3.7 GEOLOGY, SOILS, MINERALS, AND PALEONTOLOGICAL RESOURCES

Comments received on the Notice of Preparation (NOP) were reviewed during preparation of this SEIR. However, no comments related to geology, soils, minerals, or paleontological resources were received.

3.7.1 ENVIRONMENTAL SETTING

As described in the 2019 SOIA EIR, active faults (i.e., faults that have exhibited evidence of movement during the last 11,700 years) are located approximately 30–40 miles west of the Project site and off-site improvement areas, along the western margin of the Central Valley and in the Coast Ranges (Jennings and Bryant 2010). The Foothills Fault System is approximately 23 miles east of the Project site and the off-site improvement areas, but faults in this system are not classified as active (Jennings and Bryant 2010). Therefore, strong seismic ground shaking is unlikely to occur. Because the Project site and the off-site improvements areas are relatively flat, seismically-induced landslides would not occur.

As shown in Exhibit 3.7-1, in addition to the soil types at the Project site that were identified in the 2019 SOIA EIR, the off-site drainage improvements would also be constructed in the following soil types: San Joaquin Silt Loam leveled 0–1% slopes, San Joaquin silt loam 3–8% slopes, San Joaquin-Durixeralfs complex 0–1% slopes, San Joaquin-Xerarents Complex leveled 0–2% slopes, and the Xerarents-San Joaquin complex 0–1% slopes (U.S. Natural Resources Conservation Service [NRCS] 2019). These soils are rated as very limited for excavation because they have a high clay content, a shallow depth to a cemented hardpan, and are unstable for excavation sidewalls (NRCS 2019).

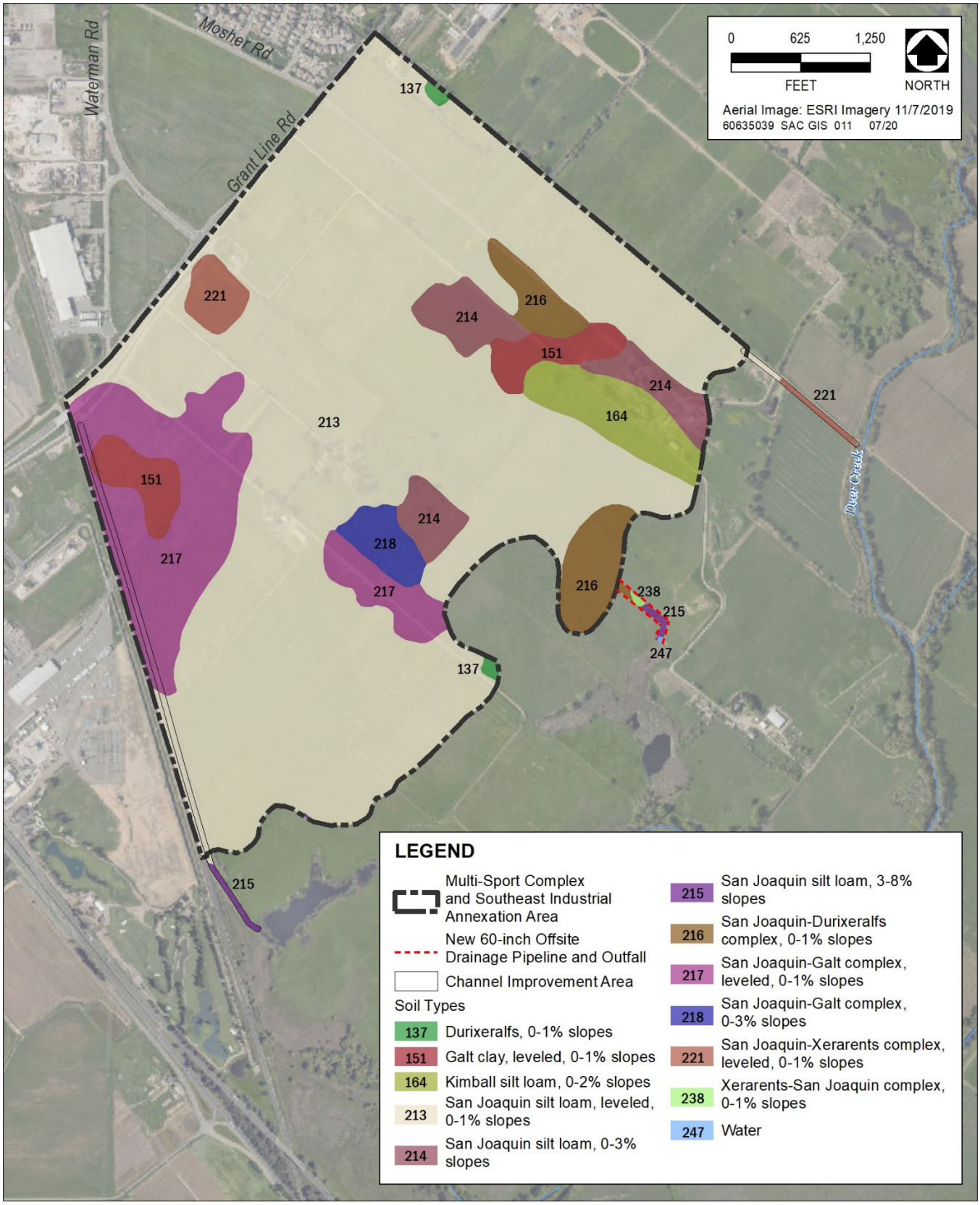
The Project site and the off-site improvements areas are not classified as containing regionally significant deposits of mineral resources (i.e., Mineral Resource Zone [MRZ] 2). Instead, these areas are classified as MRZ 3—areas containing mineral deposits, the significance of which cannot be evaluated from existing data (Dupras 1999:Plate 3). Furthermore, there are no natural gas or oil wells in the vicinity (California Geologic Energy Management Division [CalGEM] 2020).

The Project site and the off-site improvements areas are underlain by the Pleistocene-age Riverbank Formation (Wagner et al. 1981). An updated records search of the U.C. Berkeley Museum of Paleontology (UCMP) was performed by AECOM in July 2020; there are no recorded fossil localities within the Project site or the off-site improvements areas (UCMP 2020). As discussed in the 2019 SOIA EIR, the Riverbank Formation is considered paleontologically sensitive due to the number of vertebrate fossils that have been recovered therein throughout the Central Valley.

3.7.2 REGULATORY FRAMEWORK

CITY OF ELK GROVE CONSTRUCTION SPECIFICATIONS AND IMPROVEMENT STANDARDS MANUALS

The City's *Construction Specifications Manual* provides construction requirements that apply primarily to the provision of public safety and access to sidewalks and roadways during construction, including traffic controls, as well as construction standards related to utilities and trenching (City of Elk Grove 2020a).



Source: NRCS 2020

Exhibit 3.7-1. Soil Types

The City's *Standard Specifications Manual* contains the requirements for improvement plans, and provides direction for design of streets, streetlights, sound barriers, traffic analyses, storm drainage, grading, stormwater quality protection, and traffic signals (City of Elk Grove 2020b).

CITY OF ELK GROVE GENERAL PLAN

The City's General Plan (City of Elk Grove 2019), contains the following policy related to geology and soils that are applicable to the proposed Project. There are no mineral deposits or mineral extraction activities located within the Planning Area; thus, the City General Plan does not contain any policies to address mineral resources (City of Elk Grove 2019:7-25). There are no policies in the City's General Plan related to paleontological resources.

Services, Health, and Safety Element

- **Policy ER-3-2:** Seek to ensure that new structures are protected from damage caused by geologic and/or soil conditions.

3.7.3 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Based on Appendix G of the CEQA Guidelines, the proposed Project would have a significant impact related to geology, soils, paleontological resources, or minerals if it would:

- directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
    - rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
    - 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; or
- be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating substantial risks to life or property;
- 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;

- directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;
- result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or
- 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.

Paleontological Resources

Based on Appendix G of the CEQA Guidelines, the proposed project would have significant impacts on paleontological resources if it would directly or indirectly destroy a unique paleontological resource or site. A "unique paleontological resource or site" is one that is considered significant under the following professional paleontological standards.

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 several factors: 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 generally are 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 generally are considered scientifically important because they are relatively rare.

ISSUES NOT DISCUSSED FURTHER

The following issues were dismissed from further detailed analysis in the 2019 SOIA EIR because it was determined that no impact would occur; for the reasons explained below, these issues would also result in no impact for the proposed Project as evaluated in this SEIR.

Expose People or Structures to Hazards from Surface Fault Rupture—The Project site and the off-site improvements are not located within or near an Alquist-Priolo Earthquake Fault Zone (California Geological Survey [CGS] 2020), and the nearest known faults are approximately 23 miles to the east within the Foothills

Fault System. Therefore, no impacts related to loss, injury, or death involving rupture of a known earthquake fault would occur, and this issue is not addressed further in this SEIR.

Expose People or Structures to Landslides—The Project site and the off-site improvements areas are characterized by flat topography. Therefore, landslides would not represent a hazard for the proposed Project and there would be no impact. This issue is not addressed further in this SEIR.

Have Soil Unsuitable for Septic Systems—The use of an on-site wastewater disposal system is not proposed as part of the Project; therefore, no impact related to the ability of soils to support the use of septic systems would occur. This issue is not addressed further in this SEIR.

Loss of Known Regionally or Locally Important Minerals—The Project site and the off-site improvements areas are not located within a regionally-designated area of known important mineral resources. Furthermore, the City's General Plan states there are no mineral deposits or mineral extraction activities located within the Planning Area, and thus does not contain any designated mineral resource recovery areas. Finally, the off-site drainage pipeline would be extended into the unincorporated area of Sacramento County, and the *Sacramento County 2030 General Plan* indicates that the County has not designated any areas of locally important mineral resources in the vicinity of the Project site or off-site improvement areas (Sacramento County 2017:15). Thus, there would be no impact, and this issue is not addressed further in this SEIR.

IMPACT ANALYSIS

Impact 3.7-1: Exposure to Strong Seismic Ground Shaking.

The Sacramento Valley has historically experienced low levels of seismic activity. Known active faults that pose a hazard for strong seismic ground shaking are located along the margin between the western edge of the Central Valley and the Coast Ranges, and within the Coast Ranges themselves. These faults are located 30–40 miles west of Elk Grove. Faults in the Foothills Fault System, approximately 23 miles to the east, are not classified as active. The intensity of ground shaking depends on the distance from the earthquake epicenter to the site, the magnitude of the earthquake, and site soil conditions. Peak horizontal ground acceleration (PGA), which is a measure of the projected intensity of ground shaking from seismic events, can be estimated by probabilistic method using a computer model. The CGS Probabilistic Seismic Hazards Assessment Model (CGS 2008) indicates there is a 1-in-10 probability that an earthquake within 50 years would result in a PGA of approximately 0.189 at the Project site and 0.187 along the off-site drainage pipeline. These estimates indicate that a very low level of seismic shaking would be anticipated for the Project site and the off-site improvements areas.

Future projects within the Project site will be required by law to comply with seismic safety standards of the California Building Standards Code (CBC). The CBC requires an evaluation of seismic design that falls into Categories A through F (where F requires the most earthquake-resistant design) for structures designed for a project site. The CBC philosophy focuses on "collapse prevention," meaning that structures are designed for prevention of collapse for the maximum level of ground shaking that could reasonably be expected to occur at a site. Based on the seismic design category, the CBC requires an analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also requires that measures to reduce damage from seismic effects be incorporated in structural design. Measures may include ground stabilization, selection of appropriate foundation type and depths, selection of

appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The City requires that all structures be designed in accordance with the CBC. In addition, roads and underground pipelines must be engineered and constructed according to the City's Construction Specifications, Improvement Standards, and Standard Drawings, which are designed to avoid risk to life and property related to seismic ground sharking. Compliance with existing regulations ensures that this impact would be **less than significant**.

Impact 3.7-2: Seismic-Related Ground Failure.

Seismically-induced liquefaction is a process by which water-saturated materials lose strength and may fail during strong ground shaking, when granular materials are transformed from a solid state into a liquefied state as a result of increased pore-water pressure. Structures on soil that undergoes liquefaction may settle or suffer major structural damage. Factors determining liquefaction potential are soil type, level and duration of ground motions, and depth to groundwater. Liquefaction is most likely to occur in low-lying areas where the substrate consists of poorly consolidated to unconsolidated water-saturated sediments, recent Holocene-age sediments, or deposits of artificial fill.

Active seismic sources are a relatively long distance away, and the Project site and the off-site improvement areas are underlain by the stable, Pleistocene-age Riverbank Formation. Furthermore, the depth to groundwater is approximately 60 feet below the ground surface (California Department of Water Resources 2018). These factors indicate that seismically-induced liquefaction at the Project site and the off-site improvements areas is unlikely. Finally, design and construction of development projects within the Project site would be conducted in accordance with the CBC, which identifies minimum requirements for preparing site-specific, design-level geotechnical reports characterizing the geologic conditions, defining seismic loads, evaluating the response of the foundation systems, and addressing potential seismic hazards, including liquefaction. Therefore, this impact would be **less than significant.**

Impact 3.7-3: Unstable Soils.

In addition to seismic activity, liquefaction can also be triggered by the presence of heavy equipment on unstable soils, particularly adjacent to and within watercourses, and within waterlogged soils away from watercourses that are underlain by a shallow hardpan. Lateral spreading is the horizontal movement or spreading of soil toward an open face, such as a streambank, the open side of fill embankments, or the sides of levees. Soil bearing capacity is the ability of soil to support structures; areas where soil bearing capacity is too low to support structures may experience subsidence and settlement.

A review of NRCS (2019) soil survey data indicates that the Durixeralfs, Galt clay, Kimball silt loam, and San Joaquin–Galt complex soils are rated as very limited for construction of buildings and roads because of low soil bearing strength, which in turn could result in hazards from subsidence and settlement. In addition, the soils in the off-site drainage pipeline area have a shallow depth to a cemented hardpan, which could result in liquefaction during the rainy season from the presence of heavy construction equipment. Lateral spreading could also occur adjacent to the ponds where drainage improvements are proposed. However, compliance with the CBC requirements to prepare geotechnical engineering reports that include specific recommendations for construction in unstable soils, as well as compliance with the City's *Improvement Standards Manual*, would ensure that foundations for buildings and parking lots, as well as underground pipelines, are designed appropriately based on site-specific conditions. Compliance with existing regulations ensures that this impact would be **less than significant**.

Impact 3.7-4: Soil Erosion or Loss of Topsoil.

During the construction process associated with future development and installation of utilities, earth-moving activities would expose soils to potential erosion from wind and water. Earthmoving activities during the winter months would expose soils to rain events, which could mobilize loose soil and result soil erosion. Subsequent soil transport during storm events could result in sedimentation both within and downstream of the Project site and the off-site improvements areas. Furthermore, earthmoving activities during the summer months could result in wind erosion. However, prior to the start of earthmoving activities, applicants must obtain a grading permit from the City, and must demonstrate that all appropriate measures to reduce soil erosion would be implemented.

Furthermore, future project applicants are required by law to comply with the provisions of the State Water Resources Control Board's (SWRCB) *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated With Construction and Land Disturbance Activities* (Order 2009-009-DWQ as amended by Order 2012-0006-DWQ) (Construction General Permit). The Construction General Permit regulates stormwater discharges for construction activities under the Clean Water Act (CWA), and applies to all land-disturbing construction activities that would disturb 1 acre or more. Project applicants must submit a notice of intent to discharge to the Central Valley Regional Water Quality Control Board (RWQCB), and must prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) that includes site-specific Best Management Practices (BMPs) to minimize construction-related soil erosion. Construction techniques that could be implemented to reduce the potential for stormwater runoff and sediment transport may include minimizing site disturbance, controlling water flow over the construction site, stabilizing bare soil, and ensuring proper site cleanup. BMPs that could be implemented to reduce erosion may include silt fences, staked straw bales/wattles, silt/sediment basins and traps, geofabric, trench plugs, terraces, water bars, soil stabilizers and re-seeding and mulching to revegetate disturbed areas. All NPDES permits also have inspection, monitoring, and reporting requirements.

In addition, compliance with the City's *Improvement Standards Manual* requires submittal of grading plans and implementing measures to protect stormwater quality. Compliance with existing regulations ensures that this impact would be **less than significant**.

Impact 3.7-5: Expansive Soils.

Expansive soils are composed largely of clays, which greatly increase in volume when saturated with water and shrink when dried (referred to as "shrink-swell" potential). Soils with a moderate to high expansion potential can result in cracked foundations, structural distortions, and warping of doors and windows. Underground pipelines can also be damaged. The Durixarolfs, Galt clay, and Kimball silt loam soils at the Project site have a high to moderate expansion potential (NRCS 2019). The soils along the off-site drainage pipeline have a low expansion potential (NRCS 2019). Compliance with the CBC requirements to prepare geotechnical engineering reports that include specific recommendations for construction in expansive soil, as well as compliance with the City's *Improvement Standards Manual*, would ensure that foundations for buildings and parking lots, as well as underground pipelines, are designed appropriately based on site-specific conditions. Therefore, this impact would be **less than significant**.

Impact 3.7-6: Damage to Unknown Paleontological Resources.

The Project site and the off-site improvements areas are located in the Riverbank Formation. This formation is considered to be of high paleontological sensitivity, because numerous vertebrate fossil specimens have been recovered from this formation in various locations throughout the greater Sacramento area and the Sacramento and San Joaquin valleys (as described in detail in the 2019 SOIA EIR). Therefore, Project-related construction activities both on- and off-site could result in accidental damage to or destruction of unique paleontological resources, and this impact is considered **potentially significant.**

Mitigation Measure 3.7-6: Avoid Impacts to Unique Paleontological Resources (2019 SOIA EIR Mitigation Measure 3.7-6).

- Prior to the start of on- or off-site earthmoving activities that would disturb 1 acre of land or more within the Riverbank Formation, 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.

Significance after Mitigation

Implementation of Mitigation Measure 3.7-6 would reduce Project-related impacts on unique paleontological resources to a **less-than-significant** level because construction workers would be alerted to the possibility of encountering paleontological resources and, in the event that resources were discovered, fossil specimens would be recovered and recorded and would undergo appropriate curation.