in a rapid fluid-like movement as a result of liquefaction. The mass moves toward an unconfined area or free-face, such as a descending slope or stream-cut bluff, and can move on slope gradients as gentle as one degree. While the conditions for liquefaction potential are present in the RSA, the free-face condition required for inducement of lateral spreading is not present.

There are no known active or abandoned oil and gas wells in the KNE Fairfax Alignment RSA, and the alignment is not in an area of known land subsidence mapped by the USGS Areas of Land Subsidence in California (USGS n.d.).

Operation of the alignment would not exacerbate or cause conditions leading to landslides, liquefaction, lateral spreading, subsidence, or collapse. Implementation of project measure PM GEO-1 during design and construction would include design measures to stabilize soils, such as compaction grouting, compensation grouting, jet grouting, dynamic compaction, and stone columns, and operation of the alignment would not result in loss of soil stability. Therefore, the KNE Fairfax Alignment would have a less than significant impact during operation.

3.8.7.3.3 KNE LA BREA ALIGNMENT

3.8.7.3.3.1 CONSTRUCTION IMPACTS

Less than Significant Impact. Construction of the KNE La Brea Alignment would involve excavation for shafts and stations, temporary excavation support, tunneling, and dewatering that could affect soil stability and lead to ground movements (lateral or vertical) and subsidence. Dewatering to provide dry working conditions could affect soil stability by changing the in-situ soil stresses that can propagate to the surface and could manifest as surface settlement. Excavation for shafts and stations could negatively impact soil stability by reducing the self-support capacity of the retained soil and subsequently increase the loading demands on the temporary shoring. Furthermore, movement of temporary shoring could result in surface settlement and soil collapse. Tunneling with a TBM could cause volume loss through over-excavation and lead to settlement or sinkholes at the surface.

The KNE La Brea Alignment would comply with regulatory and design requirements, as well as with project measure PM GEO-1, and construction of the alignment would not result in loss of soil stability. Therefore, the KNE La Brea Alignment would have a less than significant impact during construction.

3.8.7.3.3.2 OPERATIONAL IMPACTS

Less than Significant Impact. The KNE La Brea Alignment RSA is located on relatively level or gently sloping ground. There are no mapped landslide-susceptible areas in the RSA.

As shown in Figure 3.8-2, part of the alignment is in a mapped liquefaction zone. Areas of historically high, shallow groundwater and loose, coarse-grained alluvial soils could cause seismic-induced liquefaction and settlement, including lateral spreading. Lateral spreading is a phenomenon where large blocks of intact soil move downslope in a rapid fluid-like movement as a result of liquefaction. The mass moves toward an unconfined area or free-face, such as a descending slope or stream-cut bluff, and can move on slope gradients as gentle as one degree. While the conditions for liquefaction potential are present in the RSA, the free-face condition required for inducement of lateral spreading is not present.

There are no known active or abandoned oil and gas wells in the KNE La Brea Alignment RSA, and the alignment is not in an area of known land subsidence mapped by the USGS Areas of Land Subsidence in California (USGS n.d.).

Operation of the alignment would not exacerbate or cause conditions leading to landslides, liquefaction, lateral spreading, subsidence, or collapse. Implementation of project measure PM GEO-1 during design and construction would include design measures to stabilize soils, such as compaction grouting, compensation grouting, jet grouting, dynamic compaction, and stone columns, and operation of the alignment would not result in loss of soil stability. Therefore, the KNE La Brea Alignment would have a less than significant impact during operation.

3.8.7.3.4 HOLLYWOOD BOWL DESIGN OPTION

3.8.7.3.4.1 CONSTRUCTION IMPACTS

Less than Significant Impact. Construction of the Hollywood Bowl Design Option would involve excavation for shafts and stations, temporary excavation support, tunneling, and dewatering that could affect soil stability and lead to ground movements (lateral or vertical) and subsidence. Dewatering to provide dry working conditions could affect soil stability by changing the in-situ soil stresses that can propagate to the surface and could manifest as surface settlement. Excavation for shafts and stations could negatively impact soil stability by reducing the self-support capacity of the retained soil and subsequently increase the loading demands on the temporary shoring. Furthermore, movement of temporary shoring could result in surface settlement and soil collapse. Tunnel construction using the sequential excavation method could cause volume loss through over-excavation and lead to settlement or sinkholes at the surface.

The design option would include altering a slope for construction of a staging area and ventilation shafts. Excavation into the slope could cause landslides on-site and off-site. However, all earthwork and grading activities would require grading permits from the Los Angeles Department of Buildings and Safety that include requirements and standards to limit impacts to acceptable levels. All on-site grading and site preparation must comply with applicable provisions of Chapter IX, Division 70 of the LAMC, which address grading, excavations, and fill, and the recommendations of a site-specific geotechnical report as required by the City of Los Angeles to evaluate soil issues. Furthermore, as part of project measure PM GEO-1, a geotechnical site investigation would be conducted at the site and recommendations would be given for support of the slope, which would minimize the potential for landslides on- or off-site.

The design option would comply with regulatory and design requirements, as well as with project measure PM GEO-1, and construction would not result in loss of soil stability. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during construction.

3.8.7.3.4.2 OPERATIONAL IMPACTS

Less than Significant Impact. There are no mapped landslide-susceptible areas in the RSA of the Hollywood Bowl Design Option. As shown in Figure 3.8-2, part of the design option is in a mapped liquefaction zone. There are no known active or abandoned oil and gas wells in the design option RSA, which makes subsidence due to hydrocarbon extraction unlikely. Operation of the design option would not exacerbate or cause conditions leading to landslides, liquefaction, lateral spreading, subsidence, or collapse. Implementation of project measure PM GEO-1 would include design measures to stabilize soils, such as compaction grouting, compensation grouting, jet grouting, dynamic compaction, and stone columns, and operation of the design option would not result in loss of soil stability. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during operation.

3.8.7.3.5 MAINTENANCE AND STORAGE FACILITY

3.8.7.3.5.1 CONSTRUCTION IMPACTS

Less than Significant Impact. Construction activities for the MSF would include excavation and grading for trackwork and foundations as well as associated utilities that could affect soil stability and lead to ground movements (lateral or vertical). Without compliance with regulatory and design requirements, these activities could result in loss of soil stability.

The MSF site is not in an area of mapped liquefaction or seismic landslide hazards. Furthermore, historically high groundwater elevations were 40 to 50 feet bgs, and the old alluvial deposits underlying the site are relatively dense, further reducing the potential for liquefaction.

The MSF site is on relatively level or gently sloping ground. No potential exists for landslides on- or off-site. No known active or abandoned oil and gas wells are located within the MSF RSA. Furthermore, the RSA is not in an area of known land subsidence mapped by USGS Areas of Land Subsidence in California (USGS n.d.).

As described above, the overall impact associated with soil stability that could result in landslides, lateral spreading, subsidence, liquefaction, or collapse would be minimal. Therefore, the MSF would have a less than significant impact during construction.

3.8.7.3.5.2 OPERATIONAL IMPACTS

No Impact. Operation of the MSF would not exacerbate or cause conditions leading to the occurrence of landslides, liquefaction, lateral spreading, subsidence, or collapse. In addition, implementation of project measure PM GEO-1 during design and construction would include soil stabilization. Therefore, the MSF would have no impact during operation.

3.8.7.4 IMPACT GEO-4: EXPANSIVE SOILS

Impact GEO-4: Would the project be located on expansive soil, as defined in Section 1803.5.3 of the CBC, creating substantial direct or indirect risks to life or property?

3.8.7.4.1 KNE SAN VICENTE–FAIRFAX ALIGNMENT

3.8.7.4.1.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE San Vicente–Fairfax Alignment is located within areas of alluvial deposits that might contain expansive soils. Expansive soils are materials that undergo significant volume changes in response to relative changes in water content (wetting and drying). Expansive soils have a significant amount of clay particles, which can absorb, release, and hold water. The magnitude of volumetric changes depends on the amount of expansive minerals in the soil. Shrinking and swelling may result in the tilting of structures and differential settlements, and may exert stresses and damages (e.g., cracking) to pavements, underground utilities, and shallow foundations. Additionally, bedrock units underlying alluvial deposits, such as the Fernando Formation, that contain claystone could exhibit

expansive behavior if present in the shallow subsurface. Expansive soils and bedrock, if encountered within the shallow subsurface, could affect components of the alignment, primarily stations and other ancillary structures.

The alignment would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, prior to construction, a comprehensive subsurface field and laboratory investigation program would be required to establish the subsurface conditions and geotechnical design parameters for final design and recommendations for construction. As part of the geotechnical explorations for final design, the presence, depths, and extents of expansive soils would be determined, and their expansive potential would be characterized. Therefore, the potential exists that expansive soils would be identified in the shallow subsurface, which could affect construction. However, per applicable regulations and design standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address impacts, if needed, would be incorporated into geotechnical design reports, as required by the MRDC. Compliance with such recommendations would ensure that expansive soil behavior does not pose a substantial direct or indirect risk to life or property during construction. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during construction.

3.8.7.4.1.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described above for construction impacts, the KNE San Vicente–Fairfax Alignment would be located within alluvial deposits that might contain expansive soil, which could affect components of the alignment, primarily stations and other ancillary structures.

The alignment would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, a comprehensive subsurface field and laboratory investigation program will be required, as described above. There is the potential that expansive soils could be identified in the shallow subsurface that could affect operation. However, per applicable regulations and design standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address potential impacts, if needed, would be incorporated into the geotechnical design reports, as required by the MRDC. Compliance with such recommendations will ensure that expansive soil behavior will not pose a substantial direct or indirect risk to life or property during operation. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during operation.

3.8.7.4.2 KNE FAIRFAX ALIGNMENT

3.8.7.4.2.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE Fairfax Alignment would be located within areas of alluvial deposits that might contain expansive soils. Expansive soils are materials that undergo significant volume changes in response to relative changes in water content (wetting and drying). Expansive soils have a significant amount of clay particles, which can absorb, release, and hold water. The magnitude of volumetric changes depends on the amount of expansive minerals in the soil. Shrinking and swelling may result in the tilting of structures and differential settlements, and may exert stresses and damages (e.g., cracking) to pavements, underground utilities, and shallow foundations. Additionally, bedrock units underlying alluvial deposits, such as the Fernando Formation, that contain claystone could exhibit expansive behavior if present in the shallow subsurface. Expansive soils and bedrock, if encountered within the shallow subsurface, could affect components of the alignment, primarily stations and other ancillary structures.

The alignment would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, prior to construction, a comprehensive subsurface field and laboratory investigation program would be required to establish the subsurface conditions and geotechnical design parameters for final design and recommendations for construction. As part of the geotechnical explorations for final design, the presence, depths, and extents of expansive soils would be determined, and their expansive potential would be characterized. Therefore, the potential exists that expansive soils would be identified in the shallow subsurface, which could affect construction. However, per applicable regulations and design standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address impacts, if needed, would be incorporated into geotechnical design reports, as required by the MRDC. Compliance with such recommendations would ensure that expansive soil behavior does not pose a substantial direct or indirect risk to life or property during construction. Therefore, the KNE Fairfax Alignment would have a less than significant impact during construction.

3.8.7.4.2.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described above for construction impacts, the KNE Fairfax Alignment would be located within alluvial deposits that might contain expansive soil, which could affect components of the alignment, primarily stations and other ancillary structures.

The alignment would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, a comprehensive subsurface field and laboratory investigation program will be required, as described above. There is the potential that expansive soils could be identified in the shallow subsurface that could affect operation. However, per applicable regulations and design standards, soil remediation measures

such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address potential impacts, if needed, would be incorporated into the geotechnical design reports, as required by the MRDC. Compliance with such recommendations will ensure that expansive soil behavior will not pose a substantial direct or indirect risk to life or property during operation. Therefore, the KNE Fairfax Alignment would have a less than significant impact during operation.

3.8.7.4.3 KNE LA BREA ALIGNMENT

3.8.7.4.3.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The KNE La Brea Alignment would be located within areas of alluvial deposits that might contain expansive soils. Expansive soils are materials that undergo significant volume changes in response to relative changes in water content (wetting and drying). Expansive soils have a significant amount of clay particles, which can absorb, release, and hold water. The magnitude of volumetric changes depends on the amount of expansive minerals in the soil. Shrinking and swelling may result in the tilting of structures and differential settlements, and may exert stresses and damages (e.g., cracking) to pavements, underground utilities, and shallow foundations. Additionally, bedrock units underlying alluvial deposits, such as the Fernando Formation, that contain claystone could exhibit expansive behavior if present in the shallow subsurface. Expansive soils and bedrock, if encountered within the shallow subsurface, could affect components of the alignment, primarily stations and other ancillary structures.

The alignment would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, prior to construction, a comprehensive subsurface field and laboratory investigation program would be required to establish the subsurface conditions and geotechnical design parameters for final design and recommendations for construction. As part of the geotechnical explorations for final design, the presence, depths, and extents of expansive soils would be determined, and their expansive potential would be characterized. Therefore, the potential exists that expansive soils would be identified in the shallow subsurface, which could affect construction. However, per applicable regulations and design standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address impacts, if needed, would be incorporated into geotechnical design reports, as required by the MRDC. Compliance with such recommendations would ensure that expansive soil behavior does not pose a substantial direct or indirect risk to life or property during construction. Therefore, the KNE La Brea Alignment would have a less than significant impact during construction.

3.8.7.4.3.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described above for construction impacts, the KNE La Brea Alignment would be located within alluvial deposits that might contain expansive soil, which could affect components of the alignment, primarily stations and other ancillary structures.

The alignment would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, a comprehensive subsurface field and laboratory investigation program will be required, as described above. There is the potential that expansive soils could be identified in the shallow subsurface that could affect operation. However, per applicable regulations and design standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address potential impacts, if needed, would be incorporated into the geotechnical design reports, as required by the MRDC. Compliance with such recommendations will ensure that expansive soil behavior will not pose a substantial direct or indirect risk to life or property during operation. Therefore, the KNE La Brea Alignment would have a less than significant impact during operation.

3.8.7.4.4 HOLLYWOOD BOWL DESIGN OPTION

3.8.7.4.4.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The Hollywood Bowl Design Option would be located within areas of old alluvial fan deposits, as well as tertiary-age bedrock of Topanga Group, and might be subjected to expansive soil behavior. Based on USDA rating, the surficial soils (i.e., upper five feet) in the eastern portion of the design option along Highland Avenue and Cahuenga Boulevard are classified as having low shrink-swell potential. This should be verified through site-specific exploration in subsequent design phases. At this preliminary stage, it is assumed that the design option would be subject to the effects of expansive soil behavior. Shrinking and swelling may result in the tilting of structures and differential settlements, and may exert stresses and damages (e.g., cracking) to pavements, underground utilities, and shallow foundations. Additionally, bedrock units underlying alluvial deposits that contain claystone could exhibit expansive behavior if present in the shallow subsurface. Expansive soils and bedrock, if encountered within the shallow subsurface, could affect components of the design option, primarily the station and other ancillary structures.

The design option would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, prior to construction, a comprehensive subsurface field and laboratory investigation program would be required to establish the subsurface conditions and geotechnical design parameters for final design and recommendations for construction. As part of the geotechnical explorations for final design, the presence, depths, and extents of expansive soils would be determined, and their expansive potential would be characterized. Therefore, the potential exists that expansive soils would be identified in the shallow subsurface, which could affect construction. However, per applicable regulations and design

standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address impacts, if needed, would be incorporated into geotechnical design reports, as required by the MRDC. Compliance with such recommendations would ensure that expansive soil behavior does not pose a substantial direct or indirect risk to life or property during construction. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during construction.

3.8.7.4.4.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described above for construction impacts, the Hollywood Bowl Design Option would be located in areas that might contain expansive soil, which could affect components of the design option, primarily the station and other ancillary structures.

The design option would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, a comprehensive subsurface field and laboratory investigation program will be required, as described above in the construction discussion. There is the potential that expansive soils could be identified in the shallow subsurface that could affect operation. However, per applicable regulations and design standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address potential impacts, if needed, would be incorporated into the geotechnical design reports, as required by the MRDC. Compliance with such recommendations will ensure that expansive soil behavior will not pose a substantial direct or indirect risk to life or property during operation. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during operation.

3.8.7.4.5 MAINTENANCE AND STORAGE FACILITY

3.8.7.4.5.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The MSF would be located within areas of alluvial deposits that might contain expansive soils. Expansive soils are materials that undergo significant volume changes in response to relative changes in water content (wetting and drying). Expansive soils have a significant amount of clay particles, which can absorb, release, and hold water. The magnitude of volumetric changes depends on the amount of expansive minerals in the soil. Shrinking and swelling may result in the tilting of structures and differential settlements.

The MSF would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, prior to construction, a comprehensive subsurface field and laboratory investigation program would be required to establish the subsurface conditions and geotechnical design parameters for final design and recommendations for construction. As part of the geotechnical explorations for final design, the

presence, depths, and extents of expansive soils would be determined, and their expansive potential would be characterized. Therefore, the potential exists that expansive soils would be identified in the shallow subsurface, which could affect construction. However, per applicable regulations and design standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address impacts, if needed, would be incorporated into geotechnical design reports, as required by the MRDC. Compliance with such recommendations would ensure that expansive soil behavior does not pose a substantial direct or indirect risk to life or property during construction. Therefore, the MSF would have a less than significant impact during construction.

3.8.7.4.5.2 OPERATIONAL IMPACTS

Less than Significant Impact. As described above for construction impacts, the MSF would be located within alluvial deposits that might contain expansive soil, which could affect several components of the MSF, such as buildings, newly installed utilities, trackwork, and other ancillary facilities.

The MSF would be designed in conformance with the MRDC, CBC, and other applicable regulations and design standards. In accordance with MRDC Section 5.6.2 and project measure PM GEO-1, a comprehensive subsurface field and laboratory investigation program will be required, as described above in the construction discussion. There is the potential that expansive soils could be identified in the shallow subsurface that could affect operation. However, per applicable regulations and design standards, soil remediation measures such as soil removal and replacement, chemical treatment, or structural enhancements would be implemented.

Design and construction recommendations to address potential impacts, if needed, would be incorporated into the geotechnical design reports, as required by the MRDC. Compliance with such recommendations will ensure that expansive soil behavior will not pose a substantial direct or indirect risk to life or property during operation. Therefore, the MSF would have a less than significant impact during operation.

3.8.7.5 IMPACT GEO-5: GEOLOGIC FEATURES

Impact GEO-5: Would the project directly or indirectly destroy a unique geologic feature?

3.8.7.5.1 KNE SAN VICENTE–FAIRFAX ALIGNMENT

3.8.7.5.1.1 CONSTRUCTION IMPACTS

No Impact. The KNE San Vicente–Fairfax Alignment would be located in a relatively flat, developed urban area and therefore is not anticipated to destroy, permanently cover, or adversely alter any unique or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands. Therefore, the KNE San Vicente–Fairfax Alignment would have no impact during construction.

3.8.7.5.1.2 OPERATIONAL IMPACTS

No Impact. The KNE San Vicente–Fairfax Alignment would be located in a relatively flat, developed urban area and therefore is not anticipated to destroy, permanently cover, or adversely alter any unique or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands. Therefore, the KNE San Vicente–Fairfax Alignment would have no impact during operation.

3.8.7.5.2 KNE FAIRFAX ALIGNMENT

3.8.7.5.2.1 CONSTRUCTION IMPACTS

No Impact. The KNE Fairfax Alignment would be located in a relatively flat, developed urban area and therefore is not anticipated to destroy, permanently cover, or adversely alter any unique or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands. Therefore, the KNE Fairfax Alignment would have no impact during construction.

3.8.7.5.2.2 OPERATIONAL IMPACTS

No Impact. The KNE Fairfax Alignment would be located in a relatively flat, developed urban area and therefore is not anticipated to destroy, permanently cover, or adversely alter any unique or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands. Therefore, the KNE Fairfax Alignment would have no impact during operation.

3.8.7.5.3 KNE LA BREA ALIGNMENT

3.8.7.5.3.1 CONSTRUCTION IMPACTS

No Impact. The KNE La Brea Alignment would be located in a relatively flat, developed urban area and therefore is not anticipated to destroy, permanently cover, or adversely alter any unique or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands. Therefore, the KNE La Brea Alignment would have no impact during construction.

3.8.7.5.3.2 OPERATIONAL IMPACTS

No Impact. The KNE La Brea Alignment would be located in a relatively flat, developed urban area and therefore is not anticipated to destroy, permanently cover, or adversely alter any unique or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands. Therefore, the KNE La Brea Alignment would have no impact during operation.

3.8.7.5.4 HOLLYWOOD BOWL DESIGN OPTION

3.8.7.5.4.1 CONSTRUCTION IMPACTS

Less than Significant Impact. The Hollywood Bowl Design Option would alter a hillslope for construction of a ventilation shaft and construction staging area. However, the hillslope has been previously altered as part of construction of Cahuenga Boulevard and no rock outcrops are visible on the slope. The area of grading would be approximately 60 feet by 105 feet within a much larger hillslope. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during construction.

3.8.7.5.4.2 OPERATIONAL IMPACTS

Less than Significant Impact. The Hollywood Bowl Design Option would alter a hillslope to install a ventilation shaft. However, the hillslope has been previously altered as part of construction of Cahuenga Boulevard and no rock outcrops are visible on the slope. Therefore, the Hollywood Bowl Design Option would have a less than significant impact during operation.

3.8.7.5.5 MAINTENANCE AND STORAGE FACILITY

3.8.7.5.5.1 CONSTRUCTION IMPACTS

No Impact. The MSF site is in a relatively flat, developed urban area without unique or prominent geologic or topographic features, such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands, that could be destroyed, permanently covered, or adversely altered by construction. Therefore, the MSF would have no impact during construction.

3.8.7.5.5.2 OPERATIONAL IMPACTS

No Impact. The MSF site is in a relatively flat, developed urban area without unique or prominent geologic or topographic features, such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands, that could be destroyed, permanently covered, or adversely altered by operational activities. Therefore, the MSF would have no impact during operation.

3.8.7.6 IMPACT MR-1: MINERAL RESOURCES

Impact MR-1: Would the project result in the loss of availability of a known mineral resource that would be a value to the region and the residents of the state?

3.8.7.6.1 KNE SAN VICENTE–FAIRFAX ALIGNMENT

3.8.7.6.1.1 CONSTRUCTION IMPACTS

The subsections below describe construction impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The KNE San Vicente–Fairfax Alignment lies within a highly urbanized area of Los Angeles County within the Cities of Los Angeles and West Hollywood. The portion of the alignment between its southern terminus at the existing Metro K Line Expo/Crenshaw Station and approximately the intersection of Fairfax Avenue with West 5th Street is within an area classified as MRZ-3, while the portion north of this location to its northern terminus (Hollywood/Highland Station) lies within an area classified as MRZ-1 (CGS 1994, 2021). The westernmost curve of the alignment (approximately between the Pacific Design Center at San Vicente Boulevard and the intersection of San Vicente Boulevard and Santa Monica Boulevard) appears to border or lie within a designated MRZ-3 area as well. Areas classified as MRZ-1 have little or no likelihood for the presence of significant mineral resources. Areas classified as MRZ-3 contain known mineral occurrences of undetermined significance. In addition, the alignment consists of urbanized areas that include commercial, residential, open spaces, public facilities, and light manufacturing land uses, which are unavailable for future mineral extraction. Based on the MRZ classifications, the alignment would not result in loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the KNE San Vicente–Fairfax Alignment would have no impact during construction.

OIL RESOURCES

Less than Significant Impact. The KNE San Vicente–Fairfax Alignment would traverse the Las Cienegas, Salt Lake (South), Salt Lake, Beverly Hills, and Sherman (Abandoned) oil fields. Although several idle/plugged/dry wells are within the 300-foot RSA of the alignment, the only documented active wells are located at the Beverly Center, near the intersection of Beverly Boulevard and La Cienega Boulevard. LAMC 3.01 lays out the regulatory framework for oil drilling within the City of Los Angeles. Due to technological advancements in drilling and extraction techniques, oil wells do not need to be placed directly over the oil field. The alignment is not proposed to be at depths capable of disrupting the extraction activities of any active well. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during construction.

MINERAL RESOURCES CONSTRUCTION IMPACT CONCLUSION

Less than Significant Impact. Based on the impact evaluation described in the subsections above, the KNE San Vicente–Fairfax Alignment would have a less than significant impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during construction.

3.8.7.6.1.2 OPERATIONAL IMPACTS

The subsections below describe operational impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The KNE San Vicente–Fairfax Alignment lies within a highly urbanized area of Los Angeles County within the Cities of Los Angeles and West Hollywood. The portion of the alignment between its southern terminus at the existing Metro K Line Expo/Crenshaw Station and approximately the intersection of Fairfax Avenue with West 5th Street is within an area classified as MRZ-3, while the portion north of this location to its northern terminus (Hollywood/Highland Station) lies within an area classified as MRZ-1 (CGS 1994, 2021). The westernmost curve of the alignment (approximately between the Pacific Design Center at San Vicente Boulevard and the intersection of San Vicente Boulevard and Santa Monica Boulevard) appears to border or lie within a designated MRZ-3 area as well. Areas classified as MRZ-1 have little or no likelihood for the presence of significant mineral resources. Areas classified as MRZ-3 contain known mineral occurrences of undetermined significance. In addition, the alignment consists of urbanized areas that include commercial, residential, open spaces, public facilities, and light manufacturing land uses, which are unavailable for future mineral extraction. Based on the MRZ classifications, the alignment would not result in loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the KNE San Vicente–Fairfax Alignment would have no impact during operation.

OIL RESOURCES

Less than Significant Impact. The KNE San Vicente–Fairfax Alignment would traverse the Las Cienegas, Salt Lake (South), Salt Lake, Beverly Hills, and Sherman (Abandoned) oil fields. Although several idle/plugged/dry wells are within the 300-foot RSA of the alignment, the only documented active wells are located at the Beverly Center, near the intersection of Beverly Boulevard and La Cienega Boulevard. LAMC 3.01 lays out the regulatory framework for oil drilling within the City of Los Angeles. Due to technological advancements in drilling and extraction techniques, oil wells do not need to be placed directly over the oil field. The alignment is not proposed to be at depths capable of disrupting the extraction activities of any active well. Therefore, the KNE San Vicente–Fairfax Alignment would have a less than significant impact during operation.

MINERAL RESOURCES OPERATIONAL IMPACT CONCLUSION

Less than Significant Impact. Based on the impact evaluation described in the subsections above, the KNE San Vicente–Fairfax Alignment would have a less than significant impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during operation.

3.8.7.6.2 KNE FAIRFAX ALIGNMENT

3.8.7.6.2.1 CONSTRUCTION IMPACTS

The subsections below describe construction impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The KNE Fairfax Alignment lies within a highly urbanized area of Los Angeles County within the Cities of Los Angeles and West Hollywood. The portion of the alignment between its southern terminus at the existing Metro K Line Expo/Crenshaw Station and approximately the intersection of Fairfax Avenue with 5th Street is within an area classified as MRZ-3, while the portion north of this location to its northern terminus (Hollywood/Highland Station) lies within an area classified as MRZ-1 (CGS 1994, 2021). Areas classified as MRZ-1 have little or no likelihood for the presence of significant mineral resources. Areas classified as MRZ-3 contain known mineral occurrences of undetermined significance. In addition, the alignment is in an urbanized area that includes commercial, residential, open spaces, public facilities, and light manufacturing, which are unavailable for future mineral extraction. Based on the MRZ classifications, the alignment would not result in loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the KNE Fairfax Alignment would have no impact during construction.

OIL RESOURCES

No Impact. The KNE Fairfax Alignment would traverse the Las Cienegas, Salt Lake (South), Salt Lake, and Beverly Hills oil fields. There are several idle/plugged/dry wells within the 300-foot RSA of the alignment, but no active wells. LAMC 3.01 lays out the regulatory framework for oil drilling within the City of Los Angeles. Due to technological advancements in drilling and extraction techniques, oil wells do not need to be placed directly over the oil field. Therefore, the KNE Fairfax Alignment would have no impact during construction.

MINERAL RESOURCES CONSTRUCTION IMPACT CONCLUSION

No Impact. Based on the impact evaluation described in the subsections above, the KNE Fairfax Alignment would have no impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during construction.

3.8.7.6.2.2 OPERATIONAL IMPACTS

The subsections below describe operational impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The KNE Fairfax Alignment lies within a highly urbanized area of Los Angeles County within the Cities of Los Angeles and West Hollywood. The portion of the alignment between its southern terminus at the existing Metro K Line Expo/Crenshaw Station and approximately the intersection of Fairfax Avenue with 5th Street is within an area classified as MRZ-3, while the portion north of this location to its northern terminus (Hollywood/Highland Station) lies within an area classified as MRZ-1 (CGS 1994, 2021). Areas classified as MRZ-1 have little or no likelihood for the presence of significant mineral resources. Areas classified as MRZ-3 contain known mineral occurrences of undetermined significance. In addition, the alignment is in an urbanized area that includes commercial, residential, open spaces, public facilities, and

light manufacturing, which are unavailable for future mineral extraction. Based on the MRZ classifications, the alignment would not result in loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the KNE Fairfax Alignment would have no impact during operation.

OIL RESOURCES

No Impact. The KNE Fairfax Alignment would traverse the Las Cienegas, Salt Lake (South), Salt Lake, and Beverly Hills oil fields. There are several idle/plugged/dry wells within the 300-foot RSA of the alignment, but no active wells. LAMC 3.01 lays out the regulatory framework for oil drilling within the City of Los Angeles. Due to technological advancements in drilling and extraction techniques, oil wells do not need to be placed directly over the oil field. Therefore, the KNE Fairfax Alignment would have no impact during operation.

MINERAL RESOURCES OPERATIONAL IMPACT CONCLUSION

No Impact. Based on the impact evaluation described in the subsections above, the KNE Fairfax Alignment would have no impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during operation.

3.8.7.6.3 KNE LA BREA ALIGNMENT

3.8.7.6.3.1 CONSTRUCTION IMPACTS

The subsections below describe construction impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The KNE La Brea Alignment lies within a highly urbanized area of Los Angeles County within the Cities of Los Angeles and West Hollywood. The portion of the alignment between its southern terminus at the existing Metro K Line Expo/Crenshaw Station and approximately the intersection of La Brea Avenue with 4th Street is within an area classified as MRZ-3, while the portion north of this location to its northern terminus (Hollywood/Highland Station) lies within an area classified as MRZ-1 (CGS 1994, 2021). Areas classified as MRZ-1 have little or no likelihood for the presence of significant mineral resources. Areas classified as MRZ-3 contain known mineral occurrences of undetermined significance. In addition, the alignment is in an urbanized area that includes commercial, residential, open spaces, public facilities, and light manufacturing, which are unavailable for future mineral extraction. Based on the MRZ classifications, the alignment would not result in a loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the KNE La Brea Alignment would have no impact during construction.

OIL RESOURCES

No Impact. The KNE La Brea Alignment would traverse the Las Cienegas and Salt Lake oil fields. There are several idle/plugged/dry wells within the 300-foot RSA of the alignment, but no active wells. LAMC 3.01 lays out the regulatory framework for oil drilling within the City of Los Angeles. Due to technological advancements in drilling and extraction techniques, oil wells do not need to be placed directly over the oil field. Therefore, the KNE La Brea Alignment would have no impact during construction.

MINERAL RESOURCES CONSTRUCTION IMPACT CONCLUSION

No Impact. Based on the impact evaluation described in the subsections above, the KNE La Brea Alignment would have no impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during construction.

3.8.7.6.3.2 OPERATIONAL IMPACTS

The subsections below describe operational impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The KNE La Brea Alignment lies within a highly urbanized area of Los Angeles County within the Cities of Los Angeles and West Hollywood. The portion of the alignment between its southern terminus at the existing Metro K Line Expo/Crenshaw Station and approximately the intersection of La Brea Avenue with 4th Street is within an area classified as MRZ-3, while the portion north of this location to its northern terminus (Hollywood/Highland Station) lies within an area classified as MRZ-1 (CGS 1994, 2021). Areas classified as MRZ-1 have little or no likelihood for the presence of significant mineral resources. Areas classified as MRZ-3 contain known mineral occurrences of undetermined significance. In addition, the alignment is in an urbanized area that includes commercial, residential, open spaces, public facilities, and light manufacturing, which are unavailable for future mineral extraction. Based on the MRZ classifications, the alignment would not result in a loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the KNE La Brea Alignment would have no impact during operation.

OIL RESOURCES

No Impact. The KNE La Brea Alignment would traverse the Las Cienegas and Salt Lake oil fields. There are several idle/plugged/dry wells within the 300-foot RSA of the alignment, but no active wells. LAMC 3.01 lays out the regulatory framework for oil drilling within the City of Los Angeles. Due to technological advancements in drilling and extraction techniques, oil wells do not need to be placed directly over the oil field. Therefore, the KNE La Brea Alignment would have no impact during operation.

MINERAL RESOURCES OPERATIONAL IMPACT CONCLUSION

No Impact. Based on the impact evaluation described in the subsections above, the KNE La Brea Alignment would have no impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during operation.

3.8.7.6.4 HOLLYWOOD BOWL DESIGN OPTION

3.8.7.6.4.1 CONSTRUCTION IMPACTS

The subsections below describe construction impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The Hollywood Bowl Design Option lies within an area classified as MRZ-1 south of the intersection of Highland Avenue with Milner Road and Camrose Drive, and an area classified as MRZ-3 north of this location to the Hollywood Bowl Station (CGS 1994, 2021). Areas classified as MRZ-1 have little or no likelihood for the presence of significant mineral resources. Areas classified as MRZ-3 contain known mineral occurrences of undetermined significance. In addition, the design option is in an urbanized area that includes commercial, residential, open spaces, and public facilities, which are unavailable for future mineral extraction. Based on the MRZ classifications, the design option would not result in loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the Hollywood Bowl Design Option would have no impact during construction.

OIL RESOURCES

No Impact. No known oil fields or active, plugged, or idle oil/gas wells are located in the RSA of the Hollywood Bowl Design Option. Therefore, based on the available data, the design option would have no impact during construction.

MINERAL RESOURCES CONSTRUCTION IMPACT CONCLUSION

No Impact. Based on the impact evaluation described in the subsections above, the Hollywood Bowl Design Option would have no impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during construction.

3.8.7.6.4.2 OPERATIONAL IMPACTS

The subsections below describe operational impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The Hollywood Bowl Design Option lies within an area classified as MRZ-1 south of the intersection of Highland Avenue with Milner Road and Camrose Drive, and an area classified as MRZ-3 north of this location to the Hollywood Bowl Station (CGS 1994, 2021). Areas classified as MRZ-1 have little or no likelihood for the presence of significant mineral resources. Areas classified as MRZ-3 contain known mineral occurrences of undetermined significance. In addition, the design option is in an urbanized area that includes commercial, residential, open spaces, and public facilities, which are unavailable for future mineral extraction. Based on the MRZ classifications, the design option would not result in loss of a known non-fuel mineral resource that is of

value to the region and the residents of the state. Therefore, the Hollywood Bowl Design Option would have no impact during operation.

OIL RESOURCES

No Impact. No known oil fields or active, plugged, or idle oil/gas wells are located in the RSA of the Hollywood Bowl Design Option. Therefore, based on the available data, the design option would have no impact during operation.

MINERAL RESOURCES OPERATIONAL IMPACT CONCLUSION

No Impact. Based on the impact evaluation described in the subsections above, the Hollywood Bowl Design Option would have no impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during operation.

3.8.7.6.5 MAINTENANCE AND STORAGE FACILITY

3.8.7.6.5.1 CONSTRUCTION IMPACTS

The subsections below describe construction impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The MSF site is within an area classified as MRZ-1 (CGS 1994, 2021) that has little or no likelihood for the presence of significant mineral resources. No sand or gravel mines have been identified within the MSF RSA. In addition, the MSF site is within an urbanized area with light industrial land use. Based on this MRZ classification, the MSF would not result in loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the MSF would have no impact during construction.

OIL RESOURCES

No Impact. No known oil fields or active, plugged, or idle oil/gas wells are located in the MSF RSA. Therefore, the MSF would have no impact during construction.

MINERAL RESOURCES CONSTRUCTION IMPACT CONCLUSION

No Impact. Based on the impact evaluation described in the subsections above, the MSF would have no impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during construction.

3.8.7.6.5.2 OPERATIONAL IMPACTS

The subsections below describe operational impacts on mineral resources related to non-fuel mineral resources and oil resources.

NON-FUEL MINERAL RESOURCES

No Impact. The MSF site is within an area classified as MRZ-1 (CGS 1994, 2021) that has little or no likelihood for the presence of significant mineral resources. No sand or gravel mines have been identified within the MSF RSA. In addition, the MSF site is within an urbanized area with light industrial land use. Based on this MRZ classification, the MSF would not result in loss of a known non-fuel mineral resource that is of value to the region and the residents of the state. Therefore, the MSF would have no impact during operation.

OIL RESOURCES

No Impact. No known oil fields or active, plugged, or idle oil/gas wells are located in the MSF RSA. Therefore, the MSF would have no impact during operation.

MINERAL RESOURCES OPERATIONAL IMPACT CONCLUSION

No Impact. Based on the impact evaluation described in the subsections above, the MSF would have no impact overall related to the loss of availability of a known mineral resource that would be of value to the region and the residents of the state during operation.

3.8.7.7 IMPACT MR-2: MINERAL RESOURCE RECOVERY SITES

Impact MR-2: Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

3.8.7.7.1 KNE SAN VICENTE–FAIRFAX ALIGNMENT

3.8.7.7.1.1 CONSTRUCTION IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the KNE San Vicente–Fairfax Alignment. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The alignment lies within the highly urbanized areas of the Cities of Los Angeles and West Hollywood. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. The City of West Hollywood General Plan Final Environmental Impact Report states that no state-designated or locally designated MRZs exist in the city. Construction of the alignment would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the KNE San Vicente–Fairfax Alignment would have no impact during construction.

3.8.7.7.1.2 OPERATIONAL IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the KNE San Vicente–Fairfax Alignment. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The alignment lies within the highly urbanized areas of the Cities of Los Angeles and West Hollywood. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. The City of West Hollywood General Plan Final Environmental Impact Report states that no state-designated or locally designated MRZs exist in the city. Operation of the alignment would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the KNE San Vicente–Fairfax Alignment would have no impact during operation.

3.8.7.7.2 KNE FAIRFAX ALIGNMENT

3.8.7.7.2.1 CONSTRUCTION IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the KNE Fairfax Alignment. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The alignment lies within the highly urbanized areas of the Cities of Los Angeles and West Hollywood. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. The City of West Hollywood General Plan Final Environmental Impact Report states that no state-designated or locally designated MRZs exist in the city. Construction of the alignment would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the KNE Fairfax Alignment would have no impact during construction.

3.8.7.7.2.2 OPERATIONAL IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the KNE Fairfax Alignment. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The alignment lies within the highly urbanized areas of the Cities of Los Angeles and West Hollywood. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. The City of West Hollywood General Plan Final Environmental Impact Report states that no state-designated or locally designated MRZs exist in the city.

Operation of the alignment would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the KNE Fairfax Alignment would have no impact during operation.

3.8.7.7.3 KNE LA BREA ALIGNMENT

3.8.7.7.3.1 CONSTRUCTION IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the KNE La Brea Alignment. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The alignment lies within the highly urbanized areas of the Cities of Los Angeles and West Hollywood. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. The City of West Hollywood General Plan Final Environmental Impact Report states that no state-designated or locally designated MRZs exist in the city. Construction of the alignment would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the KNE La Brea Alignment would have no impact during construction.

3.8.7.7.3.2 OPERATIONAL IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the KNE La Brea Alignment. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The alignment lies within the highly urbanized areas of the Cities of Los Angeles and West Hollywood. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. The City of West Hollywood General Plan Final Environmental Impact Report states that no state-designated or locally designated MRZs exist in the city. Operation of the alignment would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the KNE La Brea Alignment would have no impact during operation.

3.8.7.7.4 HOLLYWOOD BOWL DESIGN OPTION

3.8.7.7.4.1 CONSTRUCTION IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the Hollywood Bowl Design Option. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The design option lies within a highly urbanized area of the City of Los Angeles. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In

addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. Construction of the design option would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the Hollywood Bowl Design Option would have no impact during construction.

3.8.7.7.4.2 OPERATIONAL IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the Hollywood Bowl Design Option. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The design option lies within a highly urbanized area of the City of Los Angeles. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. Operation of the design option would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the Hollywood Bowl Design Option would have no impact during operation.

3.8.7.7.5 MAINTENANCE AND STORAGE FACILITY

3.8.7.7.5.1 CONSTRUCTION IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the MSF. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The MSF lies within a highly urbanized area of the City of Los Angeles. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. Construction of the MSF would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the MSF would have no impact during construction.

3.8.7.7.5.2 OPERATIONAL IMPACTS

No Impact. No known mineral resource recovery sites are identified in the RSA of the MSF. The area is highly urbanized and consequently unavailable for future mineral extraction. No mineral resource recovery sites are delineated in the local general plans or other plans.

The MSF lies within a highly urbanized area of the City of Los Angeles. In addition, the City of Los Angeles Oil and Gas Drilling Ordinance, which became effective on January 18, 2023, prohibits new oil and gas extraction, and deems existing extraction activities a nonconforming use across all zones. In addition, the ordinance states that the City of Los Angeles does not consider petroleum to be a mineral source of local importance. Operation of the MSF would not result in the loss of availability of a locally important oil resource recovery site. Therefore, the MSF would have no impact during operation.

3.8.7.8 MITIGATION MEASURES

As the impact analysis above demonstrates, construction and operation of any of the KNE alignments and stations, the design option, and the MSF would result in no impact or a less than significant impact related to geology, soils, and mineral resources. Therefore, no mitigation is required under CEQA.

3.8.7.9 SUMMARY OF IMPACT SIGNIFICANCE CONCLUSIONS AND MITIGATION MEASURES

Table 3.8-1 summarizes the geology, soils, and mineral resources impact significance conclusions and applicable mitigation measures. As indicated above, there are no significant impacts that would require mitigation.

TABLE 3.8-1. KNE SUMMARY OF IMPACT SIGNIFICANCE CONCLUSIONS AND MITIGATION MEASURES

IMPACT		IMPACT SIGNIFICANCE CONCLUSIONS AND MITIGATION MEASURES				
		KNE SAN VICENTE-FAIRFAX ALIGNMENT	KNE FAIRFAX ALIGNMENT	KNE LA BREA ALIGNMENT	HOLLYWOOD BOWL DESIGN OPTION	MAINTENANCE AND STORAGE FACILITY
Impact GEO-1: Exposure to Seismic Hazards	Impact Before Mitigation	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS
	Mitigation Measures	None Required	None Required	None Required	None Required	None Required
	Impact After Mitigation	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS
Impact GEO-2: Soil Erosion	Impact Before Mitigation	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS
	Mitigation Measures	None Required	None Required	None Required	None Required	None Required
	Impact After Mitigation	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS
Impact GEO-3: Soil Stability	Impact Before Mitigation	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: No Impact
	Mitigation Measures	None Required	None Required	None Required	None Required	None Required
	Impact After Mitigation	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: No Impact
Impact GEO-4: Expansive Soils	Impact Before Mitigation	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS
	Mitigation Measures	None Required	None Required	None Required	None Required	None Required
	Impact After Mitigation	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS	Construction: LTS Operation: LTS

IMPACT		IMPACT SIGNIFICANCE CONCLUSIONS AND MITIGATION MEASURES				
		KNE SAN VICENTE-FAIRFAX ALIGNMENT	KNE FAIRFAX ALIGNMENT	KNE LA BREA ALIGNMENT	HOLLYWOOD BOWL DESIGN OPTION	MAINTENANCE AND STORAGE FACILITY
Impact GEO-5: Geologic Features	Impact Before Mitigation	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: LTS Operation: LTS	Construction: No Impact Operation: No Impact
	Mitigation Measures	None Required	None Required	None Required	None Required	None Required
	Impact After Mitigation	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: LTS Operation: LTS	Construction: No Impact Operation: No Impact
Impact MR-1: Mineral Resources	Impact Before Mitigation	Construction: LTS Operation: LTS	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact
	Mitigation Measures	None Required	None Required	None Required	None Required	None Required
	Impact After Mitigation	Construction: LTS Operation: LTS	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact
Impact MR-2: Mineral Resource Recovery Sites	Impact Before Mitigation	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact
	Mitigation Measures	None Required	None Required	None Required	None Required	None Required
	Impact After Mitigation	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact	Construction: No Impact Operation: No Impact

Source: Connect Los Angeles Partners 2024
 LTS = less than significant