3.7 GEOLOGY, SOILS, MINERALS, AND PALEONTOLOGICAL RESOURCES

This section contains an analysis of impacts related to geology, soils, mineral resources, and paleontological resources. The analysis describes seismic hazards, soil conditions, and other geotechnical considerations that could affect people and structures that could be within the SOIA Area in the future. The proposed SOIA is evaluated relative to its potential to affect regionally significant mineral deposits or paleontologically sensitive geologic formations.

3.7.1 ENVIRONMENTAL SETTING

REGIONAL GEOLOGY

The SOIA Area is located in the San Joaquin Valley of the Northern Section of the Great Valley Geomorphic Province (GVGM). The relatively flat valley is bounded by Cascade Range to the North, Coast Ranges to the West, the Sierra Nevada to the East, and Coast Ranges and the Tehachapi Mountains to the South (Page, 1986). The GVGM is approximately 400 miles long and 50 miles wide.

The San Joaquin Valley is predominately made up of sedimentary units from the Cretaceous to the Quaternary Periods (Dawson 2009). Minority units include metamorphic rocks from the Jurassic Period and volcanic rocks from the Neogene Period (Dawson 2009). The geomorphic subunits of the GVGM include the delta, river floodplain, alluvial plain and low foothills. The SOIA Area is located on the river floodplain which contains unconsolidated, inorganic soils. Floodplain sediment is deposited when a river or a stream overflows its natural levees.

REGIONAL SEISMICITY

Seismicity is the likelihood of an area to be subjected to earthquake activity. Seismic activity has consequential geologic hazards such as: ground shaking, liquefaction, lateral spreading, landslides, avalanches, and ground displacement. These geologic hazards create structural hazards of infrastructure.

FAULTING

A fault is fracture or a fracture zone where there has been measurable displacement between each side of the fracture. Faults form in rocks when regional stresses overcome the strength of the rock to create fracture with measureable slip. Faults are rarely isolated geological features. A group of faults that develop from the same region in the same time interval are referred to as a Fault System. Fault systems are associated with relative movement of the earth's crust due to tectonic activity. Based on historic seismic activity, faults are categorized as active, potentially active, or inactive. According to the Alquist-Priolo Act, an active fault is one that has ruptured in the last 11,000 years.

There are no faults in the SOIA Area or in the vicinity of the SOIA Area that are considered active, potentially active, or inactive by the Alquist-Priolo definition.

SEISMIC HAZARDS

Fault Rupture

Fault rupture is the displacement of the ground surface along the fault. There are two types of fault rupture: seismic and aseismic. Seismic faults have a stick-slip behavior. Stress builds up along the fault (the stick phase) until the fault can no longer accommodate the stress and displaces (the slip phase). The slip phase is the cause of an earthquake. Aseismic faults experience offset at such a slow rate that an earthquake is not generated. This is also referred to as fault creep. Above ground and underground structures cannot accommodate fault movement and must be mitigated.

Ground Shaking

The Modified Mercalli Intensity scale us currently used the United States to assign intensity of ground shaking from an earthquake in a specific location. In contrast, the Richter Scale is used to measure the amount of energy released during an earthquake. The Richter Scale is logarithmic and the Modified Mercalli is arbitrary based on observations. A summary of the Modified Mercalli Scale is below:

Table 3.7-1. Modified Mercalli Scale

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS 1989, http://earthquake.usgs.gov/learn/topics/mercalli.php

Ground Failure

Liquefaction is when saturated sediments temporarily loose there cohesion during an earthquake and behave like a viscous liquid instead of a solid. The earthquake waves increase the water pressure in the sediment, forcing the particles apart. Liquefaction is a hazard in areas with recently deposited sediment with high groundwater levels. This process can cause the loss of foundation-bearing capacity of buildings resulting in the structure to settle or tip. Lighter structures such as underground storage tanks can rise through the liquefied soil.

Lateral spreading is when there is lateral ground movement with some vertical component caused by liquefaction. The soil rides on top of the liquefied later of sediment causing ground cracking and settlement.

Landslides and Slope Failures

Landslides are a type of mass wasting event when surface material of a slope travels to the base. Mass wasting events are an erosional process of downslope movement of soil or rock material driven by gravity. Mass wasting events are commonly triggered by triggered by rainfall or earthquakes. The type and severity of a mass wasting event is controlled by underlying geology, slope, and climate.

SOILS

The predominant soil type in the SOIA Area is the San Joaquin silt loam. It is a moderately well drained soil derived dominantly granitic rocks (USDA 1993). A typical soil profile contains a surface layer strong brown silt loam, a claypan of yellowish red clay loam, an indurated hard, a hardpan of strongly cemented silica, and a substratum of a yellowish brown loam. Other soil types in the SOIA Area include: Bruella, Galt, San Joaquin-Durixeralfs, and San Joaquin-Galt. A summary of the soil types found in the SOIA Area is below:

Table 3.7-2. Soil Types Found in the SOIA Area

Soil Name	Percentage of SOIA Area	Surface Texture	Source Material	Depth to Restrictive Feature	Drainage Class	Restraints
Bruella	19.0%	sandy loam, 0–2% slopes	Alluvium derived from granite	More than 80 inches	Well Drained	Slight/ Moderate
Galt	12.2%	clay, leveled, 0–1% slopes	Alluvium derived from granite	32 to 60 inches to duripan	Moderately Well Drained	Severe
Galt	7.3%	clay, 0–2% slopes	Alluvium derived from granite	32 to 60 inches to duripan	Moderately Well Drained	Severe
San Joaquin	13.5%	silt loam, leveled, 0–1% slopes	Alluvium derived from granite	28 to 54 inches to duripan	Moderately Well Drained	Moderate/ Severe
San Joaquin	21.3%	silt loam, 0–3% slopes	Alluvium derived from granite	28 to 40 inches to hardpan	Moderately Well Drained	Moderate/ Severe
San Joaquin-Durixeralfs	1.1%	complex, 0–1% slopes	Alluvium derived from granite	28 to 54 inches to duripan	Moderately Well Drained	Moderate/ Severe
San Joaquin-Galt	4.0%	complex, leveled, 0–1% slopes	Alluvium derived from granite	20 to 46 inches to duripan	Moderately Well Drained	Moderate/ Severe
San Joaquin-Galt	21.1%	complex, 0–3% slopes	Alluvium derived from granite	28 to 54 inches to duripan	Moderately Well Drained	Moderate/ Severe

Source: USDA 1993

PALEONTOLOGICAL RESOURCES

Fossils are any remains, trace, or imprint of a plant or animal from the geologic past that has been preserved in rock. Cenozoic (66 million years ago to the present) vertebrates, commonly mammals, have been documented in Sacramento County. The mammalian fossils include: horses, camels, canines, moles, rodents, and mammoths. All the documented fossil discoveries in the county have been from the Riverbank Formation. The Riverbank Formation is composed of sediment from the Sierra Nevada and deposited by fluvial and alluvial processes. The SOIA Area lies on exposed are of the middle member of the Riverbank Formation (Dawson 2009).

3.7.2 REGULATORY FRAMEWORK

FEDERAL

Soil and Water Resources Conservation Act of 1977

The Soil and Water Resources Conservation Act of 1977, as amended (RCA) provides the U.S. Department of Agriculture (USDA) broad strategic assessment and planning authority for the conservation, protection, and enhancement of soil, water, and related natural resources. Through RCA, USDA:

- appraises the status and trends of soil, water, and related resources on non-Federal land and assesses their capability to meet present and future demands;
- evaluates current and needed programs, policies, and authorities; and
- develops a national soil and water conservation program to give direction to USDA soil and water conservation activities.

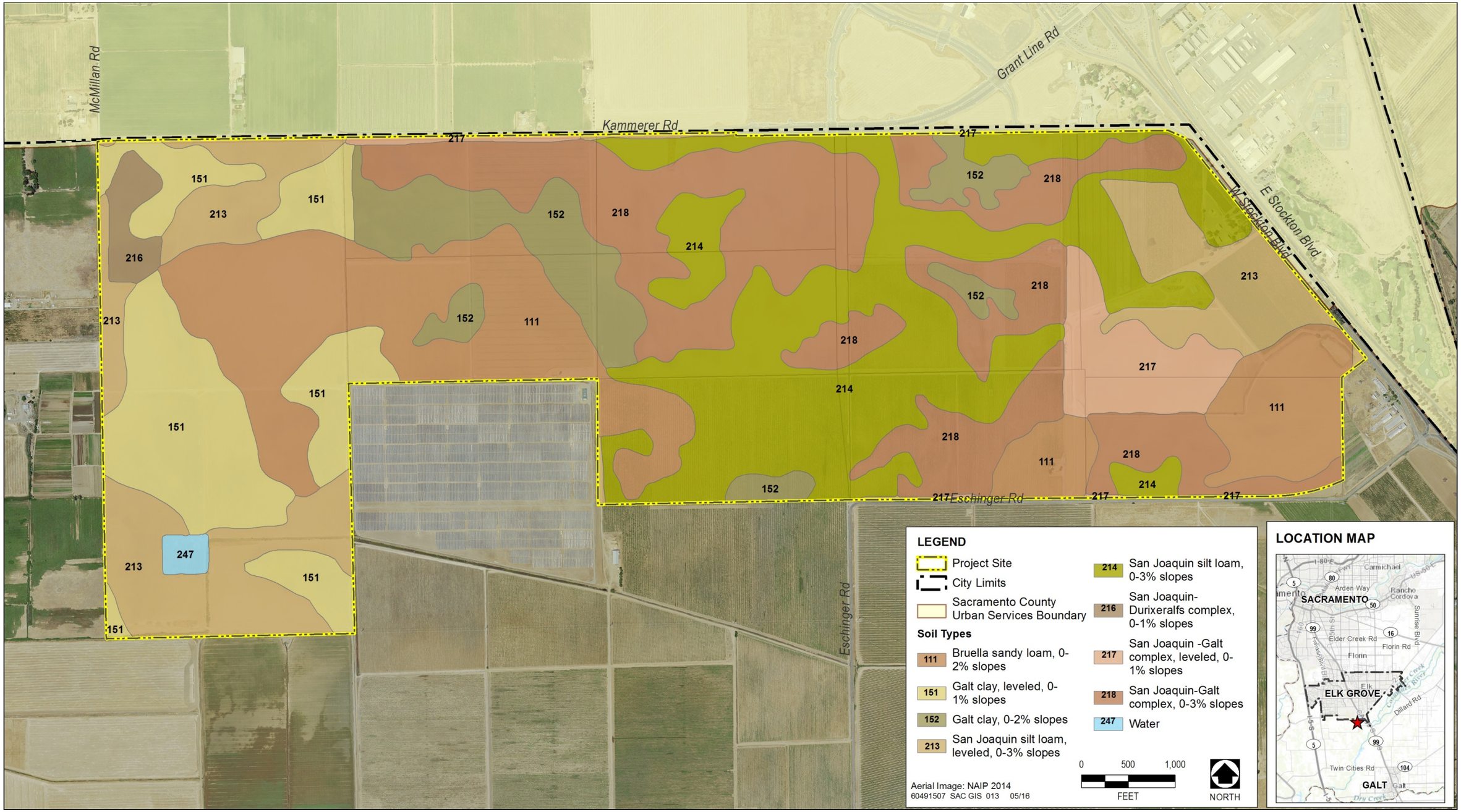
Federal Earthquake Hazards Reduction Act

This act was passed in 1977 by US congress to reduce the risks of life and property from future earthquakes through the establishment and maintenance if an effective hazards and reduction program. The National Earthquake Hazards Reduction Program (NEHRP) was established to improve understanding, characterization, and predictions of earthquake hazards and vulnerabilities; improved building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improved mitigation capacity; and accelerated application of research results.

The NEHRP designates the Federal Emergency Management Agency (FEMA) as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Other NEHRP agencies include the National Institute of Standards and Technology, the National Science Foundation, and the U.S. Geological Survey (USGS).

Uniform Building Code

The Uniform Building Code (UBC) provides site development and construction standards. The UBC is widely used throughout the United States and is generally adopted on a district-by-district or state-by-state basis. The UBC has been modified for California conditions with more detailed and more stringent regulations (see below for discussion of California building code standards).



Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at htttp://websoilsurvey.nrcs.gov/. Accessed 5-13-16.

Exhibit 3.7-1 **Soil Map**

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Clean Water Act

The Clean Water Act (CWA) regulates discharges into waters of the United States, including a range of potential point and nonpoint sources of water-transported pollutants, and the discharge of fill into waters, such as wetlands and intermittent stream channels. The purpose of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters through prevention and elimination of pollution. However, compliance with CWA requirements also has co-benefits related to reduction of soil erosion that are relevant for this section of the EIR. Implementation of the CWA has state and regional elements and, although this is the federal regulatory subsection, relevant State and regional responsibilities are highlighted here, with further detail below under the State regulatory framework subsection below.

The law requires that a CWA Section 404 permit be obtained from the U.S. Army Corps of Engineers (USACE) for any dredged or fill materials discharged into wetlands or waters of the United States whether the discharge is temporary or permanent. A National Pollutant Discharge Elimination System permit is required through the appropriate regional water quality control board (RWQCB).

Clean Water Act (CWA) Section 402 mandates that certain types of construction activity comply with the requirements of Environmental Protection Agency's National Pollution Discharge Elimination System (NPDES) stormwater program. Construction activities that disturb one or more acres of land must obtain coverage under the NPDES general construction activity stormwater permit, which is issued by the RWQCB. Obtaining coverage under the NPDES general construction activity stormwater permit generally requires that the project applicant complete the following steps:

- File a Notice of Intent with RWQCB that describes the proposed construction activity before construction begins;
- Prepare a Storm Water Pollution Prevention Plan (SWPPP) that describes Best Management Practices (BMPs) that would be implemented to control accelerated erosion, sedimentation, and other pollutants during and after project construction; and
- File a notice of termination with RWQCB when construction is complete and the construction area has been permanently stabilized.

The SWRCB adopted Order 2009-0009-DWQ for a new statewide NPDES Construction General Permit # CA000002 on September 2, 2009 that took effect on July 1, 2010 (SWRCB 2010). This General Permit imposes more minimum BMPs and establishes three levels of risk-based requirements based on both sediment risk and receiving water risk. All dischargers are subject to narrative effluent limitations. Risk level 2 dischargers are subject to technology-based numeric action levels (NALs) for pH and turbidity. Risk level 3 dischargers are subject to NALs and numeric effluent limitations (NELs). Certain sites must develop and implement a SWPPP and Rain Event Action Plan (REAP) and all projects must perform effluent monitoring and reporting, along with receiving water monitoring and reporting. The General Permit requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements. For projects commencing on or after July 1, 2010, the applicant must electronically submit Permit Registration Documents (PRDs) prior to commencement of construction activities including the Notice of Intent,

Risk Assessment, Post-Construction Calculations, a Site Map, the SWPPP, a signed certification statement by the Legally Responsible Person (LRP), and the first annual fee.

STATE

California Building Code

The California Building Standards Code (CBC) establishes minimum building requirements for renovation and construction. The CBC contains provisions intended to regulate grading activities, drainage and erosion control, and construction on unstable soil (expansive soils or areas subject to liquefaction). When no other building codes apply, Chapter 29 regulates excavations, foundations, and retaining walls. Chapter 18 of the Building Code contains provisions related to Soils and Foundations, including geotechnical investigations (Section 1803); excavation, grading and fill (Section 1804); assessing soil load-bearing capacity (Section 1806); and foundation design (Sections 1808-1810). The Residential Code contains provisions regarding soil testing, geotechnical evaluations for building foundations, and excavations for compressible or shifting soils (Section R401), foundations on expansive soils (Section R403), and seismic provisions (Section R301) (CBSC 2013).

In addition, the Green Building Standards Code (CALGreen) contains provisions for construction of nonresidential buildings regarding soil erosion and stormwater runoff, and grading activities (Section 5.106). It also contains measures related to soil analysis and protection requirements, and topsoil protection as part of the residential mandatory measures (Chapter 4) (CBSC 2013).

Updates to the California Building Standards Code were published in July of 2016. These updates, including updates to the CALGreen code, took effect beginning January 1, 2017.

California Seismic Hazards Mapping Act

The California Seismic Hazards Mapping Act (California Public Resources Code Section 1690-2699.6) addresses seismic hazards other than surface rupture, such as liquefaction and induced landslides. The Seismic Hazards Mapping Act specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Prolo Earthquake Fault Zoning Act of 1972 requires the State Geologist to delineate Earthquake Fault Zones along known active faults that have a relatively high potential for ground rupture. Faults must meet the definition of “sufficiently active” and “well-defined” to be included as an Earthquake Fault Zone. These zones extended 200 to 500 feet on either side of the fault. An area of 50 feet on either side of an active fault trace is assumed to underlain by the fault, unless proven otherwise. No structures for human occupancy may be built across an identified active fault trace. Proposed construction in an Earthquake Fault Zone is permitted only following the completion of a fault location report prepared by a California Registered Geologist.

National Pollutant Discharge Elimination System Permit

In California, the State Water Resources Control Board (SWRCB) administers the U.S. Environmental Protection Agency’s promulgated regulations (55 Code of Federal Regulations 47990) requiring the permitting of

stormwater-generated pollution under the National Pollutant Discharge Elimination System (NPDES). In turn, the SWRCB's jurisdiction is administered through Regional Water Quality Control Boards. Pursuant to these federal regulations, an operator must obtain a General Permit under the NPDES Stormwater Program for all construction activities with ground disturbance of one acre or greater. The General Permit requires the implementation of best management practices (BMPs) to reduce pollutant loads into the waters of the State and measures to reduce sediment and erosion control. In addition, a Stormwater Pollution Protection Plan (SWPPP) must be prepared. The SWPPP addresses water pollution control during construction. SWPPPs require that all stormwater discharges associated with construction activity, where clearing, grading, and excavating results in soil disturbances, must by law be free of site pollutants. Water Quality Order 99-08-DWQ requires permittees to implement specific sampling and analytical procedures to determine whether BMPs implemented on a construction site are (1) preventing further impairment by sediment in stormwater discharged directly into waters listed as impaired for sediment or silt, and (2) preventing other pollutants, that are known or should be known by permittees to occur on construction sites and that are not visually detectable in stormwater discharges, from causing or contributing to exceedances of water quality objectives. Further, the order contains information regarding the type of construction covered and not covered by the general permit, notification requirements, and a description of general permit conditions.

LOCAL

City of Elk Grove

The City of Elk Grove General Plan establishes policies to guide long-term development and conservation within the City's planning area. The City's General Plan policies and actions related to geology, soils, seismicity, and paleontological resources that may apply to potential future development in the SOIA Area are provided below.

- **Policy SA-25:** The City supports efforts by Federal, State, and other local jurisdictions to investigate local seismic and geological hazards and support those programs that effectively mitigate these hazards.

  - **SA-25-Action 1:** Implement the Uniform Building Code to ensure that structures meet all applicable seismic standards.

- **Policy SA-26:** The City shall seek to ensure that new structures are protected from damage caused by geologic and/or soil conditions.

  - **SA-26 Action 1:** Require that a geotechnical report or other appropriate analysis be conducted to determine the shrink/swell potential and stability of the soil for public and private construction projects and identifies measures necessary to ensure stable soil conditions.

- **HR-6-Action 1:** In areas identified in the Background Report as having a significant potential for containing archaeological or paleontological artifacts, require completion of a detailed on-site study as part of the environmental review process. Implement all recommended mitigation measures.

- **HR-6-Action 2:** Impose the following conditions on all discretionary projects in areas which do not have a significant potential for containing archaeological or paleontological resources:

  - "The Planning Division shall be notified immediately if any prehistoric, archaeologic, or paleontologic artifact is uncovered during construction. All construction must stop and an archaeologist that meets the

Secretary of the Interior's Professional Qualifications Standards in prehistoric or historical archaeology shall be retained to evaluate the finds and recommend appropriate action."

- "All construction must stop if any human remains are uncovered, and the County Coroner must be notified according to Section 7050.5 of California's Health and Safety Code. If the remains are determined to be Native American, the procedures outlined in CEQA Section 15064.5 (d) and (e) shall be followed."

3.7.3 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

METHODOLOGY

Important characteristics of the SOIA Area were evaluated based on previous studies and documentation. Impacts are evaluated assuming that the entire SOIA Area could potentially be subject to development, using the land use scenario developed for the purposes of analysis (see Chapter 2 of the EIR for more detail).

THRESHOLDS OF SIGNIFICANCE

Geology, Soils, and Mineral Resources

Based on Appendix G of the CEQA Guidelines, an impact is considered significant if the proposed project would:

- Expose people or structures 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 or based on other substantial evidence of a known fault;
  - Strong seismic ground shaking;
  - Seismic-related ground failure, including liquefaction; or
  - 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;
- 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;
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater;
- Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state; or

- Result in the loss of availability of a locally important mineral resource recovery site.

Paleontological Resources

For the purpose of this analysis, the following applicable thresholds of significance have been used to determine whether implementing the proposed project would result in a significant impact. These thresholds of significance are based on the CEQA Guidelines, which state that a paleontological resources impact is considered significant if implementation of the proposed project would:

- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

For the purposes of this EIR, a unique resource or site is one that:

- Has a high potential paleontological productivity rating; and
- Is known to have produced unique, scientifically important fossils.

The potential paleontological productivity rating of a rock unit exposed at a project site refers to the abundance or density of fossil specimens and/or previously recorded fossil sites in exposures of the unit in and near a project site. Exposures of a specific rock unit at a project site are most likely to yield fossil remains representing particular species in quantities or densities similar to those previously recorded from the unit in and near a project site.

An individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved, and it meets one of the following criteria:

- A type specimen (i.e., the individual from which a species or subspecies has been described);
- A member of a rare species;
- A species that is part of a diverse assemblage (i.e., a site where more than one fossil has been discovered) wherein other species are also identifiable, and important information regarding life history of individuals can be drawn;
- A skeletal element different from, or a specimen more complete than, those now available for its species; or
- A complete specimen (i.e., all or substantially all of the entire skeleton is present).

The value or importance of different fossil groups varies depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions (such as for a research project). Marine invertebrates are generally common; the fossil record is well developed and well documented, and they would generally not be considered a unique paleontological resource. Identifiable vertebrate marine and terrestrial fossils are generally considered scientifically important because they are relatively rare.

In its standard guidelines for assessment and mitigation of adverse impacts on paleontological resources, the Society for Vertebrate Paleontology (SVP) (1995) established three categories of sensitivity for paleontological resources: high, low, and undetermined. Areas where fossils have been previously found are considered to have a

high sensitivity and a high potential to produce fossils. Areas that are not sedimentary in origin and that have not been known to produce fossils in the past typically are considered to have low sensitivity. Areas that have not had any previous paleontological resource surveys or fossil finds are considered to be of undetermined sensitivity until surveys and mapping are performed to determine their sensitivity.

IMPACT ANALYSIS

IMPACT 3.7-1 Exposure to fault rupture. *Future development within the SOIA Area would not expose people or structures 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 or based on other evidence of a known fault. The impact is* less than significant.

Fault rupture has the potential to compromise the structural integrity of buildings and infrastructure, creating a hazard to people and structures in close proximity to the fault. The proposed SOIA will likely increase the amount of people and structures within the SOIA Area, potentially exposing them to risks associated with fault rupture. Fault rupture and fault creep can create a hazard to people and structures by displacement of ground from fault slip, potentially compromising structural integrity and causing injury or death to people affected by the ground displacement.

Areas surrounding active earthquake faults with the potential to be adversely affected by fault rupture are delineated as Alquist-Priolo Fault Zones. These zones are used by local jurisdictions to prevent structures intended for human occupancy from being built in close proximity to active faults to avoid the risks described above. The proposed SOIA Area is not located in an area classified as an Alquist-Priolo Fault Zone (CGS 2010). Sacramento County does not have any known active faults within its boundaries according to the USGS Earthquake Hazard Program Quaternary Faults maps.

The proposed SOIA would have the potential to increase the number of people and structures exposed to risks related to fault rupture at the proposed SOIA Area. However, because the proposed SOIA Area is not located within an Alquist-Priolo Earthquake Fault Zone or near a known earthquake fault, impacts related to loss, injury or death involving rupture of a known earthquake fault would be **less than significant**.

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-2 Exposure to strong seismic ground shaking. *Future development within the SOIA Area would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking. The impact is considered* less than significant.

Strong seismic ground shaking from earthquakes creates risks to people and structures through damage or collapse of buildings and structures, dependent on the intensity of shaking. The proposed SOIA will likely increase the amount of people and structures within the SOIA Area, potentially exposing them to risks associated with strong seismic ground shaking. Intensity of ground shaking from seismic events is measured using the Modified Mercalli Intensity (MMI) scale, which ranges from qualitative ratings of I (not felt) all the way to X+ (extreme). At an MMI rating of VII (very strong), damage becomes slight to moderate in average buildings, and considerable in poorly constructed buildings.

According to Figure 6 from the 1996 Probabilistic Seismic Hazard Assessment for the State of California, the SOIA Area has not experienced an earthquake of MMI VII or greater between 1800 and 1996 (CDMG 1996). The California Geological Survey also shows in its 2003 map of Earthquake Shaking Potential for California that the SOIA Area is "distant from known active faults and will experience lower levels of shaking less frequently" (CGS 2003). According to the County of Sacramento General Plan, the SOIA Area is ranked as a "low" severity zone for earthquake intensity, with minor to moderate probable damage and a probably maximum intensity of MMI VI or VII. Therefore, the likelihood that an earthquake with strong seismic ground shaking would occur in the SOIA Area is low.

In addition, construction of structures, utilities, or roadways within the proposed SOIA Area and associated with possible development of the SOIA Area would be required to comply with seismic design provisions of the CBC, applicable local codes, and applicable General Plan policies which contain provisions to ensure that buildings or other structures are designed to be able to withstand reasonably expected ground shaking intensities of the SOIA Area.

Development as a result of the proposed SOIA project could increase the amount of people and structures at risk of adverse effects from strong seismic ground shaking. However, based on the California Geological Survey's low predicted likelihood of strong seismic ground shaking in the proposed SOIA Area and the seismically sound design provisions required by the California Building Standards Code and other existing regulations, impacts related to exposing people or structures to potential adverse effects from strong seismic ground shaking is considered **less than significant**.

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-3 Seismic-related ground failure. *Future development within the SOIA Area would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction. The impact would be* less than significant.

The proposed SOIA will likely increase the amount of people and structures within the SOIA Area, potentially exposing them to risks associated with seismic-related ground failure. Seismic-related ground failures, such as soil liquefaction, lateral spreading, and collapse can result from changes in soil physics during seismic shaking. Liquefaction occurs when earthquakes cause sandy particles to separate, causing soil to lose strength and act as a fluid. This can cause damage to large or heavy structures on shallow foundations through cracking, tilting, and differential settlement, which can in turn pose risks to the safety of persons within or near these structures.

Lateral spreading and landslides occur when seismic shaking causes lateral movement of soil due to liquefaction. Whole buildings can be damaged or moved downslope by this type of ground failure.

As discussed in Impact 3.7-2, the SOIA Area and surrounding area do not have a history of strong seismic ground shaking, nor is it expected to experience ground shaking in the future, which generally precludes it from the effects of liquefaction. However, where there is slight potential for liquefaction, structural and foundation design for new construction activities can minimize or eliminate liquefaction hazard. As discussed in the Regulatory Framework in Section 3.7.4, all construction would be required to comply with the CBC, which includes provisions related to designing structures to be able to withstand reasonably expected seismic activity. Site-

specific geotechnical investigations would also be required prior to construction to identify and engineer for the geological limitations of each construction site.

Development as a result of the proposed SOIA could lead to increased numbers of people and structures at risk of loss or damage from seismic-related ground failure. However, the California Geological Survey predicts low probability of strong seismic events in the vicinity of the SOIA Area, and existing regulations require structures are designed to minimize risk associated with liquefaction, lateral spreading, and collapse. Therefore, the impact is considered **less than significant**.

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-4 Landslides. *Future development within the SOIA Area would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides. There would be no impact.*

As discussed in Impact 3.7-3, landslides occur when sections of soil move down slopes due to instability or seismic activity, creating damage to buildings, infrastructure, and posing hazards to people within the vicinity of the landslide. According to the California Geological Survey's susceptibility ratings for deep-seated landslides in California, the SOIA Area and most of Sacramento County has landslide susceptibility class of 0, the lowest rating for landslide susceptibility. The proposed project is characterized by an entirely flat topography, which also precludes it from the possibility of landslides.

Based on the low probability of landslides in the area and the flat topography of the proposed SOIA Area, there would be no risk of landslides and there would be **no impact**.

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-5 Soil erosion or loss of topsoil. *Future development within the SOIA Area would not result in substantial soil erosion or the loss of topsoil. The impact would be less than significant.*

New land uses and development as a result of the proposed SOIA could lead to increased soil erosion or loss of topsoil due to an increase in soil-disturbing construction activities including vegetation removal, excavation, grading, stockpiling, and boring. In addition, off-site improvements such as roads, sewer lines, drainage facilities, and water lines could also be required if future development were to occur in the SOIA Area. Human-induced soil erosion can damage buildings and other structures, damage soil fertility, and degrade water and air quality (impacts to water and air quality are discussed in Section 3.10 of this EIR, "Hydrology and Water Quality."

However, before large-scale development and construction can take place, a geotechnical study consistent with the local jurisdiction's policy must be prepared which identifies the geological characteristics of the SOIA Area in order to assess soil weaknesses for construction. These policies require applicants to obtain all necessary permits from the applicable jurisdiction, which involve preparation of an Erosion and Sediment Control Plan, use of BMPs such as preserving existing vegetation, using silt fences, covering slopes, and other actions intended to prevent or minimize soil erosion.

Construction activities would also be required to follow the CBC, which contains provisions regarding erosion control and BMPs. The CBC is discussed in greater detail above in the Regulatory Framework, Section 3.7.4.

In addition, applicants would also be required to create a Storm Water Pollution Prevention Plan (SWPPP) that would be implemented to control accelerated erosion, sedimentation, and other pollutants during and after project construction as part of the EPA's National Pollutant Discharge Elimination System (NPDES). NPDES and its associated requirements are discussed in the Regulatory Framework Section in Section 3.7.4, above.

Construction-related activities as a result of the proposed SOIA project would have the potential to cause soil erosion or loss of topsoil. Implementation of existing regulations such as the CBC, local General Plan policy, and NPDES would reduce the potential for erosion and loss of topsoil as a result of construction activities associated with the potential for development from the proposed project. As a result, impacts would be **less than significant**.

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-6 Unstable soils. *Future development within the SOIA Area would not result in the project being 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. The impact would be* ***less than significant****.*

As discussed in Impact 3.7-3 and 3.7-4, landslides, lateral spreading, and liquefaction can occur as a result of unstable soils experiencing seismic shaking. When soil becomes destabilized it can cause large-scale movement down slopes or compromise soil strength, which can adversely affect the people or structures the soil supports. Subsidence occurs when water or other fluids are extracted from the soil, causing soils to collapse or their organic matter depleted from microbial respiration. Collapse occurs when soils are located over subterranean caves, mines, or other weak underlying subsurface material.

It is possible that there could be future development within the SOIA Area, and construction would have to potential to be located on unstable soils. In the proposed SOIA Area, potential development activity as a result of the amended SOIA would involve earthwork which could cause soils to become unstable or create slope failure. However, compliance with CBC requirements would reduce or avoid these hazards through BMPs and building design intended to withstand unstable soils. Site-specific geotechnical investigations would be required prior to construction per local ordinances, which would identify potential stability issues and incorporate design measures to minimize risk associated with unstable soils.

Development as a result of the proposed SOIA project could have the potential to be located on unstable soils. However, existing regulations such as the CBC, General Plan policies, and local ordinances require site investigations and sound design practices, which would minimize potential effects related to unstable soils or associated landslide, lateral spreading, subsidence, liquefaction, or collapse. Therefore, the impact is considered **less than significant.**

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-7 Expansive soils. *Future development within the SOIA Area would not result in the project being located on be located on expansive soil, creating substantial risks to life or property. The impact would be less than significant.*

Some soils have the ability to expand and contract based on their level of saturation, which has the potential to damage structures by cracking or breaking foundations and walls. This can create risks to people and property. The proposed SOIA Area contains some expansive soils in the Galt soil series present throughout about 20 percent of the SOIA Area.

Possible future development within the SOIA Area would have the potential to be located on expansive soil. However, this impact would be addressed in site-specific geotechnical reports prepared in the planning and design process, and associated design measures intended to minimize risks associated with expansive soils. Site-specific geotechnical studies would be required to determine the local soil suitability for specific projects in accordance with standard industry practices and state-provided guidance. These measures are required under the CBC and local building codes and ordinances in order to avoid or reduce hazards relating to expansive soils.

Due to the requirements of existing regulations to study and take into account the expansive property of soils prior to construction, the potential for expansive soil impacts to have an adverse effect on life and property for the proposed SOIA project is considered **less than significant**.

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-8 Poor septic suitability. *Future development within the SOIA Area would not result in the project being located on soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater. The impact would be less than significant.*

The project does not include any development or land use designation changes. There are no preliminary land use plans, facility plans, or infrastructure plans in the materials being reviewed by LAFCo. While it is likely that any possible future development within the SOIA Area would be connected to municipal wastewater systems, there is also the potential for installation of septic tanks on the SOIA Area. The Sacramento County Code contains regulations related to the installation and management of on-site wastewater treatment systems (septic tanks), which includes a construction permit process, as part of Title 6 Health and Sanitation (Sacramento County 2010). This process would require the applicant to follow BMPs and meet Conditions of Approval relevant to the use and installation of septic tanks, which would include ensuring the suitability of the soil prior to installation.

Compliance with existing regulations such as the local codes and ordinances would ensure septic tanks would be installed only if soils were suitable or could be made suitable for the septic tank system. Therefore, the impact is **less than significant.**

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-9 Loss of mineral resources. *Future development within the SOIA Area would not result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state. The impact would be less than significant.*

Sacramento County's mineral resources are mainly aggregate materials such as sand, gravel, and crushed stone. Based on the California Geological Survey's Mineral Resource Zone classifications under the Surface Mining and Reclamation Act, the SOIA Area is zoned as MRZ-3, which indicates areas of undetermined mineral resource significance.

Because the proposed SOIA Area is classified by the California Geological Survey as having undetermined mineral resource significance, implementation of the proposed project would not result in a loss of a known mineral resource and the impact would be **less than significant**.

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-10 Loss of locally important mineral resource discovery sites. *Future development within the SOIA Area would not 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. There would be no impact.*

No active mining or natural gas extraction operations are located within the SOIA Area boundary. In addition, the Sacramento County General Plan does not designate any locally important mineral resource recovery sites within the SOIA Area. Therefore, loss of a locally important mineral resource recovery site resulting from impacts to an existing operation would not result from implementation of the proposed SOIA.

Because there is no locally important mineral resource recovery site in the SOIA Area, there would be **no impact**.

Mitigation Measures

No mitigation measures are required.

IMPACT 3.7-11 Damage to unknown paleontological resources. *Future development within the SOIA Area or off-site improvements required to support future development within the SOIA Area could disturb previously unknown paleontological resources. The impact would be potentially significant.*

If there is development proposed in the future in the SOIA Area, such development would have the potential to damage previously unknown and potentially significant paleontological resources. In addition, off-site improvements such as roads, sewer lines, drainage facilities, and water lines could also be required if future development were to occur in the SOIA Area, which could damage paleontological resources.

The University of California Museum of Paleontology specimen catalog contains records of 126 specimens discovered at localities within Sacramento County, located in the Cities of Davis and Sacramento, as well as in unincorporated areas of Sacramento County. Because numerous fossils and paleontological specimen were discovered in the vicinity of the proposed SOIA Area, this suggests the possibility of unknown paleontological resources being present near or within the proposed SOIA Area. In addition, the Elk Grove Background report identified the SOIA Area within the Pleistocene Riverbank Formation, which is sensitive for paleontological

resources. Construction activities such as digging, excavation, trenching, and other earthwork could have the potential to disturb or damage paleontological resources. The impact is **potentially significant**.

Mitigation Measures

Mitigation Measure 3.7-11: Avoid Impact to Unique Paleontological Resources

At the time of submittal of any application to annex territory within the SOIA Area, the City of Elk Grove shall require:

- Consistent with General Plan HR-6-Action 1 and Action 2, prior to the start of on- or off-site earthmoving activities that would disturb 1 acre of land or more within the Riverbank Formations, project applicants shall inform all construction personnel involved with earthmoving activities regarding the possibility of encountering fossils, the appearance and types of fossils likely to be seen during construction, and proper notification procedures should fossils be encountered.

- If paleontological resources are discovered during earthmoving activities, the construction crew shall immediately cease work in the vicinity of the find and notify the City of Elk Grove.

- The project applicant shall retain a qualified paleontologist to evaluate the resource and prepare a recovery plan. The recovery plan may include, but is not limited to, a field survey, construction monitoring, sampling and data recovery procedures, museum curation for any specimen recovered, and a report of findings. Recommendations in the recovery plan that are determined by the City to be necessary and feasible shall be implemented before construction activities can resume at the site where the paleontological resource or resources were discovered.

Summary after Mitigation

Mitigation Measure 3.7-11 would create a new implementation program that contains additional resource disturbance prevention activities and a cease-work requirement upon paleontological resource discovery. With implementation of these changes, impacts would be reduced because earth-moving activities in paleontologically sensitive rock formations would be subject to requirements consisting of construction worker personnel education, halting of work in the vicinity of any fossil specimen(s) uncovered, and preparation of a recovery plan for said specimen(s). The potential for damage to paleontological resources is reduced by policies and actions from the City of Elk Grove General Plan related to investigating construction project sites for potential paleontological resources and applying recommended BMPs as applicable to reduce impacts to these resources. The proposed mitigation measure, along with City policies and actions would minimize impacts to previously unknown paleontological resources in the proposed SOIA Area. The impact is considered **less than significant with mitigation.**