DOCKETED	
Docket Number:	26-OPT-01
Project Title:	Vaca Dixon Power Center Project
TN #:	268162
Document Title:	Section 5-16_Geological Hazards and Resources_VDPC
Description:	This section describes the geological hazards and resources present in the vicinity of the Project Site, as well as the potential impacts that may result from construction and operation of the Project related to geological hazards and geological resources of commercial, recreational, or scientific value.
Filer:	Grace Myers
Organization:	Rincon Consultants, Inc.
Submitter Role:	Applicant Consultant
Submission Date:	1/6/2026 1:24:15 PM
Docketed Date:	1/16/2026

5.16 Geological Hazards and Resources

This section describes the geological hazards and resources present in the vicinity of the Vaca Dixon Power Center (VDPC) Project (Project), as well as the potential impacts that may result from construction and operation of the Project related to geological hazards and geological resources of commercial, recreational, or scientific value. Section 5.16.1 describes the existing environmental setting, including regional and local geology and hydrogeology, as well as geological hazards. Section 5.16.2 provides an overview of the regulatory setting related to geological hazards and resources. Section 5.16.3 identifies potential impacts that may result from Project construction and operation (including maintenance), as well as mitigation measures that should be considered during Project construction and operation. Section 5.16.4 discusses cumulative impacts. Section 5.16.5 presents laws, ordinances, regulations, and standards (LORS) applicable to geological hazards and resources. Section 5.16.6 identifies regulatory agency contacts and Section 5.16.6describes permits required for the Project related to geological hazards and resources. Section 5.16.8 provides references for this section.

5.16.1 Environmental Setting

The following subsections provide an overview of the existing environmental setting for geological hazards and resources in the Project vicinity.

5.16.1.1 Regional Geology

The Project borders the Coastal Range and Great Valley ranges of the California Geomorphic Provinces (California Geologic Survey [CGS] 2002). The north central portion of Solano County, including the City of Vacaville, in which the Project is located, is dominated by non-marine sedimentary rocks deposited during the Quaternary and Tertiary periods.

5.16.1.2 Local Geology and Stratigraphy

The Project Site is underlain by Quaternary alluvium composed of mixtures of sand, gravel, silt, and clay (Sims et al. 1973). As shown in Figure 5.16-1a through Figure 5.16-1c, Late Pleistocene alluvium underlies the entirety of the Project, including the two battery energy storage system (BESS) components and the transmission intertie (gen-tie) line. Late Pleistocene alluvium consists of Pleistocene-aged, floodplain and alluvial fan deposits of interstratified, unconsolidated gravel, silt, and clay (Sims et al. 1973, Dawson 2009).

5.16.1.3 Seismic Setting

Most of Solano County, including the City of Vacaville, is situated within an area of moderate seismic activity. The faults and fault systems along the western and southwestern portion of Solano County, as well as other regional faults, have the potential to produce high-magnitude earthquakes throughout the County. The Project Site is within an area designated earthquake Risk Category III, as defined by the most recent California Uniform Building Code, which requires specific seismic design standards (California Building Code [CBC] 2022, Soils Engineering, Inc. [SEI] 2025).

According to the Division of Mines and Geology Special Publication 42, which includes an index of 7.5-minute quadrangle maps containing Earthquake Fault Zones, no known faults have been mapped through the Project Site (CGS 2018). The closest active faults to the Project Site are within the Rio Vista Fault Zone and Great Valley Thrust Fault System, located approximately 4 miles

southwest of the Project Site (United States Geological Survey [USGS] 2017a, USGS 2017b). Table 5.16-1 lists the faults within 100 miles of the Project Site and Figure 5.16-2 shows these faults in relation to the Project Site.

Table 5.16-1 Faults in Proximity to the Project Site

Fault	Approximate Fault to Project Site Distance (miles)
Rio Vista Fault	4
Great Valley Thrust Fault System	4
Lagoon Valley Fault	6
Cordelia Fault Zone	13
Green Valley Fault Zone	15
Midland Fault Zone	6
Atlas Peak Foss Lineament Zone	6
Hunting Creek-Berryessa Fault System	22
Soda Creek Fault	20

Source: USGS 2017a; USGS 2017b

5.16.1.4 Potential Geologic Hazards

The following subsections discuss the geologic hazards that have the potential to occur in the Project vicinity.

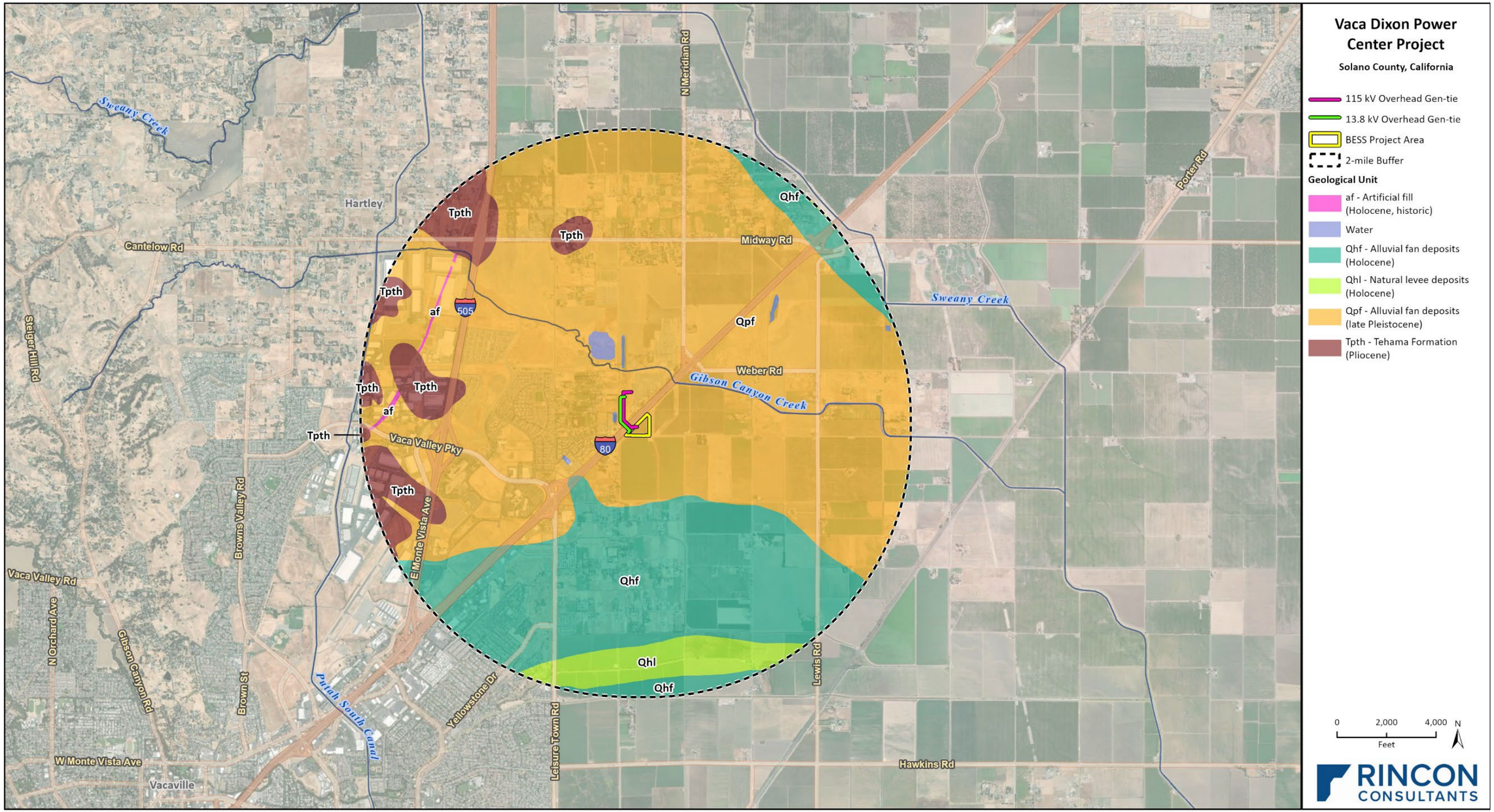
Ground Rupture

Ground rupture refers to the displacement of the ground surface along a pre-existing fault. Ground rupture can endanger life and property if structures are constructed on, or cross over, a fault due to the differential movement of the ground surface. The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) directed the State Geologist to delineate regulatory "zones of required investigation" to reduce the threat to public health posed by geologic faults and earthquakes. Zones of required investigation indicate areas with active faults that have the potential for surface rupture. There are no known faults (CGS 2015), and no zones of required investigation (CGS 2024a) within the Project Site; the closest zone of required investigation to any Project component is the Cordelia Fault, located approximately 13 miles southwest of the Project Site.

Seismic Shaking

As with virtually all of California, the Project is located in an area with the potential for ground shaking that may cause structural or property damage in the event of an earthquake. The intensity of ground motion depends upon the magnitude of an earthquake, the distance from the epicenter, and the geology between the epicenter and the site. Ground motion caused by earthquakes can be amplified in softer, unconsolidated soil, in which seismic wave velocity decreases but wave amplitude increases, as opposed to in harder material, such as bedrock. As amplitude increases, so does ground acceleration, and the ground shaking intensity.

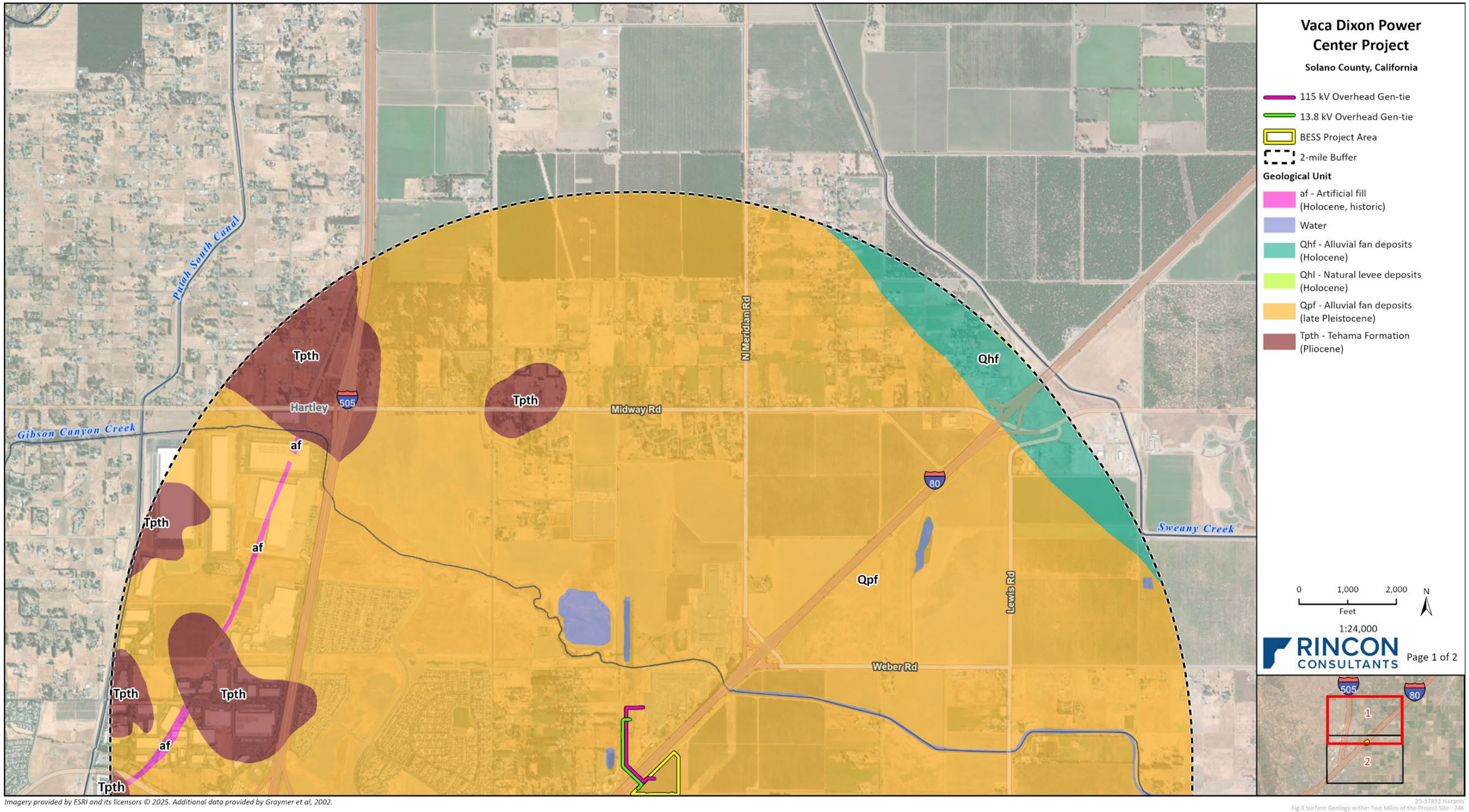
Figure 5.16-1a Surface Geology Within Two Miles of Project Site Overview



Imagery provided by ESRI and its licensors © 2025. Additional data provided by Graymer et al, 2002.

25-17851 Hazards
Fig X Surface Geology within Two Miles of the Project Site - Overview

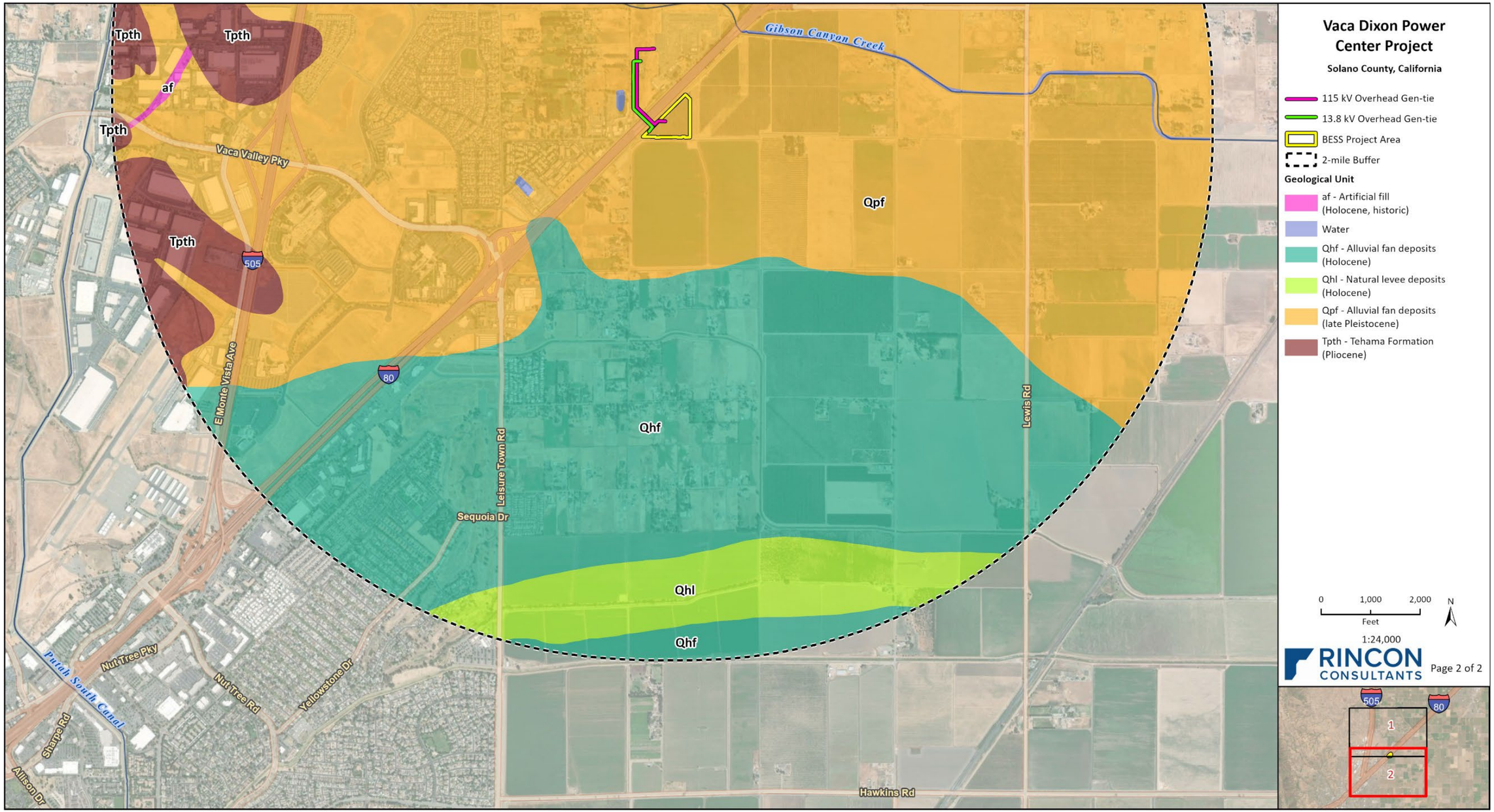
Figure 5.16-1b Surface Geology Within Two Miles of Project (Mapbook Page 1)



Imagery provided by ESRI and its licensors © 2025. Additional data provided by Graymer et al, 2002.

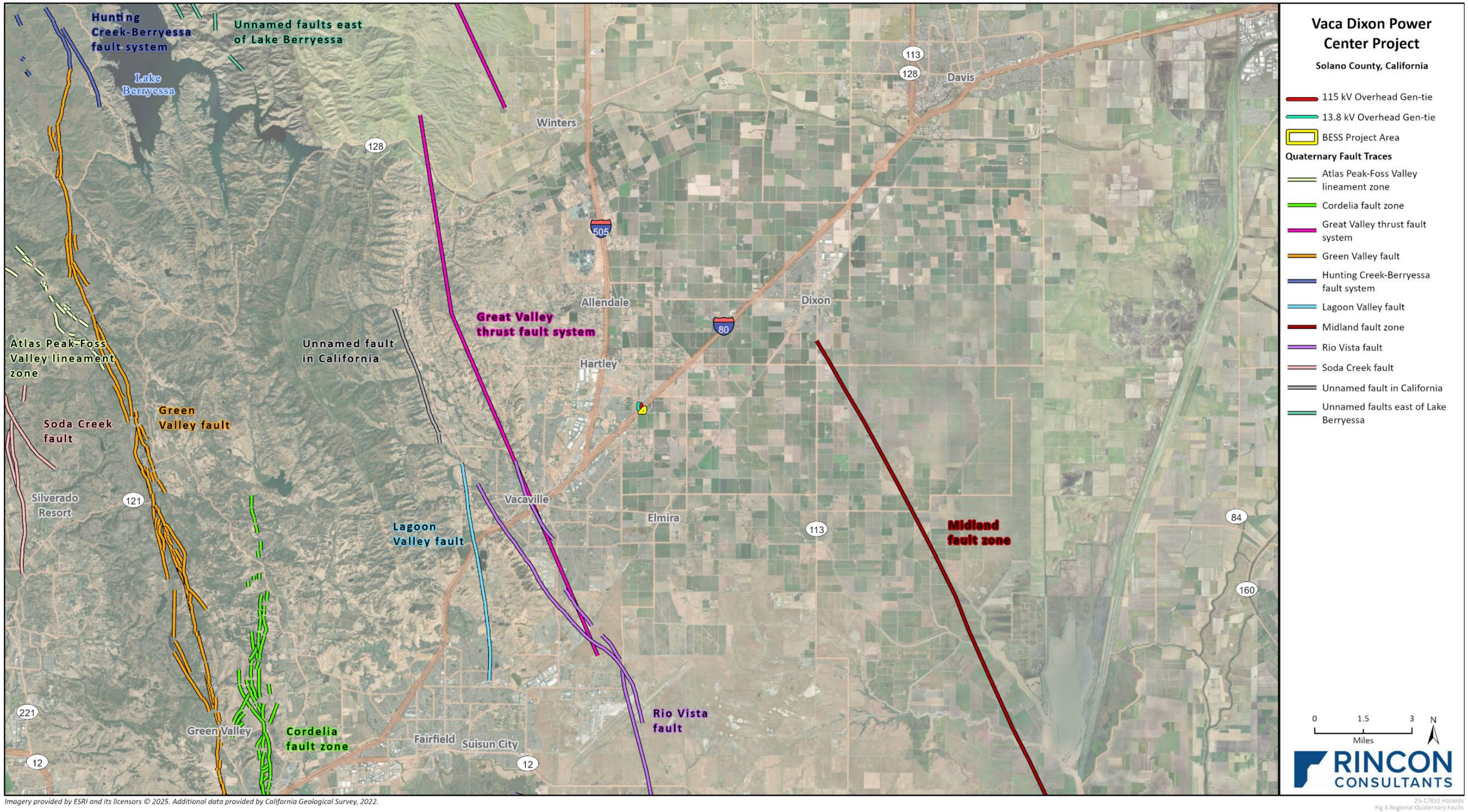
25-17851 Hazards
Fig X Surface Geology within Two Miles of the Project Site - 24K

Figure 5.16-1c Surface Geology Within Two Miles of Project (Mapbook Page 2)



Imagery provided by ESRI and its licensors © 2025. Additional data provided by Graymer et al, 2002.

Figure 5.16-2 Regional Quaternary Faults



Imagery provided by ESRI and its licensors © 2025. Additional data provided by California Geological Survey, 2022.

25-17851 Hazards
Fig X Regional Quaternary Faults

The USGS Unified Hazard Tool[1] was used to calculate estimated peak ground accelerations (PGA) based on a given time horizon and on-site specific parameters and published earthquake hazard and probability maps. The PGAs for the two Project BESS facilities were compared to the Modified Mercalli scale (Kramer and Upsall 2006)[2] to provide a qualitative assessment of the potential for ground shaking. Table 5.16-2 shows the PGA associated with each Project component.

Table 5.16-2 Peak Ground Acceleration (PGA) for the Project Components

Project Component	Latitude/Longitude	PGA	Potential for Damage
Vaca Dixon 57 MWh BESS	38.395688, -121.921863	0.5g	Weak perceived shaking, no potential damage
Arges 400 MWh BESS	38.396566, -121.921096	0.5g	Weak perceived shaking, no potential damage

Notes:
The PGAs for the 13.8 kV and 115 kV gen-ties would be similar to the Vaca Dixon 57 MWh and Arges 400 MWh BESS facilities.
g – acceleration due to gravity
PGA – peak ground acceleration

The Geotechnical Investigation prepared by Soils Engineering, Inc. (SEI) calculated the PGA for the Project Site as 0.507g, also indicating that the potential for damage from seismic shaking is low (SEI 2025).

Liquefaction

Liquefaction is a process in which saturated soil temporarily becomes fluid during intense and prolonged ground shaking, or because of a sudden shock or strain. Liquefaction typically occurs in areas with loose sand or silt where groundwater is shallow (less than 30 feet below ground surface [bgs]) (State Mining and Geology Board [SMGB] 2014). Settlement is the vertical compression of the soil structure in response to a load, such as a building or compressive ground shaking in an earthquake. Settlement can be rapidly induced by liquefaction as sediments densify in response to the dissipation of pore water pressures. Lateral spreading occurs when, during liquefaction, soil is not constrained laterally and flows horizontally. Parts of Solano County, including the City of Vacaville, may be subject to liquefaction during seismic events due to the presence of shallow groundwater. The Project Site overlies Quaternary-aged alluvium which may contain unconsolidated fine-grained fractions that are susceptible to liquefaction. However, the Project Site is not mapped within a known liquefaction zone on the California State Geoportal, CGS Seismic Hazards Program Liquefaction Zones map (California State Geoportal 2024) and according to the City of Vacaville and Solano County General Plans, the Project Site has a low potential for liquefaction (City of Vacaville 2024, Solano County 2008). Additionally, the Geotechnical Investigation prepared by SEI concluded that based on the soil types present in the upper 51.5 feet of soil (i.e., sandy clay and clayey sand) that the liquefaction potential for the Project Site is considered low (SEI 2025).

Slope Stability and Mass Wasting

Landslides are a form of mass wasting, in which rocks or soil material travel downhill under the force of gravity in a slope failure. Landslides typically occur on moderate-to-steep slopes when masses of rock or earth move down the slope. Landslides can be caused by natural events (e.g., rainfall, earthquakes, snow melt, and soil erosion) or human activities (e.g., grading) that can result in

[1] Available online at https://earthquake.usgs.gov/hazards/interactive/
[2] The PGA derived for this report is intended to offer a qualitative assessment of potential ground shaking and is not intended to provide information for use in engineering calculations or designs for the Project.

unstable fill slopes or excessive cuts. Important factors that affect slope stability include steepness of the slope and the strength of rock or soil material. Significant damage to structures and/or infrastructure can occur depending on the extent and energy of the landslide.

No records of major historical landslides were found in proximity to the Project, and the Project is not mapped within a deep-seated landslide susceptibility zone (California Department of Conservation [DOC] 2024, CGS 2024b). Landslide risk at the Project would be minimal due to the relatively flat topography within its footprint and surroundings.

Expansive Soils

Soils with relatively high clay content that contain specific clay minerals (such as smectite clays) are considered expansive, which indicates that they shrink and swell in response to changing water content. This action is characterized by a soil's "shrink-swell potential," and can damage building and structural foundations via the differential movement of soil.

Expansive soils are present throughout the City of Vacaville and Solano County (City of Vacaville 2024, Solano County 2008); however, the Geotechnical Investigation prepared by SEI described the on-site soil as having a very low to medium expansion potential. A discussion of the potential for expansive soils within the Project is included in Section 5.14, *Soils*.

Subsidence and Collapse of Below Grade Features

Subsidence is the differential (lateral or vertical) movement of the ground due to the collapse of soil pore space, which occurs without the application of an external load, such as a building. Subsidence can also occur during the compressive ground shaking of an earthquake. Common causes of subsidence in California are the over-pumping of groundwater, which reduces pore pressure, or the decay of organic matter, such as peat, which allows the soil substrate to compress and surface elevations to decrease. Subsidence is generally viewed as a regional change in surface elevation; however, localized differential displacements of the ground surface can damage foundations and structures as does settlement. Subsidence in Solano County, including within the City of Vacaville, has been relatively low over the last 10 years, averaging less than 0.1 foot over the last 10 years (California Department of Water Resources 2024a).

The Project is located in a low subsidence area with some seasonal changes due to agricultural use of groundwater resources; however, due to adequate groundwater recharge the overall change in surface elevation has been low (Solano County Water Agency 2023).

Dam Failure Inundation

Giles Dam is located approximately 4 miles northwest of the BESS Project Area. Based on review of the Department of Water Resources (DWR) and Solano General Plan Dam Inundation Maps, as well as the City of Vacaville Safety Element, the Project Site is not mapped in an area subject to flooding from a failure of the Giles Dam (DWR 2024b, Solano County 2008) or the Monticello Dam (City of Vacaville 2023) and the downstream inundation hazard is low. Additionally, dams in California are monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to collect critical information related to dam integrity, which allows for response actions that are intended to reduce the occurrence of dam failure. Current design and construction practices, and ongoing programs of review, modification, seismic retrofitting, or total reconstruction of existing dams are intended to ensure that dams are capable of withstanding the maximum credible earthquake.

Soil Erosion

A discussion of the potential for soil erosion within the Project is included in Section 5.14, *Soils.*

Tsunami Run Up

Tsunamis are large, seismically induced ocean waves that are often a result of offshore earthquakes, landslides, or submarine volcanic activity. The National Oceanic and Atmospheric Administration (NOAA) and National Weather Service (NWS) consider 100 feet above sea level or one mile inland to be a safe distance from tsunami impacts (NOAA and NWS 2024). The Project is located approximately 18 miles from the Pacific Ocean at Grizzly Bay and the overall risk of inundation from tsunamis is low for the Project Site.

5.16.1.5 Geologic Resources of Recreational, Commercial, or Scientific Value

Geologic resources in the Project vicinity include Quaternary alluvium composed of mixtures of sand and gravel. These deposits are not unique in terms of recreational or scientific value and occur throughout Solano County, including in the City of Vacaville. A mineral resource is the concentration or occurrence of a solid material of economic interest in or on the Earth's crust in such form, grade, or quality and quantity that there are reasonable prospects for eventual economic extraction. An aggregate resource is sand, gravel, and crushed stone that has been mechanically broken down and is of economic interest. Solano County produces minerals and aggregates due to the abundance and variety of resources present within the county. Extracted resources include aggregates (sand and gravel), metals (mercury), minerals (sulfur and calcium), and other minerals used in construction or industrial applications (high-grade clay and stone products) (Solano County 2008).

The CGS and SMGB classify the regional significance of mineral resources in accordance with the California Surface Mining and Reclamation Act of 1975. The SMGB uses a classification system that divides land into four mineral resource zones (MRZ) that have been designated based on quality and significance of mineral resources. The Project Site is located in an area classified as MRZ-1, which is defined as "areas where available geologic information indicates that little likelihood exists for the presence of significant concrete aggregate resources" (O'Neal and Gius 2018). In addition, according to the Solano County General Plan, the gen-tie is located outside of areas where significant mineral deposits are present, and there are no known mineral resources or resource recovery sites on the Project Site (Solano County 2008). The City of Vacaville General Plan does not discuss mineral resources or resource recovery sites (City of Vacaville 2024). Therefore, the Project Site is not considered to contain mineral resources of significant recreational, commercial, or scientific value.

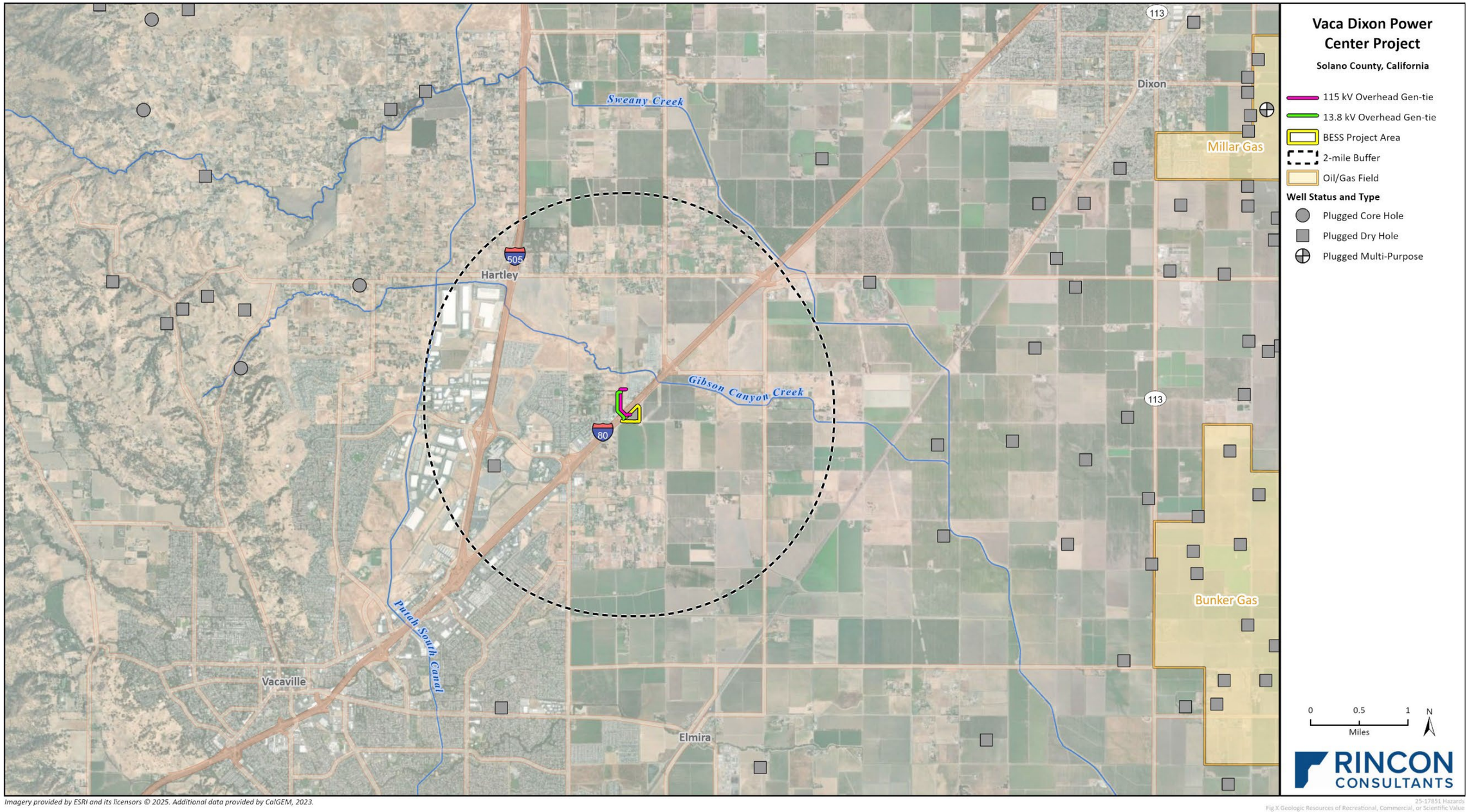
According to the California Geologic Energy Materials Division (CalGEM), the Project Site is not situated above or adjacent to any active or abandoned oil fields or wells (CalGEM 2024), as shown on Figure 5.16-3.

5.16.2 Regulatory Setting

Federal, state, and local LORS related to geological hazards and resources were reviewed for applicability to the Project. These are detailed in Section 5.16.5.

This page intentionally left blank.

Figure 5.16-3 Geologic Resources of Recreational, Commercial, or Scientific Value Overview



Imagery provided by ESRI and its licensors © 2025. Additional data provided by CalGEM, 2023.

25-17851 Hazards
Fig X Geologic Resources of Recreational, Commercial, or Scientific Value

This page intentionally left blank.

5.16.3 Impact Analysis

The following subsections discuss the potential direct and indirect impacts related to geologic hazards and resources from construction and operation (including maintenance) of the Project.

5.16.3.1 Methodology

To identify and assess potential impacts related to geologic hazards and resource, Rincon Consultants, Inc. geologists reviewed publicly available information, including maps, online databases, articles, reports, and published research papers. The literature review included the following:

- USGS and CGS geologic maps
- Seismic hazard zone maps
- Landslide inventory maps
- USGS and CGS active fault maps and ground shaking maps
- Alquist-Priolo Special Studies Zones Earthquake Fault maps
- Health and Safety Element of the General Plan for Solano County
- Resources Element of the General Plan for Solano County
- CalGEM maps
- DWR Sustainable Groundwater Management Act maps

5.16.3.2 Impact Evaluation Criteria

The potential for impacts related to geological hazards and resources were evaluated using the relevant criteria described in the California Environmental Quality Act (CEQA) Environmental Checklist (Appendix G of the CEQA Guidelines). In 2015, the California Supreme Court in *California Building Industry Association v. Bay Area Air Quality Management District* (*CBIA v. BAAQMD*, 2015, 62 Cal.4th 369), held that CEQA generally does not require a lead agency to consider the impacts of existing environmental conditions on the future occupants or users of a project. However, if a project could exacerbate pre-existing environmental hazards or conditions, then the lead agency must analyze the impact of that exacerbated condition on the environment, which may include future occupants and users within the Project vicinity. Specific to geological hazards and resources and mineral resources, the CEQA Checklist asks, would the Project:

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent 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; and/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;
- 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 a value to the region and the residents of the state; and/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?

Impact GEO-1

Threshold:	Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?

There are no known faults (CGS 2015) within the Project vicinity; the closest active faults to the Project are within the Rio Vista Fault Zone and Great Valley Thrust Fault system, located approximately 4 miles southwest of the Project Site (USGS 2017a, USGS 2017b).

Construction

No Impact. The Project would not be located within a mapped Alquist-Priolo Earthquake Fault Zone; therefore, construction of the Project would not 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. Additionally, construction of the Project does not include the injection of water or liquid wastes or the extraction of crude oil or natural gas in close proximity to a known Earthquake Fault Zone or regional Quaternary faults identified in Table 5.16-1. As such, the Project would not directly or indirectly trigger movement along a fault during construction. No impact would occur.

Operation

No Impact. The Project would not be located within a mapped Alquist-Priolo Earthquake Fault Zone; therefore, operation of the Project would not 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. Operation of the Project does not include the injection of water or liquid wastes or the extraction of crude oil or natural gas in close proximity to a known Earthquake Fault Zone or regional Quaternary faults identified in Table 5.16-1. As such, the Project would not directly or indirectly trigger movement along a fault during operation. No impact would occur.

Impact GEO-2

Threshold:	Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

Construction

Less Than Significant Impact. As shown in Table 5.16-2, the Project would be located in an area with a PGA rating that corresponds to "weak perceived shaking" and "no potential damage" when compared to the Modified Mercalli scale, indicating that the area is susceptible to seismic activity and would be subject to weak ground shaking during a reasonably likely earthquake. Final design plans would be fully compliant with seismic recommendations provided by a California-registered professional engineer in accordance with California Building Code (CBC) requirements as well as Chapter 6.3 and Chapter 31 of the Solano County Code of Ordinances and Division 15.20 of the City of Vacaville Municipal Code. The final structural designs would be subject to approval and follow-up inspection by the CEC to ensure compliance. Furthermore, the Project would be constructed in accordance with all applicable codes, which require property line and public roadway setbacks that would protect the general public from potential hazards associated with the facility that would result from an earthquake. The final design of the gen-tie structures including pole foundations associated with the aerial crossing of Interstate 80 (I-80) will be engineered to ensure structural integrity and prevent failure or collapse as detailed in the Geotechnical Investigation (SEI 2025).

Construction of the Project does not include the injection of water or liquid wastes or the extraction of crude oil or natural gas in close proximity to a known Earthquake Fault Zone or regional Quaternary faults identified in Table 5.16-1. As such, the Project would not directly or indirectly trigger movement along a fault during construction.

Implementation of the applicable CBC requirements and CEC enforcement would ensure that the Project would not directly or indirectly cause substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking. Therefore, impacts related to ground shaking during construction of the Project would be less than significant.

Operation

Less Than Significant Impact. As discussed above, the Project would be located in an area with a PGA rating that corresponds to "weak perceived shaking" and "no potential damage" when compared to the Modified Mercalli scale, indicating that the area is susceptible to seismic activity and would be subject to weak ground shaking during a reasonably likely earthquake. Operation of the Project does not include the injection of water near a known Earthquake Fault Zone or regional Quaternary faults identified in Table 5.16-1, nor would it include injection of liquid wastes or the extraction of crude oil or natural gas. As such, the Project would not directly or indirectly trigger movement along a fault during operation. Impacts would be less than significant.

Impact GEO-3

Threshold:	Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?

Construction

Less Than Significant Impact. The Project is not mapped within a known liquefaction zone on the California State Geoportal, CGS Seismic Hazards Program Liquefaction Zones map (California State Geoportal 2024) and is identified in the Solano County General Plan and City of Vacaville Safety Element has having a low potential for liquefaction (Solano County 2008, City of Vacaville 2023). However, the Project Site is located in an area underlain with soils that may be susceptible to liquefaction. Compliance with CBC requirements, which require that all improvements be constructed to withstand potential impacts caused by liquefaction and lateral spreading, and Chapter 6.3 and Chapter 31 of the Solano County Code of Ordinances, as well as Division 15.20 of the City of Vacaville Municipal Code, would ensure construction impacts related to seismic-related ground failure, including liquefaction, would be less than significant.

Operation

Less Than Significant Impact. As discussed above, the Project is not mapped within a known liquefaction zone on the California State Geoportal, CGS Seismic Hazards Program Liquefaction Zones map (California State Geoportal 2024) and is identified in the Solano County General Plan and City of Vacaville Safety Element has having a low potential for liquefaction (Solano County 2008; City of Vacaville 2023). However, the Project is located in an area underlain with soils that may be susceptible to liquefaction. The Project would be constructed to withstand potential impacts caused by liquefaction and lateral spreading, as required by CBC. Operation of the Project does not include the injection of water near a known Earthquake Fault Zone or regional Quaternary faults as shown in Table 5.16-1, nor would operations include injection of liquid wastes or the extraction of crude oil or natural gas. As such, the Project would not include operational activities that could trigger movement along a fault that may result in seismic-related ground failure, including liquefaction. Impacts would be less than significant.

Impact GEO-4

Threshold:	Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides?

Construction

No Impact. Due to the relatively flat topography, landslide risk at the Project would be minimal. Construction of the Project would not cause any geologic unit or soil to become unstable because it would be located primarily on flat to gentle terrain that is not prone to landslides; therefore, Project construction would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslide, and no impact would occur.

Operation

No Impact. As described above, landslide risk at the Project would be minimal due to the relatively flat topography. As such, operation of the Project would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides, and no impact would occur.

Impact GEO-5

Threshold:	Would the Project directly or indirectly result in substantial soil erosion or the loss of topsoil?

Please see Section 5.14, *Soils*, for a discussion of potential impacts related to this impact evaluation criteria.

Impact GEO-6

Threshold:	Would the Project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

For hazard-specific discussions, please refer to Impact GEO-3 for liquefaction and lateral spreading-related geologic hazards and refer to Impact GEO-4 for landslide-related geologic hazards. The following analysis focuses on Project impacts related to unstable soils, including subsidence and collapse.

Construction

Less Than Significant Impact. The Project is located in an area that has experienced relatively low subsidence over the last 10 years (California Department of Water Resources 2024a). Compliance with CBC requirements, which require that all improvements be constructed to withstand potential impacts caused by unstable soils, and Chapter 6.3 and Chapter 31 of the Solano County Code of Ordinances, as well as Division 15.20 of the City of Vacaville Municipal Code, would ensure construction impacts related to unstable soils would be less than significant.

Operation

Less Than Significant Impact. As discussed above, potentially unstable soils present at the Project Site would be addressed during Project construction in compliance with CBC requirements such that the Project would not operate on unstable soils. Therefore, operation of the Project would result in less than significant impacts related to unstable oils resulting in on- or off-site subsidence or collapse.

Impact GEO-7

Threshold:	Would the Project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating a substantial risk to life or property?

Please see Section 5.14, *Soils*, for a discussion of potential impacts related to this impact evaluation criteria.

Impact GEO-8

Threshold:	Would the Project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Please see Section 5.15, *Paleontological Resources*, for a discussion of potential impacts related to this impact evaluation criteria.

Impact GEO-9

Threshold:	Would the Project result in the loss of availability of a known mineral resource that would be a value to the region and the residents of the state?
Threshold:	Would the Project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

Construction

No Impact. According to the review of available data from USGS, CGS, the City of Vacaville, and Solano County, no significant mineral resources are present at the Project, and the Project would not result in the loss of availability of any mineral resource in the area. The Project would not be located in a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. Therefore, construction of the Project would not result in the loss of availability of a known mineral resource that would be of value to the region or residents of the state or locally important mineral resources, and no impact would occur.

Operation

No Impact. As detailed above, no significant mineral resources are present at the Project, nor would the Project result in the loss of availability of any mineral resource in the area. Therefore, operation of the Project would not result in the loss of availability of a known mineral resource that would be of value to the region or residents of the state or locally important mineral resources, and no impact would occur.

5.16.4 Cumulative Impacts

Impacts of the Project would be found cumulatively considerable if they would have the potential to combine with other past, present, or reasonably foreseeable projects to become significant.

Overall Project

Geological hazards are generally site-specific and depend on localized geologic and soil conditions. Construction and operation of the Project would result in less than significant impacts related to ground rupture, seismic shaking, mass wasting and slop stability, liquefaction, subsidence, tsunami runup, expansion or collapse of soil structure, and geological resources. The Project would be designed in accordance with applicable laws, regulations, ordinances, and permits pertaining to structural design and geotechnical analysis. As is required for the Project, cumulative projects in the area would be required to comply with applicable regulations related to geological hazards and resources. Adherence to all federal, state, and local programs, requirements, and policies pertaining

to building safety and construction would limit cumulative impacts related to geologic hazards and resources to a less than significant level.

5.16.5 Laws, Ordinances, Regulations, and Standards

The LORS that may apply to the Project related to geological hazards and resources are summarized in Table 5.16-3. The local LORS discussed in this section are ordinances, plans, or policies of Solano County and the City of Vacaville.

5.16.5.1 Federal LORS

There are no applicable federal LORS related to geological hazards and resources.

5.16.5.2 State LORS

California Environmental Quality Act

CEQA requires state and local government agencies to inform decision makers and the public about the potential environmental impacts of the Project and to reduce environmental impacts to the extent feasible. Appendix G of the CEQA Guidelines includes recommended criteria for evaluating potential impacts related to geological hazards and resources and mineral resources.

2022 and 2025 California Building Code

The Project is subject to the applicable sections of Title 24, Part 2 of the CBC, which is administered by the California Building Standards Commission. Under state law, all building standards must be centralized in Title 24 to be enforceable. The CBC contains necessary California amendments, which are based on American Society of Civil Engineers/Structural Engineering Institute Standards. The 2025 CBC will be effective as of January 1, 2026 and compliance with the 2025 CBC is required for construction activities beginning after the effective date. The 2025 CBC includes updates to energy efficiency, safety, and accessibility standards. The CBC standards provide requirements for general structural design and include means for determining earthquake loads, as well as other loads for inclusion into building codes. The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, which are used to determine a seismic design category (SDC) for a project. Once a project is categorized according to an SDC, design specifications can be determined. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure—or any appurtenances connected or attached to such buildings or structures—throughout California.

Table 5.16-3 LORS Applicable to Geological Hazards and Resources

Jurisdiction	LORS	Applicability	Opt-In Application Reference	Project Conformity
State	California Environmental Quality Act	Requires state and local government agencies to inform decision makers and the public about the potential environmental impacts of the Project and to reduce environmental impacts to the extent feasible.	Throughout this Opt-In Application	The Project's approval by the CEC would comply with CEQA, as required by the CEC's Opt-In Application process.
State	2025 California Building Code: ▪ Chapter 1 ▪ Chapters 16/16a ▪ Chapters 17/17a ▪ Chapters 18/18a ▪ Appendix J	Defines acceptable design criteria for structures with respect to seismic design and load bearing capacity.	▪ Impact GEO-2 ▪ Impact GEO-3 ▪ Impact GEO-5 ▪ Impact GEO-6 ▪ Impact GEO-7	Project grading and construction would comply with seismic recommendations provided by a professional engineer in accordance with CBC requirements.
State	Alquist Priolo Earthquake Fault Zoning Act	Identifies areas subject to surface rupture from surface faults.	▪ Impact GEO-1 ▪ Impact GEO-2 ▪ Impact GEO-3 ▪ Impact GEO-5 ▪ Impact GEO-6 ▪ Impact GEO-7	The Project does not include components located within a mapped Alquist-Priolo Earthquake Fault Zone.
State	Seismic Hazards Mapping Act	Identifies secondary seismic hazards including liquefaction and seismically induced landslides.	▪ Impact GEO-1 ▪ Impact GEO-2 ▪ Impact GEO-3 ▪ Impact GEO-5 ▪ Impact GEO-6 ▪ Impact GEO-7	The Project is not located in a seismic hazard area and thus would conform with requirements set forth in the Seismic Hazards Mapping Act.
Local	Solano County Code of Ordinances: ▪ Chapter 6.3 ▪ Chapter 31	Identify building and construction requirements to reduce hazard potential that are applicable to all new construction, including the Project.	▪ Impact GEO-2 ▪ Impact GEO-3 ▪ Impact GEO-5 ▪ Impact GEO-6 ▪ Impact GEO-7	The Project would adhere to the standards within Chapter 6.3 and Chapter 31 and obtain all necessary permits prior to construction.

Jurisdiction	LORS	Applicability	Opt-In Application Reference	Project Conformity
Local	City of Vacaville Municipal Code: Division 15.20	Identify building and construction requirements to reduce hazard potential that are applicable to new construction, alteration, repairs, relocations, or reconstruction, including the Project.	▪ Impact GEO-2 ▪ Impact GEO-3 ▪ Impact GEO-5 ▪ Impact GEO-6 ▪ Impact GEO-7	The Project would adhere to the standards within Division 15.20 and obtain all necessary permits prior to construction.
Local	Solano County General Plan: ▪ Policy HS.P-12 ▪ Policy HS.P-18 ▪ Policy RS.P -33	These policies aim to minimize the loss of life, injury, and property damage due to seismic and geologic hazards and preserve mineral resources.	▪ Impact GEO-2 ▪ Impact GEO-3 ▪ Impact GEO-5 ▪ Impact GEO-6 ▪ Impact GEO-7 ▪ Impact GEO-9	The Project would minimize the loss of life, injury, and property damage by complying with seismic and geologic hazard recommendations provided by a professional engineer in accordance with CBC requirements. No significant mineral resources are located within the Project Site.
Local	Solano County Multi-Jurisdictional Hazard Mitigation Plan	Provides actions and strategies to reduce or eliminate long-term risks caused by natural disasters, including earthquakes and slope failure.	▪ Impact GEO-1 ▪ Impact GEO-2 ▪ Impact GEO-3 ▪ Impact GEO-4 ▪ Impact GEO-5 ▪ Impact GEO-6 ▪ Impact GEO-7	The Project would minimize the loss of life, injury, and property damage from natural disasters by complying with seismic and geologic hazard recommendations provided by a professional engineer in accordance with CBC requirements.
Local	City of Vacaville General Plan: Safety Element Policy SAF-P1.1-SAF-P1.12	These policies aim to minimize the loss of life, injury, and property damage due to seismic and geologic hazards and preserve mineral resources.	▪ Impact GEO-2 ▪ Impact GEO-3 ▪ Impact GEO-5 ▪ Impact GEO-6 ▪ Impact GEO-7 ▪ Impact GEO-9	The Project would minimize the loss of life, injury, and property damage by complying with seismic and geologic hazard recommendations provided by a professional engineer in accordance with CBC requirements. No significant mineral resources are located within the Project Site.

Sources: California Code of Regulations, Solano County Code of Ordinances, Solano County 2008, Solano County 2022

Alquist Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was enacted by the state in 1972 to mitigate the hazards of surface faulting on structures planned for human occupancy and other critical structures. The state has established regulatory zones, known as earthquake fault zones, around the surface traces of active faults. Earthquake fault zone maps have been issued for use by government agencies to plan and review new construction projects. In addition to residential projects, structures planned for human occupancy that are associated with industrial and commercial projects are also a concern near the Alquist-Priolo earthquake fault zones. Project components would not be located in a mapped Alquist-Priolo earthquake fault zone; thus, the Project would inherently comply with the requirements of this act.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (California PRC, Chapter 7.8, §2690-2699.6) directs the CGS to identify and map areas prone to liquefaction, earthquake induced landslides, and amplified ground shaking. The purpose of this program is to minimize the loss of life and property through the identification, evaluation, and mitigation of seismic hazards. Seismic Hazard Zone Maps that identify Zones of Required Investigation have been generated as a result of the program. Counties and cities are then required to use the Seismic Hazard Zone Maps in their land use planning and building permit processes. The Project is not located in an area identified as a seismic hazard zone or zone of required investigation.

5.16.5.3 Local LORS

Solano County Code of Ordinances

The Solano County Code of Ordinances (County Code) largely adopts the CBC with specific edits. Chapter 6.3 – Building Standards and Codes and Chapter 31 – Grading, Drainage, Land Leveling, and Erosion Control include building and construction requirements to reduce hazard potential that are applicable to all new construction, including the Project.

City of Vacaville Municipal Code

The City of Vacaville Municipal Code adopts the CBC with amendments specific to the City of Vacaville. Division 15.20 – Building, Construction, and Fire Code, includes building and construction requirements to reduce hazard potential that are applicable to new construction, alterations, repairs, relocations, or reconstruction of any building or structure, including the Project.

Solano County General Plan

California Senate Bill 271 Assembly Bill 2038 required that counties and cities adopt General Plan policies regarding natural hazards. The County of Solano's General Plan provides direction and resources intended to protect people and property from natural and human-made hazards. The Solano County General Plan contains several policies that are applicable to the Project, including, but not limited to:

- **Policy HS.P-12:** Require new development proposals in moderate or high seismic hazard areas to consider risks caused by seismic activity and to include project features that minimize these risks.

- **Policy HS.P-18:** Make information about soils with a high shrink-swell potential readily available. Require proper foundation designs in these areas.
- **Policy RS.P-33:** The County shall preserve, for future use, areas with important mineral resources by preventing residential, commercial, and industrial development that would be incompatible with mining practices to the extent feasible.

Solano County Multi-Jurisdictional Hazard Mitigation Plan

The Solano County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) is intended to improve the resiliency in the community by identifying natural hazards present in Solano County, determining the community's vulnerability to each hazard, and identifying development mitigation strategies to reduce vulnerability before emergency situations develop. Solano County's MJHMP was adopted in 2014 and most recently updated in 2022. The MJHMP identifies wildfire, flood, earthquakes, extreme weather, drought, slope failure, and climate change as the prevalent hazards present in unincorporated Solano County and contains a hazards mitigation strategy to reduce vulnerability to these hazards.

City of Vacaville General Plan

California Senate Bill 271 Assembly Bill 2038 required that counties and cities adopt General Plan policies regarding natural hazards. The City of Vacaville's General Plan provides direction and resources intended to protect people and property from natural and human-made hazards. The City of Vacaville General Plan contains several policies that are applicable to the Project, including, but not limited to:

- **Policy SAF-P1.4:** Determine the geologic suitability of proposed development sites during the earliest stages of the planning process. Such analyses should consider potential structural engineering needs of the project and the impacts development activities may have on adjacent lands.
- **Policy SAF-P1.6:** Require preparation of a soils report prior to issuing a building permit, except where the Building Official determines that a report is not needed.
- **Policy SAF-P1.7:** Require comprehensive geologic and engineering studies of new critical structures, such as hospitals, fire and police stations, utility centers and substations, emergency communication facilities, overpasses, and bridges, regardless of location.

5.16.6 Agencies and Agency Contact

CEC review and approval of this Opt-in Application would satisfy compliance with geological hazard-related standards, such as CBC standards. Because of the exclusive jurisdiction of the CEC, no other permits from other agencies are required for the Project.

5.16.7 Permits and Permit Schedule

No permits are required for compliance with LORS related to geological hazards and resources. Under the CEC's Opt-In provisions, the CEC is responsible for inspections and for ensuring compliance with building standards.

5.16.8 References

California Building Code (CBC). 2022. California Code of Regulations Title 24 Part 2 (Volumes 1&2). 2022.

_____. 2025. California Code of Regulations Title 24 Part 2. 2025. Effective January 1, 2026.

California Department of Conservation (DOC). 1998. Contour Maps, cross-section, and data sheets for California's oil and gas fields – Volume 1 – Central California. http://repository.usgin.org/sites/default/files/dlio/files/2012/u18/california_og_fields_vol_1_central.pdf (accessed October 8, 2024).

_____. 2024. CGS Map Sheet 58: Deep-Seated Landslide Susceptibility Map. https://maps-cnra-cadoc.opendata.arcgis.com/maps/cadoc::cgs-map-sheet-58-deep-seated-landslide-susceptibility/explore?location=36.241456%2C-119.940998%2C11.59 (accessed October 8, 2024).

California Department of Water Resources (DWR). 2024a. Sustainable Groundwater Management Act Data Viewer. https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#current conditions (accessed October 8, 2024).

_____. 2024b. Dam Breach Inundation Map Web Publisher. https://fmds.water.ca.gov/webgis/?appid=dam_prototype_v2 (accessed October 8, 2024).

California Geologic Energy Management Division (CalGEM). 2024. Well Finder. https://maps.conservation.ca.gov/doggr/wellfinder/ (accessed October 8, 2024).

California Geological Survey (CGS). 2002. Note 36 - California Geomorphic Provinces. California Department of Conservation. https://www.conservation.ca.gov/cgs/Documents /Publications/CGS-Notes/CGS-Note-36.pdf (accessed October 8, 2024).

_____. 2015. Fault Activity Map of California. State of California. Last Modified 2023. accessed https://maps.conservation.ca.gov/cgs/fam/ (October 8, 2024).

_____. 2018. Earthquake Fault Zones; A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California. Special Publication 42. Revised 2018.

_____. 2024a. Earthquake Zones of Required Investigation. https://maps.conservation.ca.gov/cgs/EQZApp/app/ (accessed October 8, 2024).

_____. 2024b. Landslide Inventory Database. https://maps.conservation.ca.gov/cgs/lsi/app/ (accessed October 8, 2024).

California State Geoportal. 2024. Seismic Hazards Program Liquefaction Zones. https://gis.data.ca.gov/datasets/cadoc::cgs-seismic-hazards-program-liquefaction-zones-1/explore?location=35.642261%2C-118.409519%2C7.52 (accessed October 8, 2024).

California State Water Resources Control Board. 2024. Construction Stormwater Program. State of California. Last Modified April 12, 2023. https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.html (accessed October 8, 2024).

City of Vacaville. 2024. City of Vacaville General Plan – Policy Document. https://www.cityofvacaville.gov/government/community-development/general-plan/general-plan-documents (accessed July 3, 2025).

Dawson, T.E. 2009. *Preliminary geologic map of the Lodi 30' X 60' quadrangle, California*. California Geological Survey, Preliminary Geologic Maps PGM-09-04, 1:100,000

Kramer, S.L. and S.B. Upsall. 2006. *Instrumental Intensity Scales for Geohazards.* Proceedings, Geohazards, Engineering Conferences International.

National Oceanic and Atmospheric Administration (NOAA) and National Weather Service (NWS). 2024. Tsunami Frequently Asked Questions. https://www.tsunami.gov/?page=tsunamiFAQ (accessed November 5, 2024).

O'Neal, M.D. and F.W. Gius. 2018. *Special Report 245 – Mineral Land Classification: Concrete Aggregate in the Greater Sacramento Area Production-Consumption Region.* California Department of Conservation, California Geological Survey.

Sims, J.D., Fox, K.F., Bartow, J.A., and Helley, E.J. 1973. *Preliminary geologic map of Solano County and parts of Napa, Contra Costa, Marin, and Yolo Counties, California*. U.S. Geological Survey, Miscellaneous Field Studies Map MF-484, 1:62,500.

Solano County. 2008. *Solano County General Plan, Policy Document.*

_____. 2024. Multi-Jurisdictional Hazard Mitigation Plan. October. https://www.solanocounty.com/depts/oes/emergency_plans.asp (accessed October 10, 2024).

Solano County Water Agency. 2024. Local Conditions. https://scwa2.com/groundwater/local-conditions/ (accessed October 8, 2024).

State Mining and Geology Board (SMGB). 2014. *Recommended Criteria for Delineating Seismic Hazard Zones in California*. Revised April 2014.

United States Geological Survey (USGS). 2017a. *Quaternary Fault and Fold Database of the United States – Rio Vista Fault (Class A) No. 246.* Last Modified May 15, 2017. https://earthquake.usgs.gov/static/lfs/nshm/qfaults/Reports/246.pdf (accessed October 8, 2024).

_____. 2017b. *Quaternary Fault and Fold Database of the United States – Great Valley Thrust Fault System, Trout Creek (Gret Valley 04a) and Gordon Valley (Great Valley 04b) sections (Class A) No. 28d*. Last Modified June 8, 2017. https://earthquake.usgs.gov/static/lfs/nshm/qfaults/Reports/28d.pdf (accessed October 14, 2024).

This page intentionally left blank.