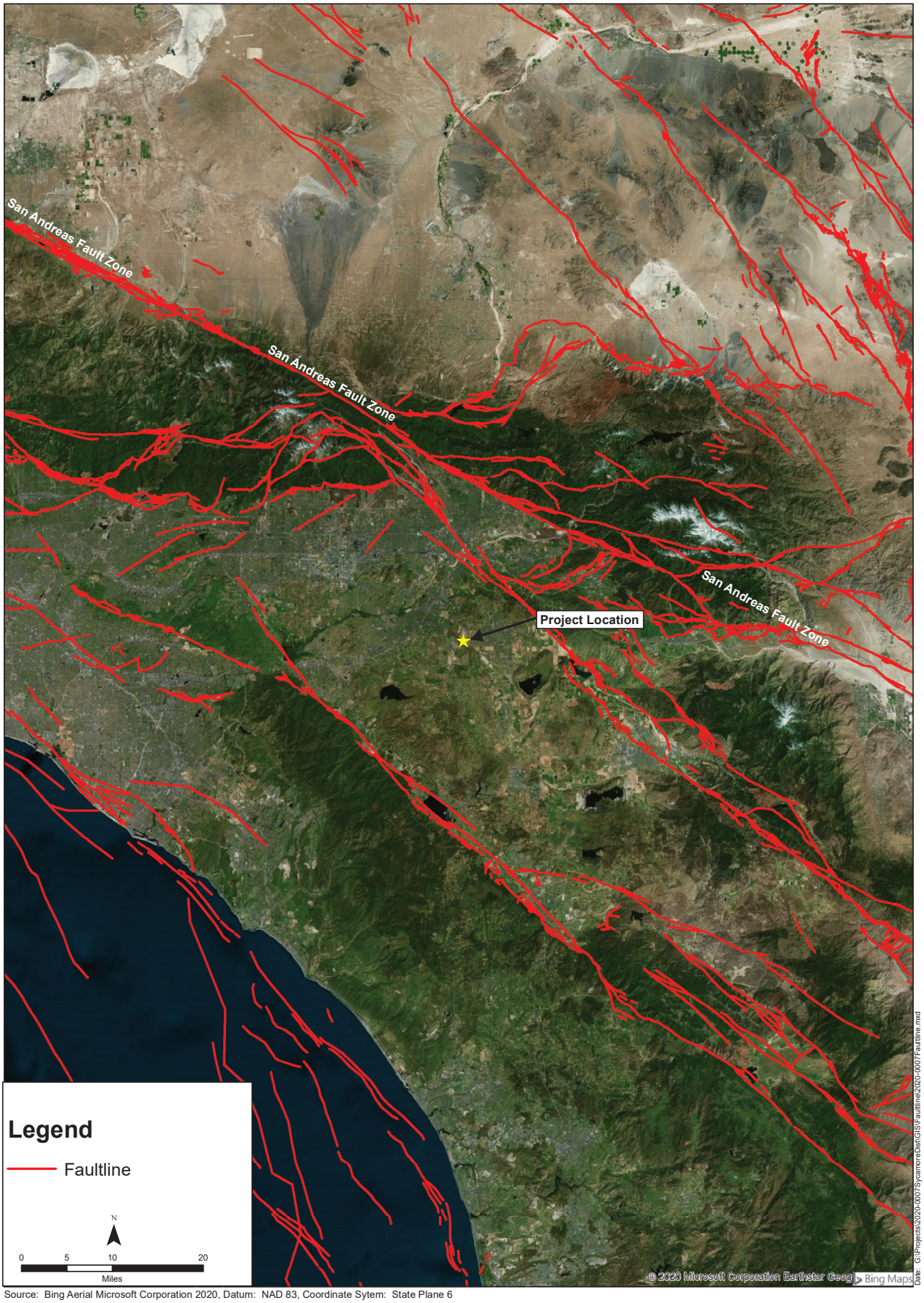



Source: Bing Aerial Microsoft Corporation 2020, Datum: NAD 83, Coordinate Sytem: State Plane 6

**SYCAMORE HILLS DISTRIBUTION CENTER**

RVA

Faultline Map

Figure 5.6-2

**Earthquake Intensity**

It is important to note that magnitude and intensity measure different characteristics of earthquakes. Magnitude measures the energy released at the source or epicenter of the earthquake with the use of a seismograph. Intensity measures the strength of shaking produced by the earthquake at a certain location and is determined from effects on people, human structures and the natural environment. The estimated maximum earthquake event would generate site intensities in the range of moderate to strong in the City with a magnitude of 5.0 to 6.9. (GP 2025, p. PS-4, PS-6) Factors of primary importance in ground shaking severity include the size of the earthquake, its distance, the paths the seismic waves take as they travel through the earth, the type of rock or soils underlying the site, and topography. The amount of resulting damage also depends on the size, shape, age, and engineering characteristics of affected structures. Interactions between ground motion and man-made structures are complex. Governing factors include a structure's height, construction and stiffness, a soil's strength and resonant period, and the period of high-amplitude seismic waves. Waves come in different lengths and thus repeat their motions with varying frequency. Short waves are short-period or high-frequency. In general, long-period seismic waves, which are characteristic of large earthquakes, are most likely to damage long-period structures such as high-rise buildings and bridges. Shorter period seismic waves, which tend to die out quickly, will most often cause damage near the earthquake epicenter, damaging structures such as one-story and two-story buildings. Very short period waves are expected to cause structural damage, such as to equipment. Wave periods of 0.3 second and 1.0 second are the lengths of seismic waves that commonly damage structures (GPA 960 DEIR, p. 4.12-3).

The USGS has developed an Instrumental Intensity scale which maps peak ground acceleration and peak ground velocity on an intensity scale which can be used to determine potential damage associated with earthquakes of given sizes. This scale is included as Table 5.6-1-Instrumental Intensity Scale.

**Table 5.6-1-Instrumental Intensity Scale**

| Instrumental Intensity | Acceleration (g) | Velocity (cm/s) | Perceived Shaking | Potential Damage |
|---|---|---|---|---|
| I | <0.0017 | <0.1 | Not Felt | None |
| II-III | 0.0017-0.014 | 0.1-1.1 | Weak | None |
| IV | 0.014-0.039 | 1.1-3.4 | Light | None |
| V | 0.039-0.092 | 3.4-8.1 | Moderate | Very Light |
| VI | 0.092-0.18 | 8.1-16 | Strong | Light |
| VII | 0.18-0.34 | 16-31 | Very Strong | Moderate |
| VIII | 0.34-0.65 | 31-60 | Severe | Moderate to Heavy |
| IX | 0.65-1.24 | 60-116 | Violent | Heavy |
| X+ | >1.24 | >116 | Extreme | Very Heavy |

**Liquefaction**

The major geologic hazards associated with ground shaking include liquefaction and ground failure. Liquefaction occurs when ground shaking causes water-saturated soils to become fluid and lose strength. Liquefaction historically has been responsible for significant damage, creating problems with bridges, buildings, buried pipes and underground storage tanks. The City is underlain by areas susceptible to varying degrees of liquefaction, ranging from moderate to very high. Liquefaction hazards are particularly significant along watercourses. The primary liquefaction areas are within the City limits including the area along the Santa Ana River, a broad area south and west of the Riverside Municipal Airport, a portion in western Riverside spanning La Sierra Avenue and a smaller area along the City's southern boundary. (GP 2025, FPEIR, p. 5.6-5- 5.6-6)

Liquefaction occurs when three general conditions exist: 1) shallow groundwater, 2) low-density silty or fine sandy soils, and 3) high intensity ground motion. As mentioned above, no groundwater was encountered during the exploratory trenching, which achieved a maximum depth of 15 feet. The Project site is expected to experience ground shaking and earthquake activity that is typical of the Southern California area. Based on review of the *City of Riverside Public Safety Element - Liquefaction Zones (2006)*, the Project site is not situated in an area of generalized liquefaction susceptibility.

**Erosion and Slope Stability/Landslides**

Soil erosion is the process by which soil particles are removed from a land surface by wind, water, or gravity. Most natural erosion occurs at slow rates; however, the rate or erosion increases when land is cleared or altered and left in a disturbed condition. The primary factors that influence erosion include soil characteristics, vegetative cover, topography, and climate. Soils with a high proportion of silt and very fine clays are generally the most erodible. Additionally, there is a higher likelihood for erosion the less permeable the soil. Vegetative cover assists in erosion control by shielding the soil surface from the impact of falling rain or blowing wind. Vegetation slows the velocity of runoff, permits greater infiltration, maintains the soil's capacity to absorb water, and holds soil particles in place. (GP 2025 FPEIR, pp. 5.6-11-5.6-12) The soils encountered within the Project site consist of fill and natural soil that are unlikely to cause erosion by wind and water (NorCal Engineering, p. 2).

The term "landslide" refers to deep-seated slope failures at least 15 feet deep. Landslides are typically related to the underlying structure of the parent material. Surficial failures refer to shallow failures that affect the upper weathered horizon of the parent material. The Project site is located in an area with slopes ranging between 0-10% (GP PEIR, pp. 5.6-3). No evidence of landsliding was identified in the geotechnical investigation report by NorCal Engineering.

**Lateral Spreading**

Seismically-induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking. Lateral spreading is not the same as slope failure in that complete ground failure with ground movement does not occur due to the relatively smaller gradient of the initial

ground surface. Lateral spreading is demonstrated by near vertical cracks with predominately horizontal movement of the soil mass involved.

**Paleontological Setting**

Paleontology is the study of the developing history of life on Earth of ancient plants and animals based on the fossil record (evidence of their existence preserved in rocks). This field includes the study of body fossils, tracks, burrows, cast-off parts, fossilized feces, and chemical residues. Modern paleontology sets ancient life in its context, by studying how long-term physical changes of global geography and climate have affected the evolution of life and how ecosystems have responded to these changes and have changed the planetary environment in turn, and how these mutual responses have affected today's patterns of biodiversity (GP 2025 FPEIR).

The Project area is located within the northeastern part of the geologically complex Peninsular Ranges geomorphic province. The Peninsular Ranges are a northwest-southeast oriented complex of blocks that extend 125 miles from the Transverse Ranges and Los Angeles Basin to the tip of Baja California. The Peninsular Ranges are bounded to the east by the Colorado Desert and range in width from 30 to 100 miles. The Project area is approximately 3.5 miles northeast of Lake Mathews and 1.5 miles southwest of Box Springs Mountain, within the central part of the Perris Block, a relatively stable rectangular structural unit positioned between the Elsinore and San Jacinto fault zones. The geology in the vicinity of the Project area consists largely of Cretaceous plutonic rocks that are part of the composite Peninsular Ranges batholith. Surface exposures of Cretaceous rocks intermixed with older, possibly Paleozoic metamorphic and plutonic rocks are distributed across the Project area (see Figure 5.6-3). (AE 2020a).

Much of the Project area consists of biotite-hornblende tonalite, the principal plutonic rock type of the Val Verde pluton (Val Verde tonalite, Kvt). The tonalite is a relatively weathered, homogeneous, gray granitic rock that is mostly massive and occasionally foliated. Fossils are not found in plutonic rocks, which formed from cooled magma within Earth's mantle. The Val Verde tonalite intrudes an elongate northwest-southeast oriented mass of older, possibly Paleozoic schist, gneiss, and granitic rocks (mostly tonalite and granodiorite). A portion of this intermixed mass occurs in the northeast region of the Project area. Although certain low-grade metamorphic rocks such as slate can occasionally preserve fossils, schist and gneiss are medium- to high-grade metamorphic rocks that have undergone extreme heat and pressure during formation. As such, most fossils originally preserved in their precursor rocks would have been destroyed or rendered unrecognizable. Medium- to high-grade metamorphic rocks therefore do not typically yield fossils, although some rare discoveries have been reported (e.g., brachiopod fossils from schist and quartzite. (AE 2020a)

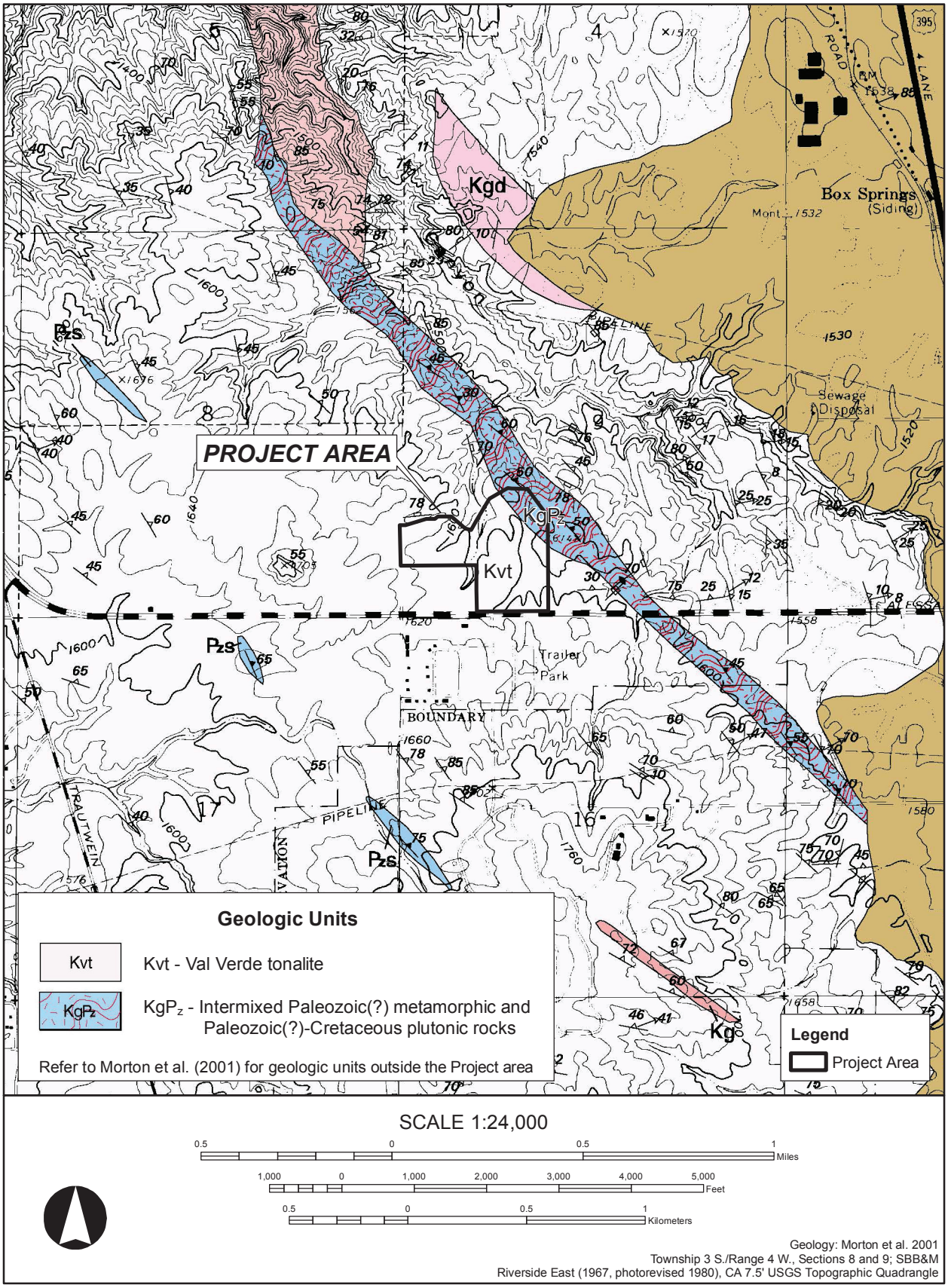
*Paleontological Resource Assessment*

A paleontological resource assessment was conducted to identify the geologic units exposed within the Project area and those likely buried beneath the Project area at unknown depths, assess the paleontological sensitivity of the geologic units, evaluate whether the Project has the potential to adversely impact scientifically significant paleontological resources, and provide Project-specific mitigation measures to be implanted during Project construction. (AE 2020a)

In order to determine whether fossil localities have been discovered previously within a project area or a particular rock unit, a desktop study is completed. AEs' study involved examination of readily available geologic maps and professional publications as well as a search of pertinent museum repositories for fossil localities within and near the Project area. As the region is known for its abundant vertebrate fossil discoveries, a museum records search for vertebrate fossil localities was conducted at the Natural History Museum of Los Angeles County (NHMLAC). Additionally, AE personnel completed a pedestrian reconnaissance survey of the Project area in September 2018. (AE 2020a)

The NHMLAC search yielded no records for previously identified vertebrae localities within the Project area or within similar geologic units; moreover, the desktop study indicated that the igneous and metamorphic rock types present in the Project area would not contain any recognizable fossils. (AE 2020a)

During the field survey, AE did not encounter any paleontological resources or sedimentary deposits conducive to fossil preservation in any parts of the Project area. Moreover, the Project area consists of geologic units with Low paleontological resource potential. Project area ground visibility was found to be poor, with much of it obscured by vegetation consisting of non-native grasses and native riparian scrub. A majority of the outcrops consist of gray, homogeneous, massive granitic rocks characteristic of the Val Verde tonalite; additionally, small outcrops of weathered schist from the intermixed metamorphic and plutonic rocks were observed near the northeast portion of the Project area. Both the Val Verde tonalite and the intermixed metamorphic and plutonic rocks in the Project area are very unlikely to preserve recognizable fossils, and a robust depositional environment in which fossils could be preserved appears unlikely within the Project area. (AE 2020a)




Geology: Morton et al. 2001
Township 3 S./Range 4 W., Sections 8 and 9; SBB&M
Riverside East (1967, photorevised 1980), CA 7.5' USGS Topographic Quadrangle

# SYCAMORE HILLS DISTRIBUTION CENTER

RVA

Geologic Units in Project Area

Figure 5.6-3

## 5.6.2 Related Regulations

The following discuss applicable Federal, State, and regional regulations as they relate to geology and soils.

### 5.6.2.1 Federal Regulations

There are no Federal regulations applicable to geology and soils with regard to the Project.

### 5.6.2.2 State Regulations

#### Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was signed into state law in 1972. The primary purpose is to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault. The Act requires the State Geologist to delineate "Earthquake Fault Zones" along faults that are "sufficiently active" and "well defined." The Act also requires that cities and counties withhold development permits for sites within an Earthquake Fault Zone until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting. Pursuant to this Act, structures for human occupancy are not allowed within 50 feet of the trace of an active fault. Therefore, if a project site is located in an Earthquake Fault Zone, the City must withhold development permits for sites within the fault zones until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting.

#### Seismic Hazard Mapping Act

California Geological Survey (CGS) provides guidance with regard to seismic hazards. Under CGS Seismic Hazards Mapping Act, seismic hazard zones are identified and mapped to assist local governments in land use planning. The intent of this Act is to protect the public from the effects of strong ground shaking, liquefaction, landslides, ground failure, or other hazards caused by earthquakes. In addition, CGS Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, provides guidance for the evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations.

#### Uniform Building Code

The Uniform Building Code (UBC) is published by the International Conference of Building Officials. It forms the basis of about half the state building codes in the United States, including California's, and has been adopted by the state legislature together with additions, amendments, and repeals to address the specific building conditions and structural requirements in California.

#### California Building Code

California Code of Regulations (CCR), Title 24, Part 2, the CBC, provides minimum standards for building design in the state, consistent with or more stringent than UBC requirements. Local codes are permitted to be more restrictive than Title 24 but are required to be no less restrictive. Chapter 16 of the CBC deals with General Design Requirements, including regulations governing seismically resistant construction (Chapter 16, Division IV) and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction

materials. Chapter 18 and Appendix Chapter 33 deal with site demolition, excavations, foundations, retaining walls, and grading, including requirements for seismically resistant design, foundation investigations, stable cut and fill slopes, and drainage and erosion control.

**Natural Hazards Disclosure Act**

The Natural Hazards Disclosure Act requires that sellers of real property and their agents provide prospective buyers with a "Natural Hazard Disclosure Statement" when the property being sold lies within one or more state-mapped hazard areas. If a property is in a Seismic Hazard Zone, as shown on a map issued by the State Geologist, the seller or the seller's agent must disclose this fact to potential buyers. California law also requires that when houses built before 1960 are sold, the seller must give the buyer a completed earthquake hazards disclosure report and a booklet titled, "The Homeowners Guide to Earthquake Safety." This publication was written and adopted by the California Seismic Safety Commission.

**California Civil Code Section 1103-1103.4**

California Civil Code Section 1103-1103.4 applies to the transfers of real property between private parties, as defined therein, and requires notification upon transfer if the property is affected by one or more natural hazards. The following potential hazards must be disclosed, if known: FEMA flood hazard areas, dam failure inundation areas, very high fire hazard severity zone, wildland area with forest fire risks, earthquake fault zone, and seismic hazard zones including landslide and liquefaction on a standardized "Natural Hazard Disclosure Statement" (Section 1103.2).

**National Pollutant Discharge Elimination System**

A Stormwater Pollution Prevention Plan (SWPPP) prepared in compliance with a National Pollutant Discharge Elimination System (NPDES) Phase I Permit describes the Project area, erosion and sediment controls, runoff water quality monitoring, means of waste disposal, implementation of approved local plans, control of post construction sediment and erosion control measures and maintenance responsibilities, and non-stormwater management controls. Dischargers are also required to inspect construction sites before and after storms to identify stormwater discharge from construction activity, and to identify and implement controls where necessary.

In 2010, the Santa Ana Regional Water Quality Control Board issued municipal separate storm sewer system (MS4) permits (Permit R8-2010-0033 and NPDES No. CAS 618033) to the Riverside County Permittees. This incorporates programs developed since 1993. These are the fourth MS4 permits issued by each Regional Board and are referred to as the "Fourth-term" MS4 Permits. In this region, the City of Riverside is a permittee under the Fourth-term MS4 Permits. Under this Permit, the City is required to enforce and comply with storm water discharge requirements.

**CEQA Paleontological Resources**

Paleontological resources cannot be replaced once they are destroyed. Therefore, paleontological resources are considered non-renewable scientific resources and are protected under CEQA. According to Appendix G of the *State CEQA Guidelines*, a project could have a

significant effect if it would directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. In order to determine the uniqueness of a given paleontological resource, it must first be identified or recovered, i.e., salvaged. Therefore, mitigation of adverse impacts to paleontological resources is mandated by CEQA.

### 5.6.2.3 Local Regulations

**Riverside General Plan 2025**

The GP 2025 contains objectives and policies related to erosion, grading, and changes in topography as well as seismic hazards relevant to the Project in its Land Use and Urban Design Element, Public Safety Element, and Open Space and Conservation Element. The Project would be subject to the following objectives and policies:

**Objective PS-1:** Minimize the potential damage to existing and new structures and loss of life that may result from geologic and seismic hazards.

> **Policy PS-1.1:** Ensure that all new development in the city abides by the most recently adopted city and State seismic and geotechnical requirements.

**Objective PS-9:** Minimize the effects from natural and urban disasters by providing adequate levels of emergency response services to all residents in Riverside.

> **Policy PS-9.8**: Reduce the risk to the community from hazards related to geologic conditions, seismic activity, flooding and structural and wildland fires by requiring feasible mitigation of such impacts on discretionary projects.

**Riverside Municipal Code**Title 17 of the RMC contains the Grading Code, which sets forth rules and regulations placed on grading to control erosion, grading, and earthwork construction, including fills and embankments. One of the purposes of this code is to regulate grading in a manner that minimizes the adverse effects of grading on natural landforms, soil erosion, dust control, water runoff, and construction equipment emissions. The following goals of the Grading Code are set forth in Section 17.04.010:

- Ensure that significant natural characteristics such as landform, vegetation, wildlife communities, scenic qualities, and open space can substantially be maintained; to preserve unique and significant geologic; biologic and hydrologic features of public value; to encourage alternative approaches to conventional hillside construction practices by achieving land use patterns and intensities that are consistent with the natural characteristics of hill areas such as slope, landform vegetation, and scenic quality.
- Maintain the identity, image, and environmental quality of the City; and to achieve land use densities that are in keeping with the General Plan.
- Minimize the visual impact of grading.
- Minimize grading which relates to the natural contour of the land, and which will round off, in a natural manner, sharp angles at the top and ends of cut and fill slopes, and which does not result in a staircase or padding affect.

- Stabilize steep hillsides, retain moisture, prevent erosion, and enhance the natural scenic beauty and, where necessary, require additional landscaping to enhance the scenic and safety qualities of the hillsides. This could include the retention of trees or replacement of trees and other vegetation.
- Encourage a variety of building types and design, when appropriate, to materially reduce grading and disturbance of the natural character of the area.
- Preserve and enhance existing community character, as defined by such factors as visual appearance, density, road widths and vegetation.
- Preserve prominent landforms within the community, including, but not limited to ridgelines, knolls, valleys, creeks, rock outcroppings or other unique topographic features or viewscapes.
- Preserve major hillsides viewscapes visible from points within the City so that they are not detrimentally altered by the intrusion of highly visible cut and/or fill slopes, building lines and/or road surfaces.
- Scrutinize development in areas of exposure to high fire risk and develop reasonable mitigation measures to reduce such risk.

**City Paleontological Objectives**

**Objective HP-1:** To use historic preservation principles as an equal component in the planning and development process.

> **Policy HP-1.3:** The City shall protect sites of archaeological and paleontological significance and ensure compliance with all applicable state and federal cultural resources protection and management laws in its planning and project review process.

**Objective HP-2:** To continue an active program to identify, interpret and designate the City's cultural resources.

**Objective HP-3:** To promote the City's cultural resources as a means to enhance the City's identity as an important center of Southern California history.

**Objective HP-4:** To fully integrate the consideration of cultural resources as a major aspect of the City's planning, permitting, and development activities.

**Objective HP-5:** To ensure compatibility between new development and existing cultural resources.

**Objective HP-6:** To actively pursue funding for a first-class historic preservation program, including money needed for educational materials, studies, surveys, staffing, and incentives for preservation by private property owners.

**Objective HP-7:** To encourage both public and private stewardship of the City's cultural resources.

## 5.6.3 Project Design Considerations

The Project's design features regarding geology and soils include an on-site Restricted Property/ Conservation Area for biological resources, culverts under the access road to Building A to provide a hydrological connection to riparian habitat on the other side and a corridor for small wildlife species. The Project also proposes native landscaping materials and groundcovers to reduce erosion potential while maintaining the native riparian habitat in the drainage within the Restricted Property/Conservation Area.

**Grading**

The Project will involve grading and earthwork within the site in order to accommodate the proposed structures, associated parking lots, drive lanes, water quality basins and landscaped areas. Prior to grading operations, a Stormwater Pollution Prevention Plan (SWPPP) will be prepared in accordance with requirements of the statewide general National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for stormwater discharges from construction sites. The SWPPP will include Project-specific best management practices (BMPs) to reduce erosion and sedimentation and is subject to review and comment by the City Public Works Department and approval by the Santa Ana Regional Water Quality Control Board. BMPs may include, but not be limited to, soil stabilization controls, perimeter silt fences, placement of hay bales, and use of sediment basins. All erosion and sediment controls will be in accordance with the currently adopted state general permit. The developer and construction contractor will be responsible for implementing the BMPs in accordance with the SWPPP.

It is anticipated that excavation of decomposed granite may be performed utilizing conventional earthmoving equipment. Blasting will not be required and is not proposed as part of the Project site preparation activities. Grading for Parcel 1/Building A, Parcel C and Parcel 2/Building B is described below:

- Parcel 1 and Parcel C will be graded within the same grading construction activities for the Project. Parcels 1 and C total approximately 25.35 acres with undulating topography with elevations varying from approximately 1,570 to 1,615 feet above mean sea level (AMSL). Grading will result in cut areas up to 15 feet and fill areas as much as 12 feet. Over-excavation may be required to provide necessary structural support but is not expected to exceed 3 feet in depth. Total earthwork volumes, exclusive of any over-excavation are approximately 145,000 cubic yards of cut and 105,000 cubic yards of fill. The estimated 40,000 cubic yards of excess material will be moved from Parcel 1 to Parcel 2. This excess material will be transported via the existing dirt road between the parcels (crossing through Parcel A), which will be utilized temporarily during construction and restored post-construction.
- Parcel 2 is approximately 10.32 acres with undulating topography with elevations varying from approximately 1,580 to 1,618 feet AMSL. Grading will result in cut areas up to 16 feet and fill areas up to 8 feet. Over-excavation may be required but is not expected to exceed 3 feet in depth. Total earthwork volumes, exclusive of any over-excavation, are approximately 25,000 cubic yards of cut and 65,000 cubic yards of fill (with 40,000 cubic

yards from Parcel 1 to balance). During the grading phase, soil quantities within the overall site will balance and no export or import of fill from the site will be needed.

Per the engineering notes in the Project's site plans, no grading will occur within the Sycamore Canyon Wilderness Park or in the existing Restricted Property, with the exception of the new access road to Parcel 1. The trailhead parking lot in Parcel C will also be graded to create the parking lot, sidewalk and other amenities (shade structure, drinking fountain, etc.). The extent of grading will tie into the existing topography within the property boundary and will not extend into the Sycamore Canyon Wilderness Park for all Project parcels. Drainage A enters the site near the northern portion of the western boundary of Parcel 2 and flows for approximately 1,183 feet before exiting the site as it flows into the Sycamore Canyon Wilderness Park, near the middle of the northern boundary of Parcel 1. During grading activities, 0.08 acre, or 1,083 linear feet, of Drainage A would be permanently impacted. A retaining wall and storm drain outlet at the northeast corner of Parcel 2 will be constructed and Drainage A storm water runoff will continue to flow through the site via an underground 48-inch pipe that will cross through the Project along the northern parking lot of Parcel 2 and will continue to convey the discharge flows to the Sycamore Canyon Wilderness Park. There is limited grading that will extend into the additional (newly proposed) Restricted Property, required for the construction of the retaining wall and stormdrain outlet at the northeast corner of Building B/Parcel 2. This grading is needed to avoid the 100 linear feet of drainage course and associated riparian vegetation. An existing trail will be used temporarily during construction between Parcel 1 and Parcel 2 to transport fill from Parcel 1 to Parcel 2.

**Retaining wall**

A Variance is requested for Parcel 1 to allow the installation of two combination retaining/ freestanding walls wherein the retaining portion exceeds the City of Riverside Municipal Code (RMC's) maximum allowable height of 4 feet and to allow combination retaining/ freestanding walls wherein the overall height exceeds the RMC's maximum allowable height of 10 feet (Chapter 19.550 – Fences, Walls and Landscape Materials). These walls are located along the eastern property line of Parcel 1, as shown on Figure 3.0-10 – Grading Exception-Wall Variance. Following is a summary of the requested Variances:

- To allow 132 linear feet of retaining/freestanding wall with the retaining portion height up to 6.4 feet in height and combined height of up to 14.4 feet.
- To allow 205 linear feet of combination retaining/freestanding wall with the retaining portion height up to 7.6 feet.

A Grading Exception is needed for Building B on Parcel 2 to allow installation of three retaining walls to exceed 6 feet in vertical height, in accordance with Chapter 17.28 of Title 17 - Grading. The three retaining walls, ranging in height from 4.7 feet to 11.5 feet, are required at the northeast and southeast corners of Parcel 2 due to existing topography relief and to avoid sensitive resources as shown on Figure 3.0-10 – Grading Exception & Wall Variance Exhibit. Following is a summary of the requested Grading Exception:

- To allow a 6.5 to 11.5-foot retaining wall in the northeast corner of Parcel 2
- To allow a 4.7 to 8.2-foot high retaining wall and a 6 to 10 foot high retaining wall in the southeast corner of Parcel 2.

The granular backfill to be utilized immediately adjacent to the retaining walls shall consist of an approved select granular soil with a sand equivalency greater than 30. The backfill zone of free draining material shall consist of a wedge beginning a minimum of one horizontal foot from the base of the wall extending upwards at an inclination of no less than ¾ to 1 (horizontal to vertical). Per the geotechnical investigation, no trenching is proposed.

Project design and construction will incorporate the geotechnical recommendations provided by NorCal Engineering. These recommendations, as outlined in Section 8.0 Conclusions and Recommendations, of the *Geotechnical Engineering Investigation* prepared by NorCal Engineering Soils and Geotechnical Consultants prepared on March 29, 2019, and updated July 2020 (Appendix G), is outlined below:

**Site Grading Recommendations**

Any vegetation and/or demolition debris shall be removed and hauled from proposed grading areas prior to the start of grading operations. Existing vegetation shall not be mixed or disced into the soils. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. Grading operations shall be performed in accordance with the attached *Specifications for Placement of Compacted Fill*.

**Removal and Recompaction Recommendations**

All disturbed soils and/or fill (about 1 to 1½ feet below ground surface) shall be removed to competent native material, the exposed surface scarified to a depth of 12 inches, brought to within 2% of optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D 1557) prior to placement of any additional compacted fill soils, foundations, slabs-on-grade and pavement. Grading shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

It is possible that isolated areas of undiscovered fill not described in this report are present on site; if found, these areas should be removed to competent native material prior to placement of compacted fill. A diligent search shall also be conducted during grading operations in an effort to uncover any underground structures, irrigation or utility lines. If encountered, these structures and lines shall be either removed or properly abandoned prior to the proposed construction.

Based on the current preliminary grading plan, the project development plan does not plan any proposed import or export of soil. Any imported fill material should be preferably soil similar to the upper soils encountered at the subject site. All soils shall be approved by this firm prior to importing at the site and will be subjected to additional laboratory testing to assure concurrence with the recommendations stated in this report.

If placement of slabs-on-grade and pavement is not completed immediately upon completion of grading operations, additional testing and grading of the areas may be necessary prior to continuation of construction operations. Likewise, if adverse weather conditions occur which may

damage the subgrade soils, additional assessment by the soils engineer as to the suitability of the supporting soils may be needed.

It is recommended the slope face shall be compacted and should be completely covered with deep rooted slope plantings classified as drought resistant to prevent any future erosion. Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase. Adequate drainage away from the structures, pavement and slopes must be provided at all times.

**Fill Blanket Recommendations**

Due to the potential for differential settlement of foundations placed on engineered fill and the underlying bedrock, it is recommended that all foundations including floor slab areas be underlain by a uniform compacted fill blanket at least two feet in thickness. This fill blanket shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater. Otherwise all foundations for each individual building or site wall shall be embedded into bedrock.

**Shrinkage/Bulking and Subsidence**

Results of our in-place density tests reveal that the soil shrinkage will be on the order of 5 to 15% due to excavation and recompaction, based upon the assumption that the fill is compacted to 92% of the maximum dry density per ASTM standards. The bulking of the bedrock shall be between 3 to 7%. Subsidence should be 0.2 feet die to earthwork operations.

The volume change does not include any allowance for vegetation or organic stripping, removal of subsurface improvements, or topographic approximations. Although these values are only approximate, they represent our best estimate of lost yardage, which will likely occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field testing the actual equipment and grading techniques should be conducted.

**Temporary Excavations**

Temporary unsurcharged excavations in the existing site materials may be made at vertical inclinations up to 4 feet in height unless cohesionless soils are encountered. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring or flatter excavations may be required. The temporary cut slope gradients given above do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of the soils engineer, CAL-OSHA and other public agencies having jurisdiction. Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase.

**Foundation Design**

All foundations may be designed utilizing the following allowable bearing capacities for an embedded depth of 18 inches into approved engineered fill or bedrock with the corresponding widths:

| Allowable Bearing Capacity (psf) | | |
|---|---|---|
| Width (feet) | Continuous Foundation | Isolated Foundation |
| 1.5 | 2000 | 2500 |
| 2.0 | 2075 | 2575 |
| 4.0 | 2375 | 2875 |
| 6.0 | 2500 | 3000 |

The bearing value may be increased by 500 psf for each additional foot of depth in excess of the 18-inch minimum depth, up to a maximum of 4,000 psf. A one-third increase may be used when considering short-term loading and seismic forces. A representative of this firm shall inspect all foundation excavations prior to pouring concrete.

**Settlement Analysis**

Resultant pressure curves for the consolidation tests are shown on Plates D to G. Computations utilizing these curves and the recommended allowable soil bearing capacities reveal that the foundations will experience settlements on the order of ¾ inch and differential settlements of less than ¼ inch.

**Lateral Resistance**

The following values may be utilized in resisting lateral loads imposed on the structure. Requirements of the California Building Code should be adhered to when the coefficient of friction and passive pressures are combined.

Coefficient of Friction - 0.40

Equivalent Passive Fluid Pressure = 250 lbs./cu.ft.

Maximum Passive Pressure = 2,500 lbs./cu.ft.

The passive pressure recommendations are valid only for approved compacted fill soils or competent native materials.

**Retaining Wall Design Parameters**

Active earth pressures against retaining walls will be equal to the pressures developed by the following fluid densities. These values are for **select imported granular backfill material** placed behind the walls at various ground slopes above the walls.

| Surface Slope of Retained Materials (Horizontal to Vertical) | Equivalent Fluid Density (lb./cu.ft.) |
|---|---|
| Level | 30 |
| 5 to 1 | 35 |
| 4 to 1 | 38 |
| 3 to 1 | 40 |
| 2 to 1 | 45 |

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. An equivalent fluid pressure of 45 pcf may be utilized for the restrained wall condition with a level grade behind the wall.

The seismic-induced lateral soil pressure for walls greater than 6 feet may be computed using a triangular pressure distribution with the maximum value at the top of the wall. The maximum lateral pressure of (20 pcf) H where H is the height of the retained soils above the wall footing should be used in final design of retaining walls. Sliding resistance values and passive fluid pressure values may be increased by 1/3 during short-term wind and seismic loading conditions.

All walls shall be waterproofed as needed and protected from hydrostatic pressure by a reliable permanent subdrain system. The granular backfill to be utilized immediately adjacent to retaining walls shall consist of an approved select granular soil with a sand equivalency greater than 30. This backfill zone of free draining material shall consist of a wedge beginning a minimum of one horizontal foot from the base of the wall extending upward at an inclination of no less than ¾ to 1 (horizontal to vertical). A Subdrain detail is attached.

**Slab Design**

All concrete slabs shall be a minimum of six inches in thickness in the proposed warehouse areas and four inches in office and hardscape and placed on approved subgrade soils. Additional reinforcement requirements and an increase in thickness of the slabs-on-grade may be necessary based upon soils expansion potential and proposed loading conditions in the structures and should be evaluated further by the project engineers and/or architect.

A vapor retarder (10-mil minimum thickness) should be utilized in areas which would be sensitive to the infiltration of moisture. This retarder shall meet requirements of ASTM E 96, *Water Vapor Transmission of Materials* and ASTM E 1745, *Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.* The vapor retarder shall be installed in accordance with procedures stated in ASTM E 1643, *Standard practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs*.

The moisture retarder may be placed directly upon compacted subgrade soils conditioned to near optimum moisture levels, although one to two inches of sand beneath the membrane is desirable. The subgrade upon which the retarder is placed shall be smooth and free of rocks, gravel or other protrusions which may damage the retarder. Use of sand above the retarder is under the purview of the structural engineer; if sand is used over the retarder, it should be placed in a dry condition.

**Pavement Section Design**

The table below provides a preliminary pavement design based upon an R-Value of 50 and 54 for the subgrade soils for the proposed pavement areas. Final pavement design may need to be based on R-Value testing of the subgrade soils near the conclusion of site grading to assure that these soils are consistent with those assumed in this preliminary design. The recommendations are based upon estimated traffic loads. Client should submit any other anticipated traffic loadings to the geotechnical engineer, if necessary, so that pavement sections may be reviewed to determine adequacy to support the proposed loadings.

| Type of Traffic | Traffic Index | Asphalt (in.) | Base Material (in.) |
|---|---|---|---|
| Automobile Parking Stalls | 4.0 | 3.0 | 3.0 |
| Light Vehicle Circulation Areas | 5.5 | 3.5 | 4.5 |
| Heavy Truck Access Areas | 7.0 | 4.0 | 8.0 |

Any concrete slab-on-grade in pavement areas shall be a minimum of six inches in thickness and may be placed on approved subgrade soils. All pavement areas shall have positive drainage toward an approved outlet from the site. Drain lines behind curbs and/or adjacent to landscape areas should be considered by client and the appropriate design engineers to prevent water from infiltrating beneath pavement. If such infiltration occurs, damage to pavement, curbs and flow lines, especially on sites with expansive soils, may occur during the life of the project.

Any approved base material shall consist of a Class II aggregate or equivalent and should be compacted to a minimum of 95% relative compaction. All pavement materials shall conform to the requirements set forth by the City of Riverside. The base material; and asphaltic concrete should be tested prior to delivery to the site and during placement to determine conformance with the project specifications. A pavement engineer shall designate the specific asphalt mix design to meet the required project specifications.

**Utility Trench and Excavation Backfill**

Trenches from installation of utility lines and other excavations may be backfilled with on-site soils or approved imported soils compacted to a minimum of 90% relative compaction. All utility lines shall be properly bedded with clean sand having a sand equivalency rating of 30 or more. This bedding material shall be thoroughly water jetted around the pipe structure prior to placement of compacted backfill soils.

**Corrosion Design Criteria**

Representative samples of the surficial soils, typical of the subgrade soils expected to be encountered within foundation excavations and underground utilities were tested for corrosion potential. The minimum resistivity value obtained for the samples tested is representative of an environment that may be severely corrosive to metals. The soil pH value was considered mildly alkaline and may not have a significant effect on soil corrosivity. Consideration should be given to corrosion protection systems for buried metal such as protective coatings, wrappings or the use of PVC where permitted by local building codes.

According to Table 4.3.1 of ACI 318 Building Code and Commentary, these contents revealed negligible sulfate concentrations. Therefore, a Type II cement according to latest CBC specifications may be utilized for building foundations at this time. It is recommended that additional sulfate tests be performed at the completion of site grading to assure that the as graded conditions are consistent with the recommendations stated in this design. Corrosion test results may be found on the attached Table IV.

**Expansive Soil**

If expansive soils are encountered, special attention should be given to the project design and maintenance. The attached *Expansive Soil Guidelines* should be reviewed by the engineers,

architects, owner, maintenance personnel and other interested parties and considered during the design of the project and future property maintenance.

## 5.6.4 Thresholds of Significance

The City has not established local CEQA significance thresholds as described in Section 15064.7 of the State CEQA Guidelines. The City generally utilizes the CEQA significance thresholds in Appendix G ("Environmental Checklist") of the State CEQA Guidelines. The Environmental Checklist prepared by the City for the Project (see Appendix A of this document) indicates that impacts related the Project may be considered potentially significant if the proposed project would:

- (Threshold A) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: i) 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 (Refer to Division of Mines and Geology Special Publication 42); ii) strong seismic ground shaking; iii) seismic-related ground failure, including liquefaction; iv) Landslides;
- (Threshold B) Result in substantial soil erosion or the loss of topsoil;
- (Threshold C) 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;
- (Threshold D) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property;
- (Threshold E) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water;
- (Threshold F) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

## 5.6.5 Environmental Impacts

**Threshold A:** *Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: i) 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? Refer to Division of Mines and Geology Special Publication 42; ii) strong seismic ground shaking; iii) seismic-related ground failure, including liquefaction?*

### *I. Fault Rupture*

Unlike damage from ground shaking, which can occur at great distances from the fault, impacts from fault rupture are limited to the immediate area of the fault zone where the fault breaks along the surface. The Project site does not lie within or adjacent to an Alquist-Priolo Earthquake Fault Zone. The nearest known active or potentially active fault, San Jacinto Fault, is approximately 8.7

miles northeast of the Project site. The other known active or potentially active faults as described in Section 5.6.1 are further away from the Project site. Thus, the potential for damage due to fault rupture is considered remote. Nonetheless, the Project is required to comply with the building design standards of the CBC related to seismicity for construction of new buildings. Therefore, the potential hazards associated with fault rupture are considered **less than significant.**

### *II. Strong Seismic Ground Shaking*

The Project site is located within the seismically active region of Southern California and may be subject to ground-shaking events. While no known active faults traverse the City, several faults in the region have the potential to produce seismic impacts within the City. The three significant faults that pass within 20 miles of the City include the San Andreas Fault (approximately 17 miles of the Project site), the San Jacinto Fault (approximately 8.7 miles of the Project site), and Elsinore Fault (approximately 15 miles of the Project site).

The expected ground motion characteristics of future earthquakes in the region would depend on the characteristics of the generating fault, the distance to the epicenter, the magnitude of the earthquake, and the site-specific geologic conditions. The San Jacinto Fault is capable of producing a 7.0 earthquake, which is the maximum magnitude assigned to a rupture of this fault (GP 2025, p. PS-3). As shown in Table 5.6-1 this severity may generally result in moderate structural damage. However, ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults.

Additionally, the Project will be designed to resist seismic impacts in accordance with the applicable RMC Title 16 – Buildings and Construction standards. Title 16 of the RMC incorporates the California Building Code. As stated in Section 16.08.020, “The California Building Code, 2019 Edition, consisting of two volumes, including appendices and any related errata, and any amendments thereto by the State of California in the 2019 Edition of Title 24 of the California Code of Regulations, promulgated by the International Code Council, which regulates the erection, construction, enlargement, alteration, repair, moving, removal, conversion, demolition, occupancy, equipment, use, height, area and maintenance of buildings and other structures, is adopted and by this reference is made a part of this Code with the force and effect as though set out herein in full, with the exception of those parts expressly excepted and deleted or as amended by this chapter.” Such building code compliance is required for development of all structures in the City. Project plans will be reviewed during the plan check process to confirm seismic safety measures are incorporated. Moreover, there is nothing unique about the Project site that would require additional measures beyond compliance with the adopted building code. Therefore, potential impacts associated with seismic ground shaking will be **less than significant.**

### *III. Seismic-Related Ground Failure, Including Liquefaction*

The site is not situated in an area of generalized liquefaction susceptibility. Moreover, the GP 2025 identifies the Project site and its immediate surrounding area with a very low susceptibility to liquefaction (GP 2025, Figure PS-2). The Project will be designed to resist seismic impacts in accordance with RMC Title 16 – Buildings and Construction standards. Such building code compliance is required for development of all structures in the City. Project plans will be reviewed

during the plan check process, which will ensure that these seismic safety measures are incorporated. These measures take into account ground shaking hazards that are typical to Southern California. Therefore, potential impacts associated with seismic ground failure, including liquefaction, will be **less than significant.**

***IV. Landslides***

Seismically induced landslides and other slope failures are common occurrences during or soon after earthquakes. The susceptibility of a geologic unit to landslides is dependent upon various factors, primarily: 1) the presence and orientation of weak structures, such as fractures, faults, and joints; 2) the height and steepness of the pertinent natural or cut slope; 3) the presence and quantity of groundwater; and 4) the occurrence of strong seismic shaking.

Strong ground shaking can also worsen existing unstable slope conditions. The Project site is located near northeastern Riverside which has areas with low to locally moderate susceptibility to landslides and rock falls. However, the Project site does not contain steep slopes in excess of 30 percent, which would be areas of high susceptibility to seismically induced landslides (GP 2025 FPEIR, p. 5.6-6). As discussed in Threshold A ii) above, there are no active faults within the City and the strength of seismic shaking at the site will be lessened due to the site's distance to faults that may produce an earthquake. Compliance with the standards in the current CBC would require an assessment of hazards related to landslides and liquefaction and the incorporation of design measures into structures to mitigate this hazard if development were considered feasible.

The RMC requires provisions to grading and development on or near hillsides. The subject property is approximately 48 acres of generally undisturbed land with undulating topography. The Sycamore Canyon Wilderness Park is immediately to the north along an irregularly shaped property line. A privately-owned, undeveloped parcel lies to the east. The property is bounded, in part, by Barton Street to the west and Alessandro Boulevard to the south. Public street frontage is limited due to a separately owned, 13.6-acre development at the northeasterly corner of Barton and Alessandro. No grading or other land disturbing activities are allowed within the wilderness park. Additionally, grading on the subject property is further restricted due to the unique presence of the existing Restricted Property. As a result of the boundary and internal grading restrictions, significant portions of the remaining site must be encumbered for matchup grading.

These restrictions have resulted in difficulty conducting perimeter grading required to transition from developed pad to significantly varied elevation changes. The Sycamore Canyon Business Park Specific Plan (SCBPSP), as part of the design criteria, also includes setback standards including front yard 50 foot building setback, side yard 20 foot building setback and rear yard 20 foot setback with landscaping for lots adjacent to the Sycamore Canyon Wilderness Park. These setback requirements also influence the orientation and the location of the buildings within the site.

Grading exceptions are needed for the Project site to allow installation of retaining walls to exceed 6 feet in vertical height, in accordance with provisions specified in the RMC 17.028.010.C.1. As a result, a grading exception is needed for Areas 1 and 2. Area 3 consists of a combination freestanding/retaining wall subject to the provisions of Title 19. Therefore, no grading exception

is needed. These areas are illustrated on the Grading Exception & Wall Variance Exhibit under Figure 3.0-8. Some retaining walls will exceed 6 feet in height and any reduction in the wall heights would directly reduce the net area for the proposed development. Areas 1 and 2 are discussed in greater detail below.

Area 1 – This area consists of approximately 95 linear feet of retaining wall that varies in height from 6.5-11.5 feet. The primary purpose of this wall is to serve as a headwall and wing walls for a 48" diameter storm drain outlet that conveys offsite flow from the Metropolitan Water District Mills Filtration Plant, through the subject property and discharges directly into the deed restricted area. The storm drain outlet is located per the direction of US Army Corp of Engineers. The storm drain outlet cannot be relocated horizontally or vertically and sufficient cover over the pipe is necessary to protect it from traffic loading. The proposed pipe connects at Barton Street and runs within the drive aisle along the northerly side of Building 2. Strict application of the Code would require narrowing the drive aisle and eliminating 1-2 parking spaces at the northeasterly corner of the building to provide approximately 8-10 feet of separation between the screen wall and the U-shaped retaining wall to accommodate a 2:1 slope. Approval of the grading exception to allow retaining walls varying from 6.5-11.5 feet in height in this area would be consistent with the general purpose and intent of Title 17 of the Riverside Municipal Code to minimize the adverse effects of grading on natural landforms, particularly in regard to water runoff.

Area 2 – This area is located near the southeasterly corner of Building 2. The walls vary in height from 5-10 feet. The sole purpose of the walls in this area is to accommodate two water quality basins. Such water quality measures for new development is a requirement of the Federal Clean Water Act, State Porter-Cologne Water Quality Control Act and the Santa Ana Region National Pollutant Discharge Elimination System (NPDES) Permit. Due to insufficient infiltration rates of the underlying soils, the basins, including the size and location, are required pursuant to design criteria specified in the Water Quality Management Plan (WQMP) guidance documents. Strict application of the Code would result in insufficient basin capacity, causing the project to fail in meeting the requirements of the MS4 Permit and WQMP. Moreover, approval of the grading exception for Area 2 is consistent with Title 17 regulations to preserve hydrologic features of public value as set forth in RMC 17.04.010(A).Therefore, the granting of the grading exception will allow reasonable development of the properties in accordance with the Specific Plan and development standards.

The topography of the Project site consists of natural rolling terrain descending gradually from a west to east direction. The Project site is not located in an area with high susceptibility for landslides and rock falls. The grading exceptions needed for the Project site to allow installation of retaining walls to exceed 6 feet in vertical height would not substantially increase the risk of landslides. The grading exceptions and retaining walls were designed to follow the overall proposed grading plans and will contribute to the Project's land stabilization. The grading exception for Area 1 would be consistent with the general purpose and intent of Title 17 of the RMC to minimize the adverse effects of grading upon natural landforms, particularly in regard to water runoff. The grading exception in Area 2 would be consistent with the general purpose and intent of Title 17 of the RMC to preserve hydrologic features of public value. In addition, RMC 17.04.010(E), which requires the stabilization of steep hillsides and the prevention of erosion,

would be enforced on all other portions of the site that do not require the grading exceptions. The City has included policies in its Public Safety Element to achieve the goal of minimizing the risk of injury, loss of life, and property damage caused by earthquake hazards or geologic disturbances (Policies PS-1.1-1.5 & Policy PS-9.8). With compliance of applicable regulations as well as policies identified in the General Plan, impacts resulting in risk of loss, injury, or death due to landslides are considered **less than significant.**

**Threshold B:** *Would the Project result in substantial soil erosion or the loss of topsoil?*

Construction activities such as grading may have the potential to cause soil erosion or the loss of topsoil. Short-term erosion effects during the construction phase of the Project will be prevented through the required implementation of a Stormwater Pollution Prevention Plan (SWPPP) in compliance with the National Pollutant Discharge Elimination System (NPDES) program as well as the incorporation of best management practices (BMPs) intended to reduce soil erosion. BMPs can be found in the Hydrology and Water Quality section of this DEIR, Section 5.9.3 – Project Design Considerations.

As mentioned in section 5.6.4, landscaped areas and groundcovers will be provided to help reduce erosion potential. With implementation of an approved SWPPP as well as the Project's design considerations, potential impacts from erosion during construction or operation will be **less than significant.**

**Threshold C:** *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?*

As discussed in threshold A, the nearest active or potentially active fault is San Jacinto and is approximately 8.7 miles from the Project site. However, the Project site in not susceptible to liquefaction or landslides (GP 2025, Figure 5.6-3). The Project site is not within an area with soils identified as having a high shrink-swell potential (GP 2025, Figure PS-3), and the Project's geological investigation testing on-site soils and determined that the soils have a "very low" expansion potential (NorCal Engineering, p. 18); thus, collapse is unlikely. Additionally, the potential for lateral spreading at the Project site is considered low because the site is underlain by dense subsurface soil and bedrock. The Project site is also not within an area susceptible to subsidence (RCMMC). Thus, the Project site is not considered to be susceptible or located on a site or unit that is unstable. Nevertheless, the Project will incorporate the Project-specific geotechnical recommendations provided by NorCal Engineering and will conform to the adopted building code. These recommendations include; special attention to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase and field testing the actual equipment and grading techniques for a more accurate shrinkage and subsidence factor. The shrinkage factor is the percentage estimate to shrink or bulk due to excavation and recompaction which is 5 to 15% for the Project. The subsidence factor refers to the number of feet of gradual settling of land which in this case is only 0.2 feet due to earthwork operations.All recommendations made in the geotechnical report prepared by NorCal Engineering have been incorporated into the Project Design Considerations (Section 5.6.3 above). With the implementation of Project-specific geotechnical recommendations

(as Project Design Considerations) and the adopted building code; potential impacts associated with seismically induced landslides will be **less than significant.**

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

Expansive soils are soils with a significant amount of clay particles that have the ability to give up water (shrink) or take on water (swell). Fine-grained soils, such as silts and clays, may contain variable amounts of expansive clay minerals. When these soils swell, the change in volume exerts significant pressures on loads that are placed on them. This shrink/swell movement can adversely affect building foundations, often causing them to crack or shift, with resulting damage to the buildings they support. The Project's geological investigation testing on-site soils determined that the soils have a "very low" expansion potential. Based on Table 5.6-2 – Expansion Test, an expansion index value between 0-20 is considered "very low" potential. (NorCal Engineering, Appendix B-Laboratory Tests) The expansion index for the Project site was 3 and 4 demonstrating that the soils have a classification of "very low". Expansion soils at this site would require an index of 21 or higher. The Project will incorporate the Project-specific geotechnical recommendations provided during the geotechnical engineering investigation, which have been incorporated into the Project Design Considerations (Section 5.6.3 above), such as the review of the Expansive Soil Guidelines and will conform to the adopted building code; thus, impacts will be **less than significant.**

**Table 5.6-2 – Expansion Test**

| Sample | Classification | Expansion Index |
|---|---|---|
| **T-4 @ 2'** | Silty SAND | 3 |
| **T-13 @ 2'** | Silty SAND | 4 |

**Threshold E:** *Would the Project 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?*

Potable and non-potable water will be provided by Western Municipal Water District (Western). A potable water line connection for Building A would be constructed within the driveway from Alessandro Blvd to Building A. A potable water line connection for Building B would be constructed within the driveway from Barton Street to Building B. Potable water would be used to serve the office, kitchen, and restrooms in Buildings A and B.

Building A will be connected to the City's wastewater (sewer) collection system. Wastewater from Building A will be conveyed via pipeline from the building within the access road alignment to Alessandro Boulevard where there is an existing City wastewater line. Wastewater from Building A will have to be pumped up to a gravity flow lateral to be constructed across Alessandro Boulevard, as the elevation of Building A is lower than the existing wastewater line in Alessandro Boulevard.

There is no existing City wastewater line in Barton Street to serve Building B. This is because Barton Road slopes down in elevation to the north and therefore a gravity fed wastewater line to

serve Building B would not work to connect to Alessandro Boulevard at a higher elevation to the south. Due to this constraint, a seepage pit septic system is proposed for Building B. To determine septic feasibility for Building B, Deep Percolation Testing (Appendix G) was conducted by GeoMat Testing Laboratories, Inc. Generally, septic tanks are to be located where the water table is deep, and the soil has favorable percolation rates. Two deep percolation tests were conducted for the proposed septic system, as shown in Figure 5.6-4 - Exploratory Borehole and Percolation Test Location Map.

Boreholes were tested at 20 feet and 15 feet below existing ground surface for test holes P-1 and P-2, respectively. The following table presents the actual and recommended percolation rates in gallons per square feet per day for the test hole. The recommended percolation rate was utilized in the system design. Based on percolation test results, the onsite soils have favorable percolation rates. Test results are appropriate to soil classification.

**Table 5.6-3 Actual and Recommended Percolation Rates**

| Test No. | Actual Percolation Rate (gallons/square feet/day) | Recommended Percolation Rate (gallons/square feet/day) |
|---|---|---|
| **P-1** | 4.4 | 2.2 |
| **P-2** | 2.2 | 2.2 |

Based on the data presented in the Deep Percolation Report, there is sufficient area on the Project site to support a primary and expansion of the onsite wastewater system that will meet the current standards of the Department of Environmental Health, County of Riverside and Regional Quality Control Board (RWQCB). According to the test elevations (elevation 1608) and minimum ten feet seepage pits (bottom of pit at 1597), the inlet should be no deeper than one foot below grade to maintain 5 feet separation between groundwater (elevation 1592) and the bottom of the seepage pit. Based on the data in the Deep Percolation Report and the testing information accumulated, it is the judgment of GeoMat Testing Laboratories, Inc. that the groundwater table will not encroach within the current allowable limit of 5 feet set forth by County requirements. Since the Project was determined to have the capability of having a sewer connection for Building A and soils capable of supporting septic for Building B, impacts with regard to soil capability will be reduced to **less than significant**.