5.6 GEOLOGY, SOILS, MINERAL RESOURCES, AND PALEONTOLOGY

This section discusses the geology of the Planning Area and general vicinity and analyzes hazards related to geology and soils, such as potential exposure of people and property to geologic hazards, landform alteration, and erosion. Mineral resource locations and paleontological resources and potential impacts are also evaluated in this section. Erosion-related water quality issues are addressed in Section 5.9, Hydrology and Water Quality.

5.6.1 EXISTING SETTING

GEOLOGY AND TOPOGRAPHY

Regional Setting

Most of Sacramento County, including the entire City, lies in the Great Valley geomorphic province.[1] The Great Valley geomorphic province is an alluvial plain approximately 50 miles wide and 400 miles long located in central California, bounded on the north by the Klamath and Cascade mountain ranges, on the east by the Sierra Nevada, and on the west by the Coast Ranges. Sediments consisting of Cenozoic non-marine (continental) sedimentary rocks and alluvium (loose, unconsolidated soil) have been deposited in the Great Valley geomorphic province almost continuously since the Jurassic period, approximately 160 million years ago. The Sacramento River, which drains the east side of the Great Valley into the Sacramento-San Joaquin Delta, is located west of the City, and is the region's major northern drainage (City of Elk Grove 2016).

Planning Area

The Planning Area is primarily underlain by the Riverbank Formation. A section of the Laguna Formation runs north to south through the center of the Planning Area (CGS 1981). These are sedimentary deposits containing layers of weathered gravel, sand, and silt eroded from metamorphic and granitic rocks of the Sierra Nevada.

The Planning Area is flat, with little variation in topography. Elevations in the Planning Area range from 10 feet above average sea level in the west to 150 feet in the east (City of Elk Grove 2016).

SEISMIC HAZARDS

Regional Faults and Seismicity

Sacramento County is less affected by seismic events and geologic hazards than other portions of the state. The California Geological Survey's (CGS) map of seismic shaking hazards in California shows that most of Sacramento County, including the Planning Area, is located in a relatively low-intensity ground shaking zone. The county generally experiences little seismic activity, but could be affected by ground motion originating in other regions that experience more seismic activity, such as the San Francisco Bay Area and the Sierra Nevada. Some property damage has occurred because of seismic events in the past; however, it was largely the result of major seismic events occurring in these adjacent areas. The areas of Sacramento County most vulnerable to seismic and geologic hazards are typically those areas subject to liquefaction and subsidence.

[1] A geomorphic province is defined as an area with similar geologic origin and erosional/depositional history.

Table 5.6-1 identifies known faults in the region and their maximum magnitudes. There are no known active faults in the Planning Area, and no active or potentially active faults underlie the City. The City is not located in an Alquist-Priolo Earthquake Fault Zone (City of Elk Grove 2016).

TABLE 5.6-1
REGIONAL FAULTS

Fault Name	Approximate Distance from Elk Grove (in miles)	Maximum Magnitude (MW)
Foothills Fault System	21	6.5
Great Valley (segment 5)[1]	27	6.5
Great Valley (segment 4)[1]	29	6.6
Greenville	41	6.9
Concord-Green Valley	42	6.9
Hunting Creek-Berryessa	45	6.9
West Napa	49	6.5
Calaveras	50	6.8
Rodgers Creek	56	7.0
Hayward	59	7.1
Bartlett Springs	72	7.1
Maacama (south)	73	6.9
Collayomi	76	6.5
Ortigalita	76	6.9
San Andreas	76	7.9
San Gregorio	78	7.3
Monte Vista-Shannon	80	6.8
Mohawk Valley-Honey Lake Fault Zone	82	7.3
Point Reyes	82	6.8
Genoa	87	6.9
Sargent	91	6.8
Zayante-Vergeles	94	6.8

Source: City of Elk Grove 2003

Note: 1. Nine segments of the Great Valley Fault are located approximately 27 to 91 miles west of the City and have maximum magnitudes of 6.4 to 6.8.

Surface Rupture

In major earthquakes, fault displacement can cause rupture along the surface trace of the fault, leading to severe damage to structures, roads, and utilities located on the fault trace. Surface rupture generally occurs along an active fault trace, but can occasionally occur along presumably inactive faults. Because no known faults traverse the Planning Area, the risk of surface rupture in the Planning Area is considered low.

Ground Shaking

Ground shaking is motion that occurs as a result of energy released during earthquakes. The damage or collapse of buildings and other structures caused by ground shaking is among the most serious seismic hazards. The intensity of shaking and its potential impact on buildings is determined by the physical characteristics of the underlying soil and rock, building materials and design, earthquake magnitude, location of the epicenter, and the character and duration of ground motion. Ground motion lasts longer and waves are amplified on loose, water-saturated materials as compared to solid rock; as a result, structures located on alluvium typically suffer greater damage. Much of Sacramento County is on alluvium, which increases the amplitude of an earthquake wave.

Liquefaction

Liquefaction is the loss of soil strength due to seismic forces generating various types of ground failure. The evaluation of potential for liquefaction is complex, and factors that must be considered include soil type, soil density, groundwater, and the duration and intensity of shaking. Liquefaction is most likely to occur in deposits of water-saturated alluvium or similar deposits of artificial fill. In Sacramento County, the Delta and downtown Sacramento are the two areas most susceptible to liquefaction in the event of an earthquake.

The soils underlying the Planning Area are relatively dense/stiff and the upper 50 feet of soil are above the depth of groundwater; therefore, the potential for liquefaction in the Planning Area is considered low. The potential for ground lurching, differential settlement, or lateral spreading to occur during or after seismic events in the Planning Area is also considered low (City of Elk Grove 2003).

SOILS

The Natural Resources Conservation Service (NRCS) Web Soil Survey identifies 38 soil types within the Planning Area. These soil types are listed in **Table 5.2-4** in Section 5.2, Agricultural Resources. The San Joaquin soil series is the most prevalent in the Planning Area. Along with similar soil types, these soils account for nearly 85 percent of soils in the Planning Area. The San Joaquin series consists of alluvium deposits from mostly granitic rock. It has a wide range of characteristics, varying from loam to clay, depending on depth of soil. Typically, these soils are well- or moderately well-drained with medium to very high runoff potential and very slow permeability (City of Elk Grove 2016).

Erosion

Erosion is a geomorphic process that occurs when sand, soil, and rocks are loosened, worn away, decomposed, or dissolved, moving materials from one place to another. Rain, snow, running water, waves, and wind can all cause erosion. In the City, wind is not a major hazard, thus reducing the likelihood of wind erosion of natural soils. However, strong winds are a secondary impact of heavy rain and storms, and may pair with increased rains to erode soils. During storm events, erosion can also result from heavy precipitation and stormwater runoff. The City's Municipal Code establishes policies to reduce sedimentation and erosion during demolition and construction. Stormwater requirements also serve to limit erosion and sedimentation. The San Joaquin soils exhibit slight erosion hazard, indicating that erosion under ordinary climatic conditions is unlikely (NRCS 2016).

Agricultural Soils/Topsoil

Table 5.2-4 in Section 5.2, Agricultural Resources, lists the characteristics of site soils for agricultural production. As indicated by the ratings, the San Joaquin soils are severely limited in their agricultural potential because of shallow soil depths, less permeable subsoil, and clayey or gravelly surface soil textures. The San Joaquin series soils are rated by the NRCS as a fair source of topsoil for construction materials because of the presence of cemented pan (NRCS 2016).

Expansive Soils

Expansive soils are soils that shrink or swell depending on the level of moisture they absorb. These soils typically contain clay minerals. As they get wet, the clay minerals absorb water molecules and expand; conversely, as they dry, they shrink, leaving large voids in the soil. Settlement caused by soils with a high shrink-swell potential can potentially result in damage from differential settlement. When structures are located on expansive soils, foundations have the tendency to rise during the wet season and drop during the dry season. This movement can create new stresses on building foundations and connected utilities and lead to structural damage. The San Joaquin soil group, the main soil series in the Planning Area, has potential for expansion because of its high proportion of clay, especially at depths of 16 inches or greater (City of Elk Grove 2016).

SUBSIDENCE

When subsurface earth materials move, the movement can cause the gradual settling or sudden sinking of ground. This phenomenon of settling or sinking ground is referred to as subsidence or settlement. Although causes of subsidence and settlement are numerous, frequent factors are aquifer-system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost. Elk Grove is located over a principal groundwater basin in a potential subsidence area, making groundwater pumping the City's largest potential cause for subsidence (City of Elk Grove 2016).

MINERAL RESOURCES

The California Department of Conservation Division of Mines and Geology has classified the region and the Planning Area for its mineral resource potential. A large portion of the northern section of the Planning Area is covered by the MRZ-2 classification. Sites described by this classification are areas underlain by mineral deposits where geologic data indicate that significant measured, indicated, or inferred mineral resources are present. Inferred mineral resources in the Planning Area are Portland cement concrete-grade aggregate composed of Lower Unit Riverbank Formation alluvium deposits (California Department of Conservation 1999).

PALEONTOLOGICAL RESOURCES

The General Plan Existing Conditions Report (City of Elk Grove 2016) stated that although no fossil discoveries have been officially reported in the Planning Area, there have been finds. For example, in 1959, a local farmer discovered a Pleistocene bone bed in the Riverbank Formation along the west side of Deer Creek. While the find was reportedly examined by a geologist from California State University, Sacramento, the find was apparently never published.

The Sacramento Valley and the San Joaquin Valley comprise the Great Valley geomorphic province of California, which is located between the Sierra Nevada on the east and the Coast

Range mountains on the west. The Great Valley is composed of thousands of feet of sedimentary deposits that have undergone periods of subsidence and uplift over millions of years. During the Jurassic and Cretaceous periods of the Mesozoic era, the Great Valley existed in the form of an ancient ocean. By the end of the Mesozoic, the northern portion of the Great Valley began to fill with sediment as tectonic forces caused uplift of the basin. By the time of the Miocene epoch, approximately 24 million years ago, sediments deposited in the Sacramento Valley were mostly of terrestrial origin. Most of the surface of the Great Valley is covered with Recent (Holocene, i.e., 10,000 years Before Present [BP] to present day) and Pleistocene (i.e., 10,000–1,800,000 years BP) alluvium. This alluvium is composed of sediments from the Sierra Nevada to the east and the Coast Range to the west that were carried by water and deposited on the valley floor. Siltstone, claystone, and sandstone are the primary types of sedimentary deposits.

There are two formations in the Planning Area that are sensitive for paleontological resources, described below.

Laguna Formation

The Laguna Formation was named for arkosic alluvial deposits near Laguna Creek, San Joaquin County. It consists of lenticular cobble gravel, sand, and small amounts of reddish to yellowish brown silt from metamorphic, granitic, and volcanic sources. This sediment is located only in the east and northeast portions of the Planning Area. The gravels that overlay this formation have been mined in some portions of the Planning Area. This formation is known to produce Pliocene fossils. As a result, this formation has a high sensitivity rating.

Riverbank Formation

Davis and Hall were the first to name the Riverbank Formation. They designated the type section in the city of Riverbank in an area along the south bank of the Stanislaus River. Sediments in the Riverbank Formation consist of weathered reddish gravel, sand, and silt that form alluvial terraces and fans. In the Sacramento Valley, this formation contains more mafic igneous rock fragments than the San Joaquin Valley, and thus tends toward stronger soil profile developments that are more easily distinguishable from the Modesto Formation which overlies the Riverbank Formation. The Riverbank Formation is Pleistocene in age, but is considerably older than the Modesto Formation; estimates place it between 130,000 and 450,000 years BP. Similar to the Modesto Formation, the Riverbank Formation forms alluvial fans and terraces of the Feather and Bear Rivers; however, Riverbank fans and terraces are higher in elevation and generally have a more striking topography than those formed by the Modesto Formation. Most of the sediments in the Planning Area are Riverbank Formation.

The Riverbank Formation is known to produce vertebrate fossils dating to the late Pleistocene west of Elk Grove Florin Road. The fossils recovered to date from the Riverbank Formation are typically large, late Pleistocene vertebrates, although fish, frogs, snakes, turtles, and a few plants such as prune, sycamore, and willow are known as well. The typically large, Rancholabrean vertebrates include bison, horse, camel, mammoth, ground sloth, and wolf. These types of fossils suggest a wet grassland environment interspersed with rivers, streams, ponds, and bogs. The Rancholabrean fauna and flora are well known in California, and they typically include many more species than reported from Sacramento County (City of Elk Grove 2003). As a result, this formation has a high sensitivity rating.

5.6.2 REGULATORY FRAMEWORK

STATE

California Building Code

Building codes are intended to ensure public safety and help protect, among other things, against future earthquake damage. Records of building response to earthquakes, especially those from structures that failed or were damaged, have led to many code revisions and improvements. The California Building Code (CBC) specifies the levels of earthquake forces that structures must be designed to withstand. A geotechnical report is required for new or replacement occupied buildings to determine existing soils conditions and to specify design specifications based on those conditions. The design specifications are based on current information from strong-motion instruments and observed seismic effects on buildings. As ground motions of greater intensity have been recorded, the minimum seismic design specifications have been refined. In addition, provisions for different soil conditions have been added to the CBC as scientists have documented the effects of soil type on shaking intensity. Buildings constructed to comply with modern codes have generally sustained relatively little damage from recent earthquakes.

NPDES Construction General Permit

The SWRCB has adopted a statewide Construction General Permit (CGP) (Water Quality Order No. 2009-0009-DWQ, as amended by 2010-0014 DWQ and 2012-0006-DWQ) for construction activities in the State. The CGP applies to construction activity that disturbs 1 acre or more and requires the preparation and implementation of a stormwater pollution prevention plan (SWPPP) that identifies best management practices (BMP) to minimize erosion and to control pollutant discharges from the construction site that could affect water quality. Section 15.12.020(B)(3) of the City's Municipal Code establishes that the City is responsible for ensuring compliance with the National Pollutant Discharge Elimination System (NPDES) requirements pertaining to the CGP. Additional information about the CGP is provided in Section 5.9, Hydrology and Water Quality.

Paleontological Resources

Paleontological resources are classified as nonrenewable scientific resources and are protected by State statute (Public Resources Code [PRC] Section 5097.5, Archeological, Paleontological, and Historical Sites). However, no State or local agencies have specific jurisdiction over paleontological resources but all must evaluate potential impacts and provide any applicable mitigation measures. No State or local agency requires a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earthmoving on State or private land in a project area.

LOCAL

City of Elk Grove Municipal Code

The City has adopted the 2016 Edition of the California Building Code, Title 24, Part 2, Volumes 1 and 2 as set forth by the State of California Building Standards Commission (Elk Grove Municipal Code Section 16.04.010). The California Building Code is updated every three years, and the 2019 edition will become effective in 2020.

Municipal Code Chapter 16.44, Land Grading and Erosion Control, establishes administrative procedures, minimum standards of review, and implementation and enforcement procedures for controlling erosion, sedimentation, and other pollutant runoff, including construction debris and hazardous substances used on construction sites, and disruption of existing drainage and related environmental damage caused by land clearing, grubbing, grading, filling, and land excavation activities. The chapter applies to projects that would disturb 350 cubic yards or more of soil, but could also apply in instances where the drainage course is amended or negatively affected through grading. Currently, a grading permit is required when 350 cubic yards or more of soil would be disturbed. The City is planning an update to the Grading Ordinance that will lower the permit threshold for activities requiring a grading permit. That is, smaller projects will trigger the requirement. Upon adoption, the revised threshold will apply, as appropriate, to future development under the General Plan.

Chapter 15.12, Stormwater Management and Discharge Control, also includes regulations pertaining to erosion control.

Sacramento County Code – Septic Systems

On-site management of wastewater is regulated under Chapter 6.32 of the Sacramento County Code. The Sacramento County Environmental Management Department (EMD) has jurisdiction over the construction, installation, and operation of on-site wastewater treatment systems in the unincorporated areas and incorporated cities in Sacramento County. If a septic system or alternative on-site treatment and disposal method is considered, soil testing would be required, and a site approval report must be submitted to EMD before a sewage disposal system permit application for a new installation can be obtained.

5.6.3 IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

The impact analysis provided below is based on the following CEQA Guidelines Appendix G thresholds of significance. A project is considered to have a significant effect on the environment if it will:

1) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

    a) 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.

    b) Strong seismic ground shaking.

    c) Seismic-related ground failure, including liquefaction.

    d) Landslides.

2) Result in substantial soil erosion or the loss of topsoil.

3) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

4) Be located on expansive soil, as defined in Section 1803.5.3 of the 2016 California Building Code, creating substantial risks to life or property.

5) 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.

6) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature.

In the NOP (see **Appendix A**), the City determined that implementation of the proposed Project would have no impacts associated with seiche, tsunami, and mudflow. Therefore, these issues are not addressed further in this Draft EIR.

METHODOLOGY

The evaluation of potential geologic, soil, mineral resources, and paleontological resources impacts of the proposed Project was based on review of NRCS soil survey maps and data, information published by the CGS, the City's Municipal Code, and the City of Elk Grove General Plan Update Existing Conditions Report (2016). This analysis assumes that future development projects in the Planning Area would comply with all applicable laws, regulations, and building codes pertaining to seismic and geological safety, as required under the City's Municipal Code.

General Plan Policies and Standards

The proposed Project contains the following policies and standards for managing future development in Elk Grove to reduce the potential for hazards related to geology and soil conditions.

Policy INF-2-1: Sewage conveyance and treatment capacity shall be available in time to meet the demand created by new development, or shall be assured through the use of bonds or other sureties to the City's satisfaction.

Policy INF-2-2: Development along corridors identified by sewer providers in their master plans as locations of future sewerage conveyance facilities shall incorporate appropriate easements as a condition of approval.

Policy INF-2-3: Reduce the potential for health problems and groundwater contamination resulting from the use of septic systems.

Policy INF-2-4: Residential development on lots smaller than 2 gross acres shall be required to connect to public sewer service, except in the Rural Area.

There are no policies that are specific to the protection of paleontological resources.

PROJECT IMPACTS AND MITIGATION MEASURES

Seismic Hazards (Standard of Significance 1)

Impact 5.6.1 The Planning Area is not located in an area that is susceptible to adverse impacts associated with seismic ground failure, including surface rupture, ground shaking, liquefaction, or landslides. This impact would be **less than significant**.

The Planning Area is not located within an Alquist-Priolo Earthquake Fault Zone or in an area with any known active faults. As shown in **Table 5.6-1**, the nearest fault is the Foothills Fault System, which is 21 miles from the City. For this reason, it is unlikely that an earthquake would result in surface rupture in the Planning Area.

However, even faults far from the Planning Area have the potential to cause damage in the City resulting from primary seismic hazards, including ground shaking, which is one of the biggest risks to human life and property in an earthquake. The risk of other types of seismic-related ground failure, such as liquefaction, is low because the Planning Area does not have soils prone to liquefaction. In addition, the flat nature of the Planning Area and surrounding areas would preclude the potential for landslides that could affect the Planning Area.

Existing Regulations and Standards That Provide Mitigation

The California Building Code (CBC) specifies the levels of earthquake forces that structures must be designed to withstand. The City has adopted the 2016 Edition of the California Building Code, Title 24, Part 2, Volumes 1 and 2 (City of Elk Grove Municipal Code Section 16.04.010). A geotechnical investigation is required for new or replacement occupied buildings to determine potential seismic hazards at a site and recommendations for construction methods and building design features to minimize seismic hazard risk.

Conclusion

The low risk of ground shaking in the City minimizes associated seismic hazards. Implementation of the CBC as set forth in Municipal Code Section 16.04.010 and required geotechnical investigations therein would ensure that buildings and infrastructure are designed and constructed to minimize potential damage resulting from primary or secondary seismic hazards. This impact would be **less than significant**.

Mitigation Measures

No additional mitigation required beyond compliance with existing State and local regulations and standards.

Soil Erosion (Standard of Significance 2)

Impact 5.6.2 Future development resulting from the proposed Project, including buildings, pavement, and utilities, would include grading and excavation activities that could result in the potential for topsoil erosion. This impact would be **less than significant**.

Future development and construction activities could require large-scale grading and excavation, which, if done improperly, could result in topsoil erosion. In the City, the primary concern with erosion is deposition of sediment into surface waters near a construction site via overland flow or through storm drains, and increases in the amount of particulate matter in the air, resulting in adverse air quality impacts. For analyses specific to these issue areas, refer to Section 5.3, Air Quality, and Section 5.9, Hydrology and Water Quality. From a geotechnical perspective, erosion generally does not pose a hazard during construction or occupancy because the City is flat and exposed native San Joaquin soils exhibit minimal erosion hazard. However, cut and fill activities required to prepare a site for development could result in temporary conditions that could cause erosion.

Existing Regulations and Standards That Provide Mitigation

Section 15.12.020(B)(3) of the City's Municipal Code establishes that the City is responsible for ensuring compliance with the NPDES requirements pertaining to the CGP, which requires use of BMPs to control erosion during land development activities. Municipal Code Chapter 16.44, Land Grading and Erosion Control, establishes administrative procedures, minimum standards of review, and implementation and enforcement procedures for controlling erosion caused by land clearing, grubbing, grading, filling, and land excavation activities. The chapter applies to projects that would disturb 350 cubic yards or more of soil, but could also apply in instances where the drainage course is amended or negatively affected through grading. As noted above, the City is planning an update to the ordinance that will lower the threshold, and this requirement will apply to future projects under the General Plan, as appropriate.

Conclusion

The potential for erosion resulting from future development activities in the Planning Area would be minimized by adhering to the CGP, as enforced through Municipal Code Section 15.12.020(B)(3) and Municipal Code Chapter 16.44, Land Grading and Erosion Control. Compliance with existing regulations would ensure that the Project would not result in substantial erosion. This impact would be **less than significant**.

While future development in the Planning Area could result in the loss of approximately 5,600 acres of Important Farmland, the San Joaquin soils—the primary soil type in the Planning Area—are severely limited in their agricultural potential as topsoil because of shallow soil depths, less permeable subsoil, and clayey or gravelly surface soil textures. The potential loss of topsoil is generally associated with agricultural land conversion. See Impact 5.2.1 in Section 5.2, Agricultural Resources, for additional information.

Mitigation Measures

No additional mitigation required beyond compliance with existing State and local regulations and standards.

Unstable and Expansive Soils (Standards of Significance 3 and 4)

Impact 5.6.3 Future development resulting from the proposed Project, including buildings, pavement, and utilities, could incur damage as a result of underlying expansive or unstable soil properties. Compliance with applicable building codes and commonly accepted engineering practices that address these conditions would ensure impacts associated with expansive or unstable soils are **less than significant**.

When structures are located on expansive soils, movements can occur under the structures, creating new stresses on foundations and connected utilities. These variations in ground settlement can lead to structural failure and damage to infrastructure. Subsidence with little or no horizontal motion could also occur in the Planning Area. Land subsidence is most often caused by human activities, mainly from pumping of subsurface water (groundwater) for water supply. Pumping of water for residential, commercial, and agricultural activities is the greatest cause of subsidence in the City (City of Elk Grove 2016).

Buildout of the proposed Project would increase the development intensity in the Planning Area, which would include construction of office, light industrial/flex space, commercial, residential, and schools, thereby resulting in an increased risk associated with expansive and unstable soils.

Existing Regulations and Standards That Provide Mitigation

The City has adopted the 2016 Edition of the California Building Code, Title 24, Part 2, Volumes 1 and 2 (City of Elk Grove Municipal Code Section 16.04.010). The CBC's accepted engineering practices require special design and construction methods for dealing with expansive soils. The two most common methods to prevent damage from expansive soils are to design the building's foundation to resist soil movement and to control surface drainage in order to reduce seasonal fluctuations in soil moisture. Pursuant to the CBC, future projects would be required to submit a geotechnical report for the site. Based on conditions at the site, the geotechnical study would identify appropriate construction and structural design methods to reduce the potential for damage from unstable soil conditions.

Conclusion

Compliance with recommendations included in the geotechnical reports and applicable building codes, which would be verified by City staff prior to the issuance of a grading and/or building permit, would ensure that soils at future development sites are capable of supporting the structures in the Planning Area and that potential unstable soils are accounted for in building design. Therefore, impacts resulting from expansive and unstable soils would be reduced to a **less than significant** level.

Mitigation Measures

No additional mitigation required beyond compliance with existing State and local regulations and standards.

Septic Systems (Standard of Significance 5)

Impact 5.6.4 Future development resulting from the proposed Project could occur in locations where public sewer service is not available. This is a **less than significant** impact.

Two regional entities, the Sacramento Area Sewer District (SASD) (responsible for sewage conveyance) and Sacramento Regional County Sanitation District (Regional San) (responsible for sewage treatment and discharge), provide the City with wastewater services. The SASD is responsible for the collection of wastewater from the unincorporated areas of Sacramento County, the cities of Citrus Heights, Rancho Cordova, and Elk Grove, and portions of the cities of Folsom and Sacramento. Although there is extensive wastewater collection infrastructure, some areas in the City rely on septic systems where public sewer is not available (City of Elk Grove 2016).

Future development could occur in areas where SASD and Regional San collection systems do not exist. However, the use of septic or alternative wastewater treatment systems is anticipated to be minimal because Policy INF-2-4 states that residential development on lots smaller than 2 gross acres shall be required to connect to public sewer, except in the Rural Area.

Existing Regulations and Standards and Proposed General Plan Policies That Provide Mitigation

Policy INF-2-1 requires that sewage conveyance and treatment capacity be available in time to meet demand created by new development, or shall be assured through the use of bonds or other sureties to the City's satisfaction. If a septic system or alternative on-site treatment and disposal method is considered, soil testing would be required, and a site approval report must be submitted to Sacramento County before a sewage disposal system permit application for a new installation can be obtained. Property owners would be required to monitor and maintain the system.

Conclusion

The use of septic or alternative wastewater treatment systems is anticipated to be minimal, and if such systems are used, they would be required to obtain a permit from Sacramento County in accordance with Chapter 6.32 of the Sacramento County Code. With implementation of proposed General Plan policies and existing regulations, the proposed Project would not result in conditions where soils would not be capable of adequately supporting the use of septic tanks or alternative wastewater disposal systems, and the impact would be **less than significant**.

Mitigation Measures

No additional mitigation required beyond compliance with existing State and local regulations and standards and proposed General Plan policies.

Paleontological Resources (Standard of Significance 6)

Impact 5.6.5 Construction activities in the Planning Area could affect undiscovered unique paleontological resources in paleontologically sensitive rock formations. This impact would be **potentially significant**.

Impacts on paleontological resources could occur when excavation activities encounter fossiliferous geological deposits and cause physical destruction of fossil remains. The potential for impacts on fossils depends on the sensitivity of the geologic unit and the amount and depth of grading and excavation. Much of the Planning Area is considered highly sensitive for paleontological resources. The City is underlain by the Riverbank Formation and Laguna Formation, which are considered sensitive for paleontological resources. Fossil remains, fossil sites, fossil-producing geologic formation, and geologic formations with the potential for containing fossil remains are all considered paleontological resources or have the potential to be paleontological resources. Fossil remains are considered important if they are (1) well preserved; (2) identifiable; (3) type/topotypic specimens; (4) age diagnostic; (5) useful in environmental reconstruction; and/or (6) represent new, rare, and/or endemic taxa.

Existing Laws That Provide Mitigation

Paleontological resources are classified as nonrenewable scientific resources and are protected by State statute (PRC Section 5097.5, Archeological, Paleontological, and Historical Sites). However, no State or local agencies have specific jurisdiction over paleontological resources but all must evaluate potential impacts and provide any applicable mitigation measures.

Conclusion

There is a possibility of the unanticipated discovery of paleontological resources during ground-disturbing activities as well as the potential to damage or destroy paleontological resources that

may be present below the ground surface. Therefore, future developments that require grading and excavation in sensitive formations could affect unique paleontological resources and this impact would be **potentially significant**.

Mitigation Measures

MM 5.6.5 Before the start of any earthmoving activities, the project owner shall retain a qualified scientist (e.g., geologist, biologist, paleontologist) to train all construction personnel involved with earthmoving activities, including the site superintendent, 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. Training on paleontological resources shall also be provided to all other construction workers but may use videotape of the initial training and/or written materials rather than in-person training.

If any paleontological resources (fossils) are discovered during grading or construction activities within the project area, work shall be halted immediately within 50 feet of the discovery, and the City Planning Division shall be immediately notified. The project owner will retain a qualified paleontologist to evaluate the resource and prepare a recovery plan in accordance with Society of Vertebrate Paleontology guidelines (SVP 2010). The recovery plan may include but is not limited to a field survey, construction monitoring, sampling and data recovery procedures, museum storage coordination 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 will be implemented by the applicant before construction activities resume in the area where the paleontological resources were discovered.

Future projects occurring under the proposed Project would be required to implement mitigation measure **MM 5.6.5**, which requires discovery procedures for paleontological resources during project construction and requires a qualified paleontologist to recommend measures specific to the discovered resource to mitigate adverse impacts discovered during construction activities. Implementation of mitigation measure **MM 5.6.5** would reduce impacts to paleontological resources to **less than significant**.

5.6.4 CUMULATIVE SETTING, IMPACTS, AND MITIGATION MEASURES

CUMULATIVE SETTING

Impacts associated with geology and soils are generally site-specific rather than cumulative in nature as geologic properties can vary by site. Individual development projects would be subject to, at a minimum, uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent in the region. Refer to Section 5.9, Hydrology and Water Quality, regarding cumulative water quality impacts from soil erosion.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

Cumulative Geologic and Soil Impacts (Standards of Significance 1 through 5)

Impact 5.6.6 Implementation of the proposed Project, in combination with other reasonably foreseeable development, would not contribute to cumulative geologic and soil impacts, as the impacts would be site-specific. This impact would be **less than cumulatively considerable**.

Implementation of the Project would allow an increase in the number of structures that could be subject to seismic hazards and/or the effects of expansive soils or other soil constraints, which could affect structural integrity, roadways, or underground utilities. Potentially adverse environmental effects associated with seismic hazards, expansive soils, topographic alteration, and erosion are site-specific and generally do not combine with similar effects that could occur with other projects in the City or elsewhere. Implementation of the provisions of the CBC, NPDES permit requirements, Municipal Code Chapters 16.44 and 15.12, and proposed Project policies would ensure that potential site-specific geotechnical conditions and soil conditions would be addressed fully in the design of future development. The use of septic or alternative wastewater systems would be minimal because new development (with few exceptions) would be required to connect to the public sewer system. Therefore, the proposed Project's contribution to cumulative geology and soil-related impacts would be considered **less than cumulatively considerable**.

Mitigation Measures

No additional mitigation required beyond compliance with existing State and local regulations and standards and proposed General Plan policies.

Paleontological Resources

Impact 5.6.7 Development of the proposed Project could contribute to the cumulative disturbance of paleontological resources (i.e., fossils and fossil formations). This impact would be **less than cumulatively considerable**.

There are no known paleontological resources within the Planning Area; however, the geological formations present in the Planning Area and region are considered sensitive for paleontological resources, and excavation and grading during construction could affect previously undiscovered fossils. Past projects throughout the region, including in south Sacramento County, have discovered fossilized Rancholabrean-age remains, including mammoth. As a result, ground-disturbing activities within the Planning Area could potentially uncover previously unknown paleontological resources, and these impacts would contribute to the cumulative loss of paleontological resources, specifically in the Riverbank and Laguna Formations. This potential loss of paleontological resources would be cumulatively considerable, when considered together with the effects of past, present, and reasonably foreseeable projects, including the proposed Project. Future projects would be required to implement mitigation measure **MM 5.6.5**, which addresses the inadvertent discovery of previously unknown paleontological resources, which would ensure that the Project's contribution to these impacts would be **less than cumulatively considerable**.

Mitigation Measures

No additional mitigation required beyond compliance with existing laws and mitigation measure **MM 5.6.5**.

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