

IV. Environmental Impact Analysis

D. Geology and Soils

1. Introduction

This section of the Draft EIR provides an analysis of the Project's potential impacts on geology and soils, including rupture of a known earthquake fault, seismic ground shaking, soil erosion, geologic unit or soil stability (e.g., lateral spreading, subsidence), expansive soils, and other geologic conditions. The analysis is based on a review of California regulatory requirements, County of Los Angeles requirements, City of Los Angeles requirements, as well as the: (1) *Preliminary Geotechnical Evaluation Los Angeles County Museum of Art 5905 Wilshire Boulevard, Los Angeles, California* (Geotechnical Evaluation) dated August 17, 2016, revised September 6, 2017, prepared for the Project by AECOM and included in Appendix E of this Draft EIR; (2) *Methane Report, Los Angeles County Museum of Art, Museum Building and Ogden Parking Structure Project* (Methane Report) dated February 2017, prepared by Methane Specialists, and included as Appendix F of this Draft EIR; and (3) *Construction Instrumentation—Tar Migration and Excavation Memorandum* (Tar Migration Memorandum) dated February 21, 2017, prepared for the Project by AECOM, and included as Appendix G of this Draft EIR.

2. Environmental Setting

a. Regulatory Framework

Below is a discussion of the regulatory framework applicable to the Project. As a note, although the County-owned Museum Building would not be subject to the City zoning and building regulations, the Ogden Parking Structure would be built within the City's jurisdiction and would be subject to City zoning and building regulations. As such, a discussion of both County and City regulations is provided below.

(1) State of California

(a) Alquist–Priolo Earthquake Fault Zoning Act

The Alquist–Priolo Earthquake Fault Zoning Act (Public Resources Code Section 2621) was enacted by the State of California in 1972 to address the hazard of surface

faulting to structures for human occupancy.¹ The Alquist–Priolo Earthquake Fault Zoning Act was enacted in response to the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged homes, commercial buildings, and other structures. The primary purpose of the Alquist–Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings intended for human occupancy on the surface traces of active faults. The Alquist–Priolo Earthquake Fault Zoning Act is also intended to increase the safety of citizens and minimize the loss of life during and immediately following earthquakes by facilitating seismic retrofitting to strengthen buildings against ground shaking.

The Alquist–Priolo Earthquake Fault Zoning Act requires the State Geologist to establish regulatory zones, known as “earthquake fault zones,” around the surface traces of active faults and to issue appropriate maps to assist cities and counties in planning, zoning, and building regulation functions. Maps are distributed to all affected cities and counties for the control of new or renewed construction and are required to sufficiently define potential surface rupture or fault creep. The State Geologist is charged with continually reviewing new geologic and seismic data, and revising existing zones and delineating additional earthquake fault zones when warranted by new information. Local agencies must enforce the Alquist–Priolo Earthquake Fault Zoning Act in the development permit process, where applicable, and may be more restrictive than State law requires. According to the Alquist–Priolo Earthquake Fault Zoning Act, before a project can be permitted, cities and counties shall require a geologic investigation, prepared by a licensed geologist, to demonstrate that buildings will not be constructed across active faults. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back. Although setback distances may vary, a minimum 50-foot setback is required. The Alquist–Priolo Earthquake Fault Zoning Act and its regulations are presented in California Department of Conservation, California Geological Survey, Special Publication 42, *Fault-Rupture Hazard Zones in California*.

(b) *Seismic Safety Act*

The California Seismic Safety Commission was established by the Seismic Safety Act in 1975 to provide oversight, review, and recommendations to the Governor and State Legislature regarding seismic issues. The Commission’s name was changed to Alfred E. Alquist Seismic Safety Commission in 2006. Since then, the Commission has adopted several documents based on recorded earthquakes, including:²

¹ *The Alquist–Priolo Earthquake Fault Zoning Act was originally entitled the Alquist–Priolo Geologic Hazards Zone Act.*

² *Alfred E. Alquist Seismic Safety Commission, Publications, www.seismic.ca.gov/pub.html, accessed June 10, 2016.*

- Research and Implementation Plan for Earthquake Risk Reduction in California 1995 to 2000, report dated December 1994;
- Seismic Safety in California's Schools, "Findings and Recommendations on Seismic Safety Policies and Requirements for Public, Private, and Charter Schools," report dated December 2004;
- Findings and Recommendations on Hospital Seismic Safety, report dated November 2001; and
- Commercial Property Owner's Guide to Earthquakes Safety, report dated October 2006.

(c) *Seismic Hazards Mapping Act*

In order to address the effects of strong ground shaking, liquefaction, landslides, and other ground failures due to seismic events, the State Legislature enacted the Seismic Hazards Mapping Act of 1990 (Public Resources Code Sections 2690–2699). Under the Seismic Hazards Mapping Act, the State Geologist is required to delineate "seismic hazard zones." Cities and counties must regulate certain development projects within these zones until the geologic and soil conditions of the project site are investigated and appropriate mitigation measures, if required, are incorporated into development plans. The State Mining and Geology Board has promulgated additional regulations and policies to assist municipalities in preparing the Safety Element of their General Plan and encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety. Under Public Resources Code Section 2697, cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard. Each city or county shall submit one copy of each geotechnical report, including mitigation measures, to the State Geologist within 30 days of its approval. Public Resources Code Section 2698 does not prevent cities and counties from establishing policies and criteria which are stricter than those established by the State Mining and Geology Board.

State publications supporting the requirements of the Seismic Hazards Mapping Act include the California Geological Survey Special Publication 117, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, and California Geological Survey Special Publication 118, *Recommended Criteria for Delineating Seismic Hazard Zones in California*. The objectives of Special Publication 117 are to assist in the evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations and to promote uniform and effective statewide implementation of the evaluation and mitigation elements of the Seismic Hazards Mapping Act. Special Publication 118 implements the requirements of the Seismic Hazards Mapping Act in the production of Probabilistic Seismic Hazard Maps for the State.

(d) California Building Code

The California Building Code (California Code of Regulations, Title 24) is a compilation of building standards, including seismic safety standards for new buildings. The purpose of the California Building Code is to establish minimum standards for safeguarding public health and safety through structural strength, means of egress, facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures. The California Building Code applies to all occupancies in California, except where stricter standards have been adopted by local agencies. The 2013 edition of the California Building Code became effective on January 1, 2014, and incorporates by adoption the 2012 edition of the International Building Code of the International Code Council, with California amendments.³ The 2013 California Building Code incorporates the latest seismic design standards for structural loads and materials as well as provisions from the National Earthquake Hazards Reduction Program to mitigate losses from an earthquake and provide for the latest in earthquake safety. Specific California Building Code building and seismic safety regulations have been incorporated by reference in the Los Angeles County Building Code (County Building Code) and the Los Angeles Building Code, with local amendments.

(2) County of Los Angeles

(a) Los Angeles County General Plan

As discussed further in Section IV.H, Land Use, of this Draft EIR, the Los Angeles County General Plan (County General Plan) directs future growth and development in the County's unincorporated areas and establishes goals, policies, and objectives that pertain to the entire County. The current County General Plan, adopted in 2015, includes relevant policies that focus on the enforcement of standards and requirements that reduce seismic and geologic hazards as well as promoting seismically resistant lifelines that serve the County and connect to surrounding areas.

(b) Los Angeles County Building Code

The 2014 County Building Code, effective January 1, 2014, is based on the 2013 California Building Code and the 2012 International Building Code. Relevant provisions address site grading, cut and fill slope design, soil expansion, geotechnical investigations before and during construction, slope stability, allowable bearing pressures and settlement below footings, effects of adjacent slopes on foundations, retaining walls, basement walls,

³ *California Building Code, Title 24, Part 2.*

shoring of adjacent properties, and potential primary and secondary seismic effects. The Los Angeles County Department of Public Works Building and Safety Division is responsible for implementing the provisions of the County Building Code.

(c) Los Angeles County Tentative Map Reports

Geologic reports must be submitted to the Public Works Geotechnical and Materials Engineering Division (GMED) by a Project Engineering Geologist and/or Project Geotechnical Engineer to demonstrate the feasibility of any development depicted on a tentative subdivision map. Each report must be based on the latest tentative map submitted to the County Department of Regional Planning and must contain sufficient geologic information to demonstrate that: (1) the site is suitable for proposed development as designed; (2) existing or potential geologic conditions have been identified and their effect on development determined; and (3) adequate mitigation measures have been provided.

(d) County of Los Angeles Methane Mitigation Ordinance

The County of Los Angeles requires that any building within 300 feet of an abandoned oil well be protected with a methane gas system consistent with California Building Code, Volume 1, Title 26 Section(s) 110.3 and 110.4 and the County of Los Angeles *Landfill Gas Assessment and Management Los Angeles Department of Public Works Landfill Gas Protection Policy*.

(3) City of Los Angeles

(a) Los Angeles General Plan Safety Element

The City of Los Angeles General Plan Safety Element (Safety Element), which was adopted in 1996, addresses public safety risks due to natural disasters, including seismic events and geologic conditions, and sets forth guidance for emergency response during such disasters. The Safety Element also provides generalized maps of designated areas within the City that are considered susceptible to earthquake-induced hazards such as fault rupture and liquefaction.

Regarding assessment of seismic hazards, the Safety Element acknowledges that Section 2699 of the California Public Resources Code requires that a safety element take into account available seismic hazard maps prepared by the State Geologist pursuant to the Alquist–Priolo Earthquake Fault Zoning Act. The Public Resources Code also requires that the State Geologist map active faults throughout the State. The Safety Element states that those maps which are applicable to the City of Los Angeles are incorporated into Exhibit A of the Safety Element. The Safety Element also states that local jurisdictions are

required by the Seismic Hazards Mapping Act to require additional studies and appropriate mitigation measures for development projects in the areas identified as potential hazard areas by the State seismic hazard maps. In addition, the Safety Element states that as maps are released for Los Angeles, they will be utilized by the Los Angeles Department of Building and Safety in helping to identify areas where additional soils and geology studies are needed for evaluation of hazards and imposition of appropriate mitigation measures prior to the issuance of building permits.

The Safety Element was approved in 1996 during an ongoing mapping effort by the State. Therefore, it contemplated that, once the entire set of maps for Los Angeles was complete, it would be used to revise the soils and geology exhibits of the Safety Element. The Safety Element acknowledged that it was based on available official maps at the time, and that exhibits in the Safety Element would be revised following receipt of reliable new information.

(b) Los Angeles Building Code

Earthwork activities, including grading, are governed by the Los Angeles Building Code, which is contained in LAMC, Chapter IX, Article 1. Specifically, Section 91.7006.7 includes requirements regarding import and export of material; Section 91.7010 includes regulations pertaining to excavations; Section 91.7011 includes requirements for fill materials; Section 91.7013 includes regulations pertaining to erosion control and drainage devices; Section 91.7014 includes general construction requirements, as well as requirements regarding flood and mudflow protection; and Section 91.7016 includes regulations for areas that are subject to slides and unstable soils. In addition, Section 91.1803 includes specific requirements addressing seismic design, grading, foundation design, geologic investigations and reports, soil and rock testing, and groundwater. The Los Angeles Building Code incorporates the California Building Code, with City amendments. The City Department of Building and Safety is responsible for implementing the provisions of the Los Angeles Building Code.

(c) Los Angeles Ordinance No. 175790

Los Angeles Ordinance No. 175790 defines the methane mitigation requirements for all projects which fall within the “methane zone” or the “methane buffer zone”. The zones have been defined by the City of Los Angeles to include areas of the City which fall within or adjacent to the oil production fields by the Division of Gas and Geothermal Resources. The ordinance requires that each parcel that falls within the methane or methane buffer zone be evaluated for methane concentration and pressure and certified by an approved testing agency. Upon completion and certification, the highest concentration and pressure measures during the investigation determines the “design level” for the project. The ordinance defines five design levels and corresponding mitigation measures for all sites in

the methane and methane buffer zones. Level I is the least stringent escalating to Level V as the most stringent “active” methane mitigation.

b. Existing Conditions

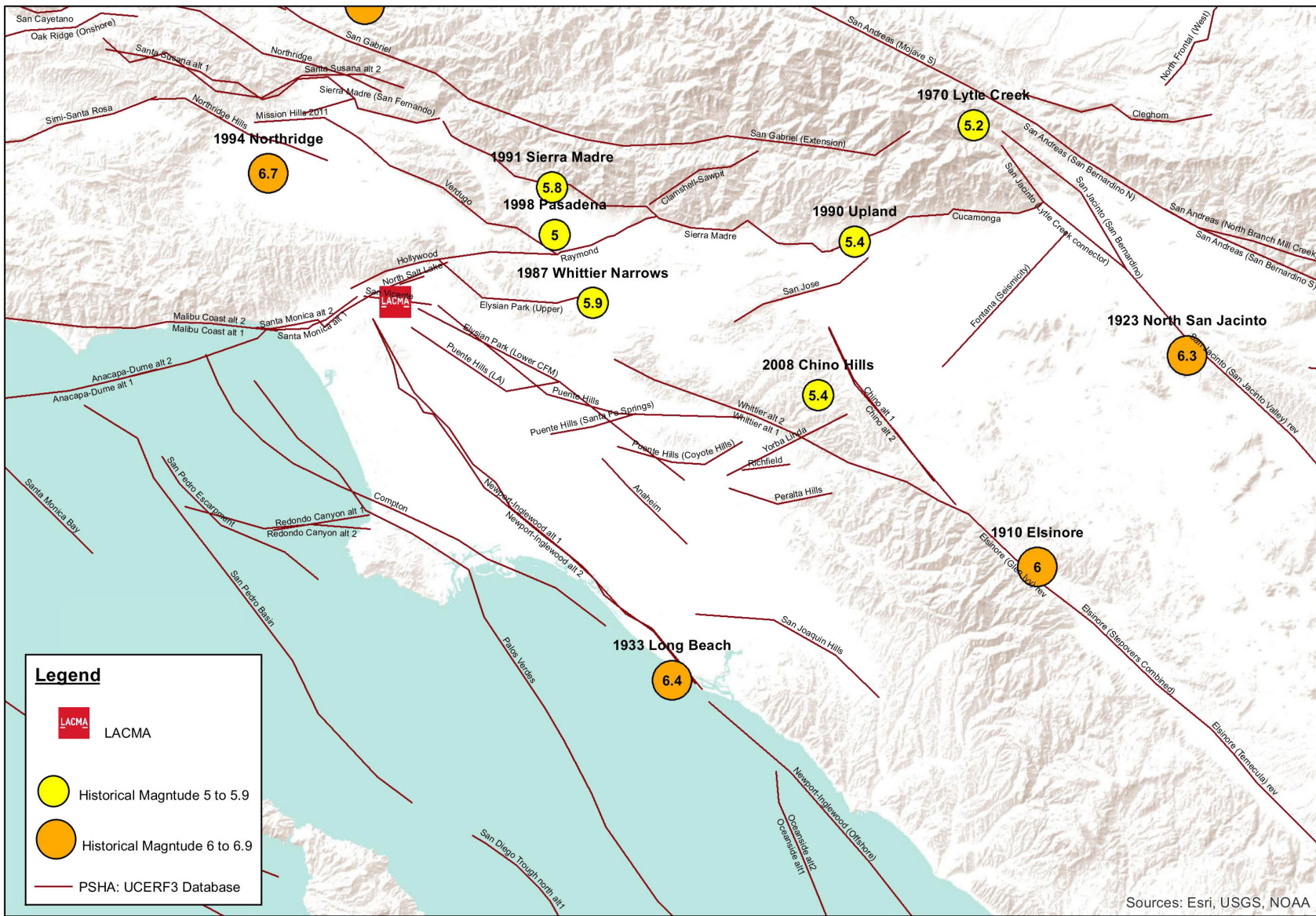
(1) Regional Geology

Based on the Geotechnical Evaluation, the Project Site is located in the northernmost part of the Peninsular Ranges geomorphic province near the boundary of the Transverse Ranges geomorphic province. The Peninsular Range province is characterized by northwest-southeast trending alignments of mountain ranges and hills with intervening basins reflecting the influence of northwest trending major fault zones controlling the geologic structure of the region. A broad sediment-filled trough, referred to as the Los Angeles Basin, characterizes the northern portion of the Peninsular Ranges province. The Los Angeles Basin is an alluvial plain of low relief which was created by tectonic subsidence and subsequent deposition of sediments from ancestral streams from erosion along the flanks of the local mountains.

(2) Regional Faulting and Seismicity

The numerous faults in Southern California include active, potentially active, and inactive faults. Based on criteria established by the California Geological Survey (CGS), active faults are those that have shown evidence of surface displacement within the past 11,000 years (i.e., Holocene-age). Potentially active faults are those that have shown evidence of surface displacement within the last 1.6 million years (i.e., Quaternary-age). Inactive faults are those that have not shown evidence of surface displacement within the last 1.6 million years. The Southern California region also includes blind thrust faults, which are faults without a surface expression. Due to the buried nature of these thrust faults, their existence is usually not known until they produce an earthquake. Since the seismic risk of these buried thrust faults in terms of recurrence and maximum potential magnitude is not well established, the potential for earthquakes with magnitude higher than 6.0 occurring on buried thrust faults cannot be precluded. The faults in the vicinity of the Project Site are shown in Figure IV.D-1 on page IV.D-8.

The Alquist–Priolo Earthquake Fault Zoning Act defines “active” and “potentially active” faults utilizing the same aging criteria as those used by CGS, as described above. Therefore, the Alquist–Priolo Earthquake Fault Zoning Act identifies zones that include faults which have direct evidence of movement within the last 11,000 years. The CGS considers fault movement within this period a characteristic of faults that have a relatively high potential for ground rupture in the future. As discussed in the Regulatory Framework above, the Alquist–Priolo Earthquake Fault Zoning Act requires the State Geologist to establish earthquake fault zones around the surface traces of active faults and to issue



appropriate maps to assist cities and counties in planning, zoning, and building regulation functions. These zones, which generally extend from 200 to 500 feet on each side of a known active fault, based on the location precision, complexity, or regional significance of the fault, identify areas where potential surface fault rupture along an active fault could prove hazardous and identify where special studies are required to characterize hazards to habitable structures. If a site lies within an Earthquake Fault Zone on an official CGS map, then a geologic fault rupture investigation must be performed before issuance of permits to demonstrate that the proposed development is not threatened by surface displacement from the fault.

As illustrated in Figure IV.D-1 on page IV.D-8, no known active faults have been mapped across the Project Site. In addition, the Project Site is not located within an Alquist–Priolo Earthquake Fault Zone. The closest major active (and zoned) fault near the Project Site is the Hollywood Fault, located approximately 2.2 miles northwest of the Project Site. The second closest major active (and zoned) fault near the Project Site is the Newport-Inglewood Fault, located approximately 2.5 miles southwest of the Project Site. While no known active faults have been mapped across the Project Site and the Project Site is not located within an Alquist–Priolo Earthquake Fault Zone, the Project Site is located in the seismically active Southern California region, and could be subjected to moderate to strong ground shaking in the event of an earthquake on one of the many active Southern California faults.

(3) Local Geology

(a) Soil Conditions

According to the Geotechnical Evaluation, the Project Site is part of the La Brea Plain consisting of a broad south-dipping gently sloping topography with underlying alluvial deposits. These alluvial deposits are known as the Lakewood Formation. The Lakewood Formation is underlain by weakly consolidated lower shallow marine deposits referred to as the San Pedro Formation. The Project Site is also underlain by crude oil deposits that originated from structural traps created by folding and faulting of bedrock. These structural traps exist in the form of anticlinal folds and fault blocks where crude oil migrated to the surface along bedrock shears and joints. During migration toward the surface, crude oil tends to lose its volatile constituents producing a viscous tar. There are several oil and gas fields located adjacent to the Project Site, including the South Salt Lake and Salt Lake oil fields.

During subsurface explorations under LACMA East and the Spaulding Lot, artificial fill was encountered up to three feet below ground surface. The artificial fill consists of sandy silt and sandy/silty clay with few rootlets, asphalt, and brick fragments. Localized backfill from archaeological excavation pits was also found between 15 and 20 feet deep at

LACMA East. With regard to the Ogden Lot, there was a previous 23-foot deep shored excavation covering most of the Ogden Lot. However, the shored excavation was abandoned and was backfilled in 2009/2010. Backfills on the Ogden Lot consist of silty/clayey sand and sandy clay and is considered secondary structural fill, which may be only used for supporting the floor slabs and pavement sections.

Generally beneath the artificial fill are alluvial deposits associated with the Lakewood Formation, which is exposed at the surface of the Project Site and at depths ranging from 12 to 16 feet below ground surface to a maximum thickness of approximately 40 feet below ground surface. The Lakewood Formation consists of medium dense fine to medium-grained silty sand with trace fine gravels interbedded with discontinuous flood plain fine-grained sediments consisting of clayey silt, lean clay, and sandy clay.

Underlying the alluvial deposits from the Lakewood Formation are shallow marine deposits from the San Pedro Formation, consisting of dense silty sand, sand, sand with salt, and varying amounts of fine gravel. The depth to the San Pedro formation varies from approximately 17 feet below ground surface to 50 feet below ground surface.

The entire Project Site is then underlain by marine sedimentary bedrock known as the Fernando Formation. The depth to the Fernando Formation ranges from 58.5 feet below ground surface to 82 feet below ground surface. The Fernando Formation was characterized by a transition to dark brown to black very fine sandy silt, clayey silt with fine sand, lean clay, and very fine sandy clay and some samples were impacted with varying amounts of tar.

(b) Liquefaction and Lateral Spreading

As discussed in the Geotechnical Evaluation, liquefaction is a phenomenon whereby saturated, granular soils lose their inherent shear strength due to excess pore water pressure buildup, such as that generated during repeated cyclic loading from an earthquake. A low relative density and loose consistency of the granular materials, shallow groundwater table, long duration and high acceleration of seismic shaking are some of the factors favorable to cause liquefaction. Liquefaction-related effects include sand boils, excessive settlement, bearing capacity failures, and lateral spreading. Based on the Seismic Hazards Maps of the State of California, the Project Site is not located within a potentially liquefiable area.⁴ Although groundwater may be present at relatively shallow depths at the Project Site, the soil below the groundwater level consists predominately of

⁴ California Geological Survey, *Earthquake Zones of Required Investigation, Hollywood Quadrangle*, released November 6, 2014.

fine-grained soils and dense to very dense, tar-impregnated sand with low liquefaction-susceptibility. Therefore, the potential for liquefaction is considered remote at the Project Site.

Lateral spreading is a phenomenon in which large blocks of intact, non-liquefied soil move downslope on a liquefied soil layer. Lateral spreading is often a regional event. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area, such as an unlined river channel. Since the potential for liquefaction at the Project Site is considered remote, the potential for lateral spreading at the Project Site is also considered remote.

(c) Subsidence

Subsidence generally occurs when a large portion of land is displaced vertically, usually due to the rapid and intensive withdrawal of subterranean fluids such as groundwater or oil. Historical ground subsidence related to fluid withdrawal has been documented within the vicinity of the Project Site. This subsidence has been primarily attributed to oil production from the petroleum reservoirs underlying the general area.

(d) Collapse

Soils prone to collapse exist in sandy, dry conditions. Collapsible soils typically have very low moisture content and low degree of saturation. Due to the high groundwater level and high degree of saturation of near surface salty and/or clayey soils, the potential for collapse is considered remote at the Project Site.

(e) Expansive Soils

Expansive soils are soils that swell when subjected to moisture and shrink when dried. Expansive soils are typically associated with clayey soils. According to the Geotechnical Evaluation, based on available soil investigations of the Project Site, the clay soils encountered within the artificial fill and alluvium are subject to expansion and shrinkage resulting from changes in the moisture content. The fine-grained clayey artificial fill and alluvial deposits have a medium to high expansion potential.

(f) Other Geologic Conditions

(i) Compressible Soils and Settlement

As discussed in the Geotechnical Evaluation, artificial fill and near-surface alluvial deposits may be compressible, particularly with the addition of water. Where present, these materials may be subject to load-induced settlement and are not suitable for support

of foundations, slabs-on-grade, paving, or new compacted fills. The thickness of artificial fill and alluvium are varying across the Project Site, resulting in a potential for settlement or differential settlement if any new loads are imposed on the fill and surface alluvium.

(ii) Corrosive Soils

Based on geotechnical explorations and sampling of the soils underlying the Project Site, the top 11 feet of surface soils were also found to be corrosive to severely corrosive to metals, and moderate corrosive to concrete. Corrosive soils are characterized by their ability to degrade concrete and corrode ferrous materials in contact with water or soil. In particular, concrete is susceptible to corrosion when it is in contact with soil or water that contains high concentrations of soluble sulfates.

(iii) Oil Wells

The Project Site is located within the limits of the Salt Lake Oil Field. There are two oil wells in the immediate vicinity of the Project Site. These wells include the Mars Oil Co. "Masselin" 1, located approximately 10 to 20 feet south of the Project Site, and the Wilshire Oil Producers Co. 2, located approximately 300 feet southeast of the Project Site. According to the Division of Oil, Gas, and Geothermal Resources, both wells are plugged and abandoned. There are no active or abandoned oil/gas wells within the footprint of the Project Site. The likelihood of encountering an abandoned oil/gas well during construction is low.

(iv) Tar Sands

As discussed in the Geotechnical Evaluation, tar sand (petroleum) material with light to heavy hydrocarbon odor was also encountered at depths 10 feet below ground surface. Soils excavated within the top 10 feet (and above the groundwater level) of the Project Site would contain lesser amount of natural oil or tar. Soils resulting from excavations for basement and foundation that extend more than 10 feet below ground surface or below groundwater could contain natural oil or tar.

(v) Methane

As discussed in the Geotechnical Evaluation, the Project Site is also located within an area delineated by the City of Los Angeles as a Methane Zone or zones with high potential for seepage of methane gas. Methane is a naturally occurring gas associated with the decomposition of organic materials. In high-enough concentrations, between 50,000 parts per million and 150,000 parts per million by volume in the presence of oxygen, methane can be considered as an explosion hazard. A methane investigation was conducted for LACMA East and the results are provided in the Methane Report, included

as Appendix F, of this Draft EIR. As discussed therein, results indicated the elevated concentration of methane exceeding 12,500 parts per million by volume.

(vi) *Landform Alteration*

No distinct or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, or wetlands are located at the Project Site.

3. Project Impacts

a. Methodology

To evaluate potential impacts relative to geology and soils, a Geotechnical Evaluation was prepared by AECOM, as provided in Appendix E, of this Draft EIR. The Geotechnical Evaluation included a review of available geologic and seismic data, published geotechnical literature relevant to the Project Site, and data from current and past geotechnical investigations performed at the Project Site.

b. Thresholds of Significance

In 2015, the California Supreme Court, in *CBIA v. BAAQMD*,⁵ held that CEQA generally does not require a lead agency to consider the impacts of the existing environment on the future residents or users of the project. The revised thresholds provided below are intended to comply with this decision. Specifically, the decision held that an impact from the existing environment to the project, including future users and/or residents, is not an impact for purposes of CEQA. However, if the project, including future users and residents, exacerbates existing conditions that already exist, that impact must be assessed, including how it might affect future users and/or residents of the project.

In accordance with Appendix G of the CEQA Guidelines and the *CBIA v. BAAQMD* decision, the following considerations have been evaluated in determining whether a project would have a significant impact related to geology and soils:

Would the project:

⁵ *California Building Industry Association v. Bay Area Air Quality Management District (2015) 62 Cal.4th 369, Case No. S213478.*

- Exacerbate existing hazardous environmental conditions by bringing people or structures into areas that are susceptible to 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 based on other substantial evidence of a known fault? Refer to Division of Mines and Geology⁶ Special Publication 42.
 - Strong seismic ground shaking
 - Seismic-related ground failure, including liquefaction
 - Landslides
- Result in substantial soil erosion or the loss of topsoil.
- 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 caused in whole or in part by the project's exacerbation of the existing environmental conditions.
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property caused in whole or in part by the project exacerbating the expansive soil conditions.
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

The County of Los Angeles has not adopted specific thresholds pursuant to CEQA Guidelines section 15064.7, however, in many instances it utilizes Appendix G of the CEQA Guidelines for considerations to determine whether a proposed project would have a significant effect on the environment. The City of Los Angeles, a Responsible Agency under CEQA for this EIR, has adopted specific local thresholds that incorporate the considerations reflected in Appendix G (the "L.A. CEQA Thresholds Guide"). While the County of Los Angeles is not required to utilize the City's local thresholds, the County has evaluated those thresholds and has determined based on substantial evidence in the entire record that the application of the City's thresholds to this Project is appropriate and sufficient to analyze the potential significant environmental effects of the Project as required by CEQA Guidelines section 15064.

⁶ *Now the California Geological Survey.*

Courts have recognized the appropriateness of using Appendix G in determining significance standards, including thresholds that are based on the considerations in Appendix G. The thresholds in the L.A. CEQA Thresholds Guide are specifically correlated to the Appendix G considerations and are further defined based on a variety of factors, including existing local, state and federal regulations, administrative practices of other public agencies, and commonly accepted professional standards. Accordingly, these thresholds are coextensive with considerations in Appendix G and therefore consistent with criteria the County has used in other contexts.

In addition, utilizing the thresholds of significance adopted by the City of Los Angeles for this Project is consistent with CEQA Guidelines section 15064.7(c), which encourages lead agencies to consider thresholds of significance previously adopted or recommended by other public agencies. Moreover, utilizing the City of Los Angeles' thresholds of significance for this Project will streamline the consideration of potential environmental impacts between the County, the lead agency for the Project, and the City of Los Angeles, a responsible agency, resulting in more consistent and efficient analyses among the agencies.

Specifically, in the context of these questions from the CEQA Guidelines, the *L.A. CEQA Thresholds Guide* states that a project would normally have a significant geology and soils impact if the project would:

- Cause or accelerate geologic hazards, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.
- Constitute a geologic hazard to other properties by causing or accelerating instability from erosion; or
- Accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition which would not be contained or controlled on-site.
- One or more distinct and prominent geologic or topographic features would be destroyed, permanently covered, or materially and adversely modified as a result of the project. Such features may include, but are not limited to, hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands.

With regard to the above question from Appendix G of the CEQA Guidelines regarding liquefaction, as discussed in the Initial Study for the Project, which is included in Appendix A of this Draft EIR, based on the Seismic Hazards Maps of the State of California, the Project Site is not located within a potentially liquefiable area. Therefore, as

concluded in the Initial Study, no impact from liquefaction would occur, and no mitigation measures are required.

With regard to the above question from Appendix G of the CEQA Guidelines regarding landslides, as discussed in the Initial Study for the Project, which is included in Appendix A of this Draft EIR, the Project Site and surrounding area are fully developed and generally characterized by flat topography. In addition, based on the State of California Seismic Hazards Map, Hollywood Quadrangle, the Project Site is not located in a landslide area as mapped by the State, nor is the Project Site mapped as a landslide area by the City of Los Angeles. Furthermore, the development of the Project does not require substantial alteration to the existing topography. Therefore, as concluded in the Initial Study, the Project Site would not be susceptible to landslides. No impact from landslides would occur, and no mitigation measures are required.

With regard to the above question from Appendix G of the CEQA Guidelines regarding the ability of soils to support septic tanks or alternative wastewater disposal systems, as discussed in the Initial Study for the Project, the Project Site is located within a community served by existing sewer infrastructure. Therefore, wastewater generated by the Project would be accommodated via connections to the existing sewage infrastructure located in the vicinity of the Project Site. As such, the Project would not require the use of septic tanks or alternative wastewater disposal systems. Thus, as concluded in the Initial Study, the Project would not result in impacts related to the ability of soils to support septic tanks or alternative wastewater disposal systems, and no mitigation measures are required.

c. Project Design Features

No specific project design features are proposed with regard to geology and soils.

d. Analysis of Project Impacts

(1) Seismic Hazards

(a) Fault Rupture

Ground rupture is the visible breaking and displacement of the earth's surface along the trace of a fault during an earthquake. As previously discussed, based on research of available literature and the findings of the Geotechnical Evaluation, no known active or potentially active faults underlie the Project Site. In addition, the Project Site is not located within an Alquist–Priolo Earthquake Fault Zone, as mapped by the CGS. The closest major active (and zoned) fault near the Project Site with surface expression is the Hollywood Fault, which, as discussed above, is located approximately 2.2 miles northwest

of the Project Site. Therefore, no active faults with the potential for surface fault rupture are known to pass directly beneath the Project Site, and as such, the potential for surface rupture due to faulting occurring beneath the Project Site is considered low. Thus, the Project would not exacerbate an existing environmental condition or cause or accelerate geologic hazards related to fault rupture as no known active or potentially active faults underlie the Project Site, which could result in substantial damage to proposed structures or infrastructure, or expose people to substantial risk of injury. Impacts associated with fault rupture from a known earthquake fault would be less than significant, and no mitigation measures are required.

(b) Strong Seismic Ground Shaking

The Project Site is located within the seismically active region of Southern California and most of Southern California is potentially subject to strong ground motion from movement along a fault or fault zone. Ground shaking can occur in areas adjacent to an earthquake epicenter, as well as in more distant areas for many miles in all directions. Thus, the Project Site could be subject to strong seismic ground shaking and impacts associated with seismic ground shaking could be potentially significant. However, strong ground shaking is common to Southern California, and potential damage caused by seismic shaking is typically reduced through proper structural design and construction techniques that are required as part of compliance with state and local seismic regulations.

As with any new development in the State of California, Project building design and construction would be required to conform to the current seismic design provisions of the California Building Code to minimize potential seismic impacts. Construction of the Museum Building would also be required to adhere to the seismic safety requirements contained in the Los Angeles County Building Code and construction of the Ogden Parking Structure would be required to comply with the Los Angeles Building Code. In addition, the proposed Museum Building would be required to comply with the site plan review and permitting requirements of the County of Los Angeles Department of Public Works, Building and Safety Division, including the recommendations provided in site-specific geotechnical reports subject to Building and Safety Division's review and approval. Similarly, the Ogden Parking Structure would comply with the permitting requirements of the City of Los Angeles Department of Building and Safety, including the recommendations provided in a final, site-specific geotechnical report subject to review and approval by the City of Los Angeles Department of Building and Safety. Compliance with regulatory requirements would ensure Project construction adheres to the seismic safety requirements contained in the state, County, and City Building Codes, as applicable, and that site-specific engineering recommendations are implemented in accordance with a design-level geotechnical investigation. Therefore, with compliance with applicable regulatory requirements, the Project would not exacerbate existing environmental conditions or cause or accelerate geologic hazards related to strong seismic ground

shaking, which could result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. Thus, potential impacts related to strong seismic ground shaking would be less than significant. No mitigation measures are required.

(2) Soil Erosion

Sedimentation and erosion could potentially occur as a result of exposed soils during construction of the Project. However, construction activities would occur in accordance with erosion control requirements, including grading and dust control measures, imposed by the County and City pursuant to grading permit regulations. In addition, as discussed in detail in Section IV.G, Hydrology, Water Quality, and Groundwater, of this Draft EIR, the Project would be required to have a Storm Water Pollution Prevention Plan pursuant to National Pollutant Discharge Elimination System permit requirements. As part of the Storm Water Pollution Prevention Plan, Best Management Practices would be implemented during construction to reduce sedimentation and erosion levels to the maximum extent possible. The Project also would comply with South Coast Air Quality Management District Rule 403, which requires the implementation of best available fugitive dust control measures during active construction periods capable of generating fugitive dust emissions from on-site earth-moving activities, construction/demolition activities, and construction equipment travel on paved and unpaved roads, as discussed in Section IV.B, Air Quality, of this Draft EIR. With compliance with regulatory requirements and implementation of appropriate Best Management Practices, impacts with respect to soil erosion and the loss of topsoil associated with Project construction would be less than significant. No mitigation measures are required.

(3) Lateral Spreading

As discussed above, liquefaction-related effects include sand boils, excessive settlement, bearing capacity failures, and lateral spreading. Based on the Seismic Hazards Maps of the State of California, the Project Site is not located within a potentially liquefiable area. In addition, although groundwater may be present at relatively shallow depths at the Project Site, the soil below the groundwater level consists predominately of fine-grained soils and dense to very dense, tar-impregnated sand with low liquefaction-susceptibility. Therefore, the potential for liquefaction is considered remote at the Project Site. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area, such as an unlined river channel. As described in Section II, Project Description, of this Draft EIR, the Project Site is located in an urbanized area and is primarily surrounded by commercial uses, residential uses, and open space. The Project Site is also relatively flat and is not surrounded by an unlined river channel or similar feature. As the potential for liquefaction to occur on the Project Site is considered remote, the potential for lateral spreading to

occur at the Project Site is also considered remote. Thus, potential impacts related to lateral spreading would be less than significant, and no mitigation measures are required.

(4) Subsidence

As previously discussed, subsidence generally occurs when a large portion of land is displaced vertically, usually due to the rapid and intensive withdrawal of subterranean fluids such as groundwater or oil. Historical ground subsidence related to fluid withdrawal has been documented in the vicinity of the Project Site. This subsidence has been primarily attributed to oil production from the petroleum reservoirs underlying the general area. In addition, as described in the Geotechnical Evaluation, the groundwater level is assumed to be at the existing ground surface for LACMA East/Spaulding Lot and eight feet below ground surface for the Ogden Lot. Grading for the Project would require excavations up to approximately 25 feet below the existing ground surface for the basement level under the Museum Building and subterranean parking as part of the Ogden Parking Structure. Therefore, in the event groundwater is encountered during construction of the Project, temporary dewatering or other withdrawals of groundwater could be required within the Project Site. However, no permanent dewatering is anticipated for operation of the Project. As temporary dewatering would not cause a rapid and intensive withdrawal of subterranean fluids, the Project would not have the potential to cause subsidence. Thus, the Project would not exacerbate, cause, or accelerate geologic hazards related to subsidence. Therefore, impacts related to subsidence would be less than significant.

(5) Collapse

As discussed above, soils prone to collapse exist in sandy, dry conditions. Collapsible soils typically have very low moisture content and low degree of saturation. Due to the high groundwater level and high degree of saturation of near surface salty and/or clayey soils, the potential for collapse is considered remote at the Project Site. Therefore, impacts related to collapse would be less than significant, and no mitigation measures are required.

(6) Expansive Soils

As discussed above, based on soil investigations of the Project Site, the clay soils encountered within the artificial fill and alluvium are subject to expansion and shrinkage resulting from changes in the moisture content. The fine-grained clayey artificial fill and alluvial deposits have a medium to high expansion potential. The Geotechnical Evaluation provides recommendations to reduce impacts related to expansive soils. Specifically, the Geotechnical Evaluation recommends performing a detailed assessment of the potential for expansive soils during the design phase of the Project, in which mitigation techniques would be developed, as enforced through Mitigation Measure D-1. Examples of techniques

include over-excavation and replacement with non-expansive soil, soil treatment, moisture management, and/or specific structural design for expansive soil conditions developed during design of the Project. Based on the above, the Project would not create substantial risks to life or property associated with expansive soils, and potential impacts related to expansive soils would not be exacerbated by the Project. With implementation of Mitigation Measure D-1, impacts related to expansive soils would be less than significant.

(7) Other Geologic Conditions

(a) Compressible Soils and Settlement

As discussed above, the thickness of artificial fill and alluvium are varying across the Project Site, resulting in a potential for settlement or differential settlement if any new loads are imposed on the fill and surface alluvium. As described in the Geotechnical Evaluation, the Museum Building has been designed to include a base isolation system to address potential settlement. In addition, it is anticipated that the Museum Building would be supported on deep foundation systems, embedded into the underlying dense/stiff San Pedro and Fernando Formations. Furthermore, the existing secondary structural fill at the Ogden Lot would be completely removed and the Ogden Parking Structure would be supported on deep foundations. Therefore, with implementation of site-specific design recommendations, the potential for settlement from potentially compressible existing fill and near-surface alluvium is unlikely.

(b) Corrosive Soils

As discussed above, based on geotechnical explorations and sampling of the soils underlying the Project Site, the top 11 feet of surface soils were also found to be corrosive to severely corrosive to metals, and moderate corrosive to concrete. The Geotechnical Evaluation provides recommendations to reduce impacts related to corrosive soils. Specifically, the Geotechnical Evaluation states that measures to reduce the potential effects of corrosive soils would be developed in the detailed design phase as enforced through Mitigation Measure D-1. Examples of measures include the use of concrete resistant to sulfate exposure, epoxy and metallic protective coatings, the use of alternative (corrosion resistant) materials, and selection of appropriate type of cement and water/cement ratio. The Project would also adhere to the California Building Code requirements with regard to corrosive soils. With implementation of Mitigation Measure D-1 and compliance with regulatory recommendations, impacts related to corrosive soils would be less than significant.

(c) Oil Wells

As discussed in the Geotechnical Evaluation, the Project Site is located within the limits of the Salt Lake Oil Field. Although it was concluded that the likelihood of encountering an abandoned oil/gas well during construction is low, should any known or previously undiscovered oil production wells be encountered on the Project Site during construction activities, Mitigation Measure D-2 would be implemented to reduce potential impacts to a less than significant level.

(d) Tar Sands

As discussed above, excavations for basement and foundation that extend more than 10 feet below ground surface or below groundwater could contain natural oil or tar. As discussed in the Tar Migration Memorandum, as tar migrates, it could manifest through to the surface through cracks. The tar migration mechanism can be affected by both natural and man-made causes. While the natural causes of tar migration would remain unchanged after Project construction is complete, the various construction activities occurring under the Project, and in the surrounding Project vicinity, may have varying degrees of man-made impact on the existing tar migration pattern. To address potential impacts associated with tar sands (petroleum), Mitigation Measure D-3, which would require chemical analysis for off-site disposal characterization, is provided below. In addition, as set forth in Mitigation Measure D-1, the Project would implement recommendations with regard to tar sands (petroleum), including underpinning,⁷ strengthening, and/or temporary protection in place. Furthermore, as discussed in the Tar Migration Memorandum, in order to control tar migration due to the proposed construction activities, the Project would implement Mitigation Measure D-4, which would require the implementation of an instrumentation program to monitor all known surface manifestation and potential locations such as cracks on the paved surface or floor slabs identified within the Project vicinity. In order to establish a baseline, the Project would also obtain information from the Los Angeles County Metropolitan Transportation Authority (Metro) and incorporate the records and observations from the relevant construction activities by Metro into the instrumentation program. If any sign of excessive deformation is observed, excavation will be temporarily halted and the issue corrected immediately. With implementation of Mitigation Measure D-1, D-3, and D-4, impacts related to tar sands (petroleum) would be less than significant.

⁷ *Underpinning involves the placement of a solid foundation that is laid below the ground level to support or strengthen a building.*

(e) *Methane*

As previously noted, Methane Specialists conducted a methane investigation at LACMA East, and results indicate the elevated concentration of methane exceeding 12,500 parts per million by volume. As provided in the Methane Report, the Project would comply with the more stringent of the provisions in both the City and the County methane ordinances. The Ogden Parking Structure would be permitted under the jurisdiction of the City and would comply with the City methane ordinance. Compliance with the City and County methane ordinances includes adherence to construction controls/precautions, implementation of active and passive systems, implementation of an operations and maintenance plan, and the development of an emergency plan. The County Department of Public Works Environmental Programs Division would review the construction plans and other methane measures prior to the issuance of building permits for the Museum Building. The City Department of Building and Safety would ensure compliance with the City's methane ordinance before issuing building permits for the Ogden Parking Structure. With compliance with the City and County methane ordinance, impacts related to methane would be less than significant, and no mitigation measures are required.

(f) *Landform Alteration*

As described above, there are no distinct and prominent geologic or topographic features (i.e., hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, or wetlands) on the Project Site or vicinity. Therefore, the Project would not destroy, permanently cover, or materially and adversely modify any distinct and prominent geologic or topographic features. Impacts associated with landform alteration would not occur, and no mitigation measures are required.

4. Cumulative Impacts

Due to the site-specific nature of geological conditions (i.e., soils, geological features, subsurface features, seismic features, etc.), geology impacts are typically assessed on a project-by-project basis, rather than on a cumulative basis. Nonetheless, cumulative growth through 2023, the Project's build out year, (inclusive of the 34 related projects identified in Section III, Environmental Setting, of this Draft EIR) would expose a greater number of people to seismic hazards. However, as with the Project, related projects and other future development projects would be subject to established guidelines and regulations pertaining to building design and seismic safety, including those set forth in the California Building Code and City of Los Angeles Building Code, as appropriate.⁸

⁸ *All related projects in the vicinity of the Project Site are within the City of Los Angeles and, unlike the Project, would not be subject to County Building Code requirements.*

Therefore, with adherence to such regulations, cumulative impacts with regard to geology and soils would be less than significant.

5. Mitigation Measures

The following mitigation measures would ensure that potential impacts associated with expansive soils and other geologic conditions would be reduced to less than significant levels:

Mitigation Measure D-1: A final site-specific, design-level geotechnical, geologic, and seismic hazard investigation report that complies with all applicable state and local code requirements shall be prepared by a qualified geotechnical engineer and certified engineering geologist and submitted to the Los Angeles County Building and Safety Division for review. The site-specific, design-level geotechnical reports shall address each of the potential geologic hazards addressed in the *Preliminary Geotechnical Evaluation Los Angeles County Museum of Art 5905 Wilshire Boulevard, Los Angeles, California 90036* prepared by AECOM, August 2016, revised September 2017. The site-specific, design-level geotechnical report shall include recommendations for fills and compaction, foundation, expansive soils, corrosive soils, and tar sands.

Mitigation Measure D-2: Should any known or previously undiscovered oil production wells be encountered on the Project Site during construction activities, the Applicant shall halt work in the immediate area and notify the California Division of Oil, Gas, and Geothermal Resources and the Los Angeles Fire Department (LAFD). Any wells encountered shall be abandoned or re-abandoned in accordance with the requirements set forth by the California Division of Oil, Gas, and Geothermal Resources and the Los Angeles Fire Department.

Mitigation Measure D-3: Excavation spoils shall require chemical analysis for disposal characterization. If excavation spoils are characterized as non-hazardous, the spoils can be disposed of at a treatment, disposal, and storage facility. However, if the spoils are characterized as hazardous, the spoils shall be disposed at a hazardous waste facility.

Mitigation Measure D-4: The Project shall implement an instrumentation program to monitor all known surface manifestation and potential locations such as cracks on the paved surface or floor slabs identified within the Project vicinity. In addition, periodic monument survey on selected ground features and critical locations on the installed shoring system shall be performed to ensure the performance of excavation support meets design criteria. If any sign of excessive

deformation is observed, excavation shall be temporarily halted and the issue shall be corrected immediately. Furthermore, the Project shall request a review of any relevant instruction information generated by Metro as part of pre-construction baseline conditions.

6. Level of Significance After Mitigation

Considering the investigation process required under the engineering standard of care, compliance with state laws and County and City regulatory requirements, technical review and approval by the County Building and Safety Division and City Department of Building and Safety of a design-level geotechnical engineering report, and adherence to the mitigation measures proposed above, the Project's impacts related to geology and soils would be less than significant. In addition, cumulative impacts with regard to geology and soils would be less than significant.