5.5 GEOLOGY AND SOILS

This section of the Draft Environmental Impact Report (DEIR) evaluates the potential for implementation of the Agua Mansa Commerce Park Specific Plan project (proposed project) to impact geological and soil resources.

The following analysis is based in part on information obtained from:

- *Preliminary Geotechnical Investigation Report for Agua Mansa Commerce Park, 1500 Rubidoux Boulevard, Jurupa Valley, California*, Langan Engineer & Environmental Services, April 28, 2017.
- *Preliminary Geologic Evaluation Report Agua Mansa Open Space City of Jurupa Valley, California*, Langan Engineer & Environmental Services, September 10, 2019.
- *Phase I Cultural Resources Assessment of the Proposed Agua Mansa Commerce Park, City of Jurupa Valley, County of Riverside, California*, MIG, December 14, 2017.
- *Mine Deformation Study Finite Element Analysis Report for the Agua Mansa Commerce Park,* Langan Engineer & Environmental Services, August 18, 2017.

Complete copies of these studies are included in the Technical Appendices to this Draft EIR (Volume II, Appendices E and F).

5.5.1 Environmental Setting

5.5.1.1 REGULATORY BACKGROUND

Federal

Clean Water Act

The federal Water Pollution Control Act (also known as the Clean Water Act [CWA]) is the principal statute governing water quality. The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States and gives the US Environmental Protection Agency the authority to implement pollution control programs, such as setting wastewater standards for industry. The statute's goal is to end all discharges entirely and to restore, maintain, and preserve the integrity of the nation's waters. The CWA regulates both direct and indirect discharge of pollutants into the nation's waters. It sets water quality standards for all contaminants in surface waters and makes it unlawful to discharge any pollutant from a point source into navigable waters unless a permit is obtained under its provisions. The CWA mandates permits for wastewater and stormwater discharges and requires states to establish site-specific water quality standards for navigable bodies of water. The CWA also recognizes the need for planning to address nonpoint sources of pollution.

Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act was enacted in 1997 to "reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program." To accomplish this, the act established the National Earthquake Hazard Reduction Program (NEHRP), which refined the description of agency responsibilities, program goals, and objectives. NEHRP's mission includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improvement of building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improvement of mitigation capacity; and accelerated application of research results. NEHRP designates the Federal Emergency Management Agency as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Programs under NEHRP help inform and guide planning and building code requirements such as emergency evacuation responsibilities and seismic code standards.

State

California Alquist-Priolo Earthquake Fault Zoning Act

The California Alquist-Priolo Earthquake Fault Zoning Act was signed into state law in 1972, and amended, with its primary purpose being to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault. This act (or state law) was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The act requires the State Geologist (head of the California Geologic Survey [CGS]) to delineate regulatory zones known as "earthquake fault zones" along faults that are "sufficiently active" and "well defined" and to issue and distribute appropriate maps to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Pursuant to this act and as stipulated in Section 3603(a) of the California Code of Regulations, structures for human occupancy are not permitted to be placed across the trace of an active fault. The act also prohibits structures for human occupancy within 50 feet of the trace of an active fault, unless proven by an appropriate geotechnical investigation and report that the development site is not underlain by active branches of the active fault, as stipulated in Section 3603(a) of the California Code or Regulations. Furthermore, the act 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, as stipulated in Section 3603(d) of the California Code of Regulations.

Seismic Hazard Mapping Act

The Seismic Hazard Mapping Act was adopted by the state in 1990 for the purpose of protecting the public from the effects of nonsurface fault rupture earthquake hazards, including strong ground shaking, liquefaction, seismically induced landslides, or other ground failure caused by earthquakes. The goal of the act is to minimize loss of life and property by identifying and mitigating seismic hazards. The CGS prepares and provides local governments with seismic hazard zones maps that identify areas susceptible to amplified shaking, liquefaction, earthquake-induced landslides, and other ground failures.

California Building Code

Current law states that every local agency enforcing building regulations, such as cities and counties, must adopt the provisions of the California Building Code (CBC) within 180 days of its publication. The publication date of the CBC is established by the California Building Standards Commission, and the code is also known as Title 24, Part 2, of the California Code of Regulations. It provides minimum standards to protect property and public safety by regulating the design and construction of excavations, foundations, building frames, retaining walls, and other building elements to mitigate the effects of seismic shaking and adverse soil conditions. The CBC contains provisions for earthquake safety based on factors including occupancy type, the types of soil and rock onsite, and the strength of ground shaking with a specified probability at a site. The 2016 CBC took effect on January 1, 2017.

Requirements for Geotechnical Investigations

Requirements for geotechnical investigations for subdivisions requiring tentative and final maps and for other specified types of structures are detailed in California Health and Safety Code Sections 17953 to 17955 and in Section 1802 of the CBC. Testing of samples from subsurface investigations is required, such as from borings or test pits. Studies must be done as needed to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on load-bearing capacity, compressibility, liquefaction, differential settlement, and expansive potential of the soils.

Storm Water Pollution Prevention Plans

Pursuant to the CWA, in 2012, the State Water Resources Control Board issued a statewide general National Pollutant Discharge Elimination System (NPDES) Permit for stormwater discharges from construction sites (No. CAS000002). Under this Statewide Construction General Permit (CGP), discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the CGP. Coverage by the CGP is accomplished by completing and filing a Notice of Intent with the State Water Resources Control Board and developing and implementing a Storm Water Pollution Prevention Plan (SWPPP). Each applicant under the CGP must ensure that a SWPPP is prepared prior to grading and is implemented during construction. The SWPPP must list best management practices (BMPs) implemented on the construction site to protect stormwater runoff and must contain a visual monitoring program, a chemical monitoring program for “non-visible” pollutants to be implemented if there is a failure of BMPs, and a monitoring plan if the site discharges directly to a water body listed on the state’s 303(d) list of impaired waters.

Local

Riverside County MS4 Permit (Santa Ana Region)

Whereas the General Industrial Permit and General Construction Permit (GCP) are issued statewide, MS4 permits are issued by the local Regional Water Quality Control Board (RWQCB) in order to provide the permits with the means to address stormwater quality issues specific to the local watershed or region. As a result, MS4 permits are a more prescriptive level of regulation, requiring permittees to develop and implement a stormwater-management program with the goal of reducing the discharge of pollutants to the maximum extent practicable. This is a more stringent performance standard than for either the General Industrial Permit or GCP. The stormwater management program or drainage area management plan, as it is referred to in the Riverside County MS4 Permit, must specify RWQCB-approved BMPs.

The MS4 permit for the part of Riverside County in the Santa Ana RWQCB's jurisdiction, Order No. R8-2010-0033 (NPED No. CAS 618033), was issued by the Santa Ana RWQCB in 2010. The principal permittee of the MS4 NPDES permit is the Riverside County Flood Control and Water Conservation District, and the City of Jurupa Valley is one of 15 co-permittees.

City of Jurupa Valley General Plan Policies

The specific policies outlined in the City's General Plan Conservation and Open Space Element that are related to geology and soils and that apply to the proposed project are listed in Table 5.9-2, City of Jurupa Valley General Plan Consistency Analysis.

5.5.1.2 EXISTING CONDITIONS/ENVIRONMENTAL SETTING

Regional Geologic Setting

Jurupa Valley is in the fault-bounded, northwest-southeast trending Perris Block in the Peninsular Ranges geomorphic province of California. The Perris Block is bounded in the east by the San Jacinto Fault Zone, the north by Cucamonga Fault Zone, and the west by Elsinore Fault Zone. According to United States Geological Survey (USGS) maps, the Perris Block is underlain by diverse metasedimentary rocks[1] intruded by igneous or volcanic rocks.[2] Erosional depositional surfaces are developed on the Perris Block, and thin to relatively thick sections of nonmarine sediments discontinuously cover the basement rock.

Geologically, the study area is in the Peninsular Ranges Province of Southern California, dominated by granitic rocks of Mesozoic age that intruded preexisting sedimentary strata. A tertiary stratum was deposited west of the eroded granitic rocks, and as the area was uplifted, some of these strata formed upland coastal plains. The study area is east of the coastal plains in an area dominated by granitic rocks that are mainly quartz diorite. It was developed for mining activities because of two steeply dipping limestone formations approximately 200 to 300 feet thick at the south end of the study area. The limestone formations are roughly parallel with an upper and lower formation; the upper formation is known as Sky Blue Hill, and the lower formation is known as Chino Limestone. Thin, poorly developed soils and minor sedimentary strata locally cover the bedrock on the study area.

Regional Faulting

The closest known fault to the project site is the Rialto-Colton Fault, approximately four miles northeast. The closest active fault is the San Jacinto Fault, approximately five miles northeast of the site. An inferred fault near

[1] Metasedimentary rock was originally sedimentary, but became metamorphic after undergoing heat, pressure, or other natural forces. Sedimentary rock formed through the deposition and solidification of sediment transported by, e.g., water, ice, or wind.
[2] Igneous rocks are formed when molten materials cool and solidify. Volcanic rock is igneous rock of volcanic origin.

Fontana is approximately six miles northwest of the site. Due to the project site's proximity to active faults, moderate to strong ground shaking could occur from an earthquake on any of the nearby faults.

Regional Seismicity

A search of the CGS earthquake catalog (updated through December 2016) found that 82 earthquakes with magnitudes greater than 5.0 have occurred within a 100-kilometer radius of the site since 1800. In addition, a search of the USGS ANSS Comprehensive Earthquake Catalog (updated through August 15, 2016) found that 48 earthquakes with magnitudes greater than 5.0 have occurred within a 100-kilometer radius of the project site since 1900.

Local Geologic Setting

The project site is in the eastern end of the Jurupa Mountains on the south side of the San Bernardino Valley. The Santa Ana River drains the San Bernardino Valley toward the southwest and is approximately one mile east of the project site.

The site is underlain by a variety of geologic units consisting of unconsolidated, gray to tan, massive, fine grained sand forming stabilized dunes; the northern portion of the site is underlain by young alluvial fan deposits consisting of unconsolidated, gray, cobbley and bouldery alluvium of Lytle Creek fan; the western, southern, and eastern portions of the site are underlain by two geologic units consisting of artificial fill and intermixed tonalite marble and schist. The artificial fill consists of uncompacted and undocumented fill from mining operations, cement kiln dust, and unconsolidated talus deposits.

Quarrying and subsurface mining activities were initiated in 1906 to mine the limestone within the southern portion of the site. Prior to quarrying, the limestone was present as two generally irregular, roughly parallel, lenticular limestone bodies dipping primarily east-northeast. The upper (shallower) and lower (deeper) limestone bodies are referred to as Sky Blue and Chino Limestones, respectively. The limestone is coarsely crystalline, associated with metamorphosed sediments, enveloped and cut by intrusive igneous rocks and contact metamorphic minerals.

Onsite Quarries

The existing Riverside Cement Plant consists of the cement plant, four quarries (Wet Weather Quarry, Lonestar Quarry, Commercial Quarry, and Chino Quarry), the Crestmore Mine, and various support buildings. The former quarries and mine were used for the mining of limestone minerals for cement production. Shallow below-grade chambers associated with the former cement plant and deeper below-grade chambers associated with former mining operations are present below portions of the site.

The Wet Weather Quarry is in the southeast portion of the Project site, and elevations within the quarry vary between 835 to 945 feet above mean sea level (amsl). The slopes within the Wet Weather Quarry have a maximum height of approximately 110 feet and have an approximate inclination of 3:4 (horizontal to vertical) or flatter.

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The Lonestar Quarry was west and adjacent to the Wet Weather Quarry, but the Lonestar Quarry was filled in prior to 1976, as interpreted from stereographic photographs.

The Commercial Quarry is in the southeast end of the site and was mined in the 1960s and early 1970s. The Commercial Quarry was filled in the mid-1970s, but the fill material was mined in the late 1970s, and the majority was removed and recovered by the late 1980s for mill or kiln feed supplement. Elevations within the Commercial Quarry vary between 810 to 900 feet amsl.

The Chino Quarry is at the south end of the site and is flooded to an elevation of approximately 815 feet amsl. The ground surface elevation at the southern end of the site, adjacent to the Chino Quarry, is approximately 915 feet amsl. The 100-foot high slope between the southern end of the site and the Chino Quarry has an approximate slope of 1:1 (horizontal to vertical) or flatter. Underground mining below the Chino Quarry started in 1930 and was designated as Crestmore Mine. Underground mining ceased in 1986, and Crestmore Mine was allowed to flood.

Based on the various Riverside Cement Company maps that were reviewed, the shallowest mine level is at an elevation of 572 feet amsl.

Geologic Hazards

Surface Rupture

The City of Jurupa Valley's 2017 General Plan states that there are no known active faults in Jurupa Valley.

Liquefaction

The Jurupa Valley General Plan (2017) shows the eastern portion of the site in an area with low liquefaction susceptibility, and the western portion in an area with medium liquefaction susceptibility.

However, information from the Department of Water Resources Water Data Library shows State Well Number 03S03W03A001S less than 100 feet north of the project site. Groundwater data was collected from 2012 to 2016, and the groundwater elevation was reported at approximately 825 feet amsl (depth of 137 feet). In 2016, groundwater levels were also measured at two onsite wells, identified as Monitoring Well (at the northern boundary of the site) and Well MW-3 (at the eastern boundary). The groundwater elevation at the Monitoring Well was approximately 818 feet amsl (approximate depth of 134 feet) and at Well MW-3 the groundwater elevation was approximately 806 feet amsl (approximate depth of 84 feet).

The potential for soil liquefaction at the project site is anticipated to be low under the design earthquake.

Lateral Spreading

Lateral spreading is a phenomenon in which surface sediment moves downslope due to liquefaction in a subsurface layer. The potential for liquefaction is anticipated to be low and therefore the potential for lateral spreading is considered low.

Seismic-Induced Ground Failure

Seismic-induced ground failure includes ground settlement due to liquefaction of saturated cohesionless soils and compaction of unsaturated sands and gravels caused by earthquakes. The potential for liquefaction under the design earthquake is anticipated to be low; however, according to the geologic conditions of the project site, seismic-induced ground deformations induced by dry seismic settlement of artificial fill, young alluvial fan deposits and eolian[3] deposits could occur.

Earthquake-Induced Landslide Areas

Based on the City of Jurupa Valley General Plan, the site is not located within an earthquake-induced landslide area. Documented evidence of historic landslides was also not observed at the site.

Subsidence

Land subsidence may be induced from withdrawal of oil, gas, or water from wells. Based on a search of the Division of Oil, Gas & Geothermal Resources Well Finder online tool, the project site is not within a state-designated oil field. In addition, no active oil, gas, or geothermal wells are identified within the project site. Existing groundwater production wells on site will be closed and properly abandoned by the completion of Site development activities and associated improvements. Thus, the likelihood of land subsidence caused by oil, gas, or water withdrawal from wells is not expected.

Furthermore, the USGS "Areas of Land Subsidence in California" map indicates that the project site is not susceptible to subsidence (USGS 2019).

Collapsible Soils

Collapsible soils are geologically young, unconsolidated, low-density, loose, dry soils commonly present in arid to semiarid regions, such as Southern California. These soils generally occur within wind-deposited sands or silts, alluvial fans, colluvial soils,[4] stream banks, or residual mudflow soils. Collapsible soils have a porous structure. Once water is introduced, the porous structure collapses and the granular particles are rearranged (i.e., hydroconsolidation). A rise in groundwater or increase in surface-water infiltration, combined with the weight of a structure or fill, can cause rapid settlement that can crack foundations and walls. Based on the reported geologic conditions and subsurface information reviewed for the site, soils potentially susceptible to significant hydroconsolidation are anticipated at the site. These soils will be removed from areas of proposed structures during the grading phase of site preparation.

Expansive Soils

Expansive soils occur when the moisture content in the soil causes swelling or shrinking as a result of cyclic wet/dry weather cycles, installation of irrigation systems, change in landscape plantings, or changes in grading. Swelling and shrinking soils can result in differential movement of structures, including floor slabs and

[3] Eolian = windblown.
[4] Colluvial soil is a general name for loose, unconsolidated sediments that have been deposited at the base of hillslopes by rainwash, sheetwash, slow continuous downslope creep, or a combination of these processes.

foundations, and site work including hardscape, utilities, and sidewalks. Portions of the site are underlain by alluvial soils, which could have expansive clays, although expansive clays have not been identified on the site yet.

Paleontological Resources

On August 15, 2016, MIG commissioned a paleontological resources records search through the Division of Geological Sciences at the National History Museum of Los Angeles County, Vertebrate Paleontology Section (NHMLAC). This institution maintains files of regional paleontological site records as well as supporting maps and documents. This records search entailed an examination of current geologic maps and known fossil localities inside and within a one-mile radius of the study area. The objective of the records search was to determine the geological formations underlying the study area, whether any paleontological localities have previously been identified within the study area or in the same or similar formations near the study area, and the potential for excavations associated with the study area to encounter paleontological resources. The results also provide a basis for assessing the sensitivity of the study area for additional buried paleontological resources.

On September 12 and 13, 2016, MIG conducted a pedestrian field survey on portions of the study area that were either undeveloped or vacant because these areas are undisturbed by the associated cement plant activities and may exhibit visible ground-surface paleontological resources. MIG surveyed 100 percent of the undeveloped and vacant land within the study area. The field survey was carried out on foot, and survey transects were spaced no more than 10 meters apart between each interval.

Results of the paleontological resources records search through Natural History Museum of Los Angeles County (NHMLAC) indicate that no vertebrate fossil localities from the NHMLAC records have been previously recorded within the study area or within a one-mile radius. The County of Riverside General Plan shows the study area mapped as having a low potential for paleontological resources. Moreover, no paleontological resources were identified by MIG during the pedestrian survey. Nevertheless, the results of the literature review and the search at the NHMLAC indicate that the western portion of the study area is composed of younger Quaternary Alluvium derived as alluvial fan deposits from the elevated terrain adjacent to the west and also contains surface deposits of younger Quaternary drift sands. Both of these younger Quaternary deposits are unlikely to contain significant vertebrate fossils in the uppermost layers. At relatively shallow depths between six and eight feet there may be older Quaternary deposits that may well contain significant fossil vertebrate remains. Excavations in these older Quaternary deposits may have a potential to impact paleontological resources.

5.5.2 Notice of Preparation (NOP)/Scoping Comments

A Notice of Preparation (NOP) for the proposed project was circulated for public review on July 17, 2017. None of the comments received during the NOP comment period pertain to the topic of geology and soils.

In addition, a scoping meeting was held on July 27, 2017, at the Jurupa Valley City Hall, 8930 Limonite Avenue, Jurupa Valley, CA 92509, to elicit comments on the scope of the DEIR. A list of attendees is provided in Appendix A; no verbal or written comments were received during the scoping meeting.

5.5.3 Thresholds of Significance

The City of Jurupa Valley has not established local CEQA significance thresholds as described in Section 15064.7 of the State CEQA Guidelines. Criteria for determining the significance of impacts related to geology and soils are based on criteria in Appendix G of the CEQA Guidelines. According to Appendix G, a project would normally have a significant effect on the environment if the project would:

GEO-1 Expose people or structures to 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.

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

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

GEO-4 Be located on expansive soil, as defined in Table 18-1B of the Uniform building Code (1994), creating substantial risks to life or property.

GEO-5 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.

GEO-6 Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

5.5.4 Applicable Policies and Design Features

5.5.4.1 PLANS, POLICIES, AND PROGRAMS

These include existing regulatory requirements, such as plans, policies, or programs, applied to the project based on federal, state, or local law currently in place and which effectively reduce impacts related to geology and soils. These requirements are included in the project's Mitigation Monitoring and Reporting Program to ensure compliance:

PPP GEO-1 As required by Municipal Code Section 8.05.010, the Project is required to comply with the most recent edition of the California Building Code to preclude significant adverse effects associated with seismic hazards. In accordance with Section 1803.2 of the 2016 CBC, a

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geotechnical investigation is required that must evaluate soil classification, slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction, and expansiveness, as necessary, determined by the City building official. The geotechnical investigation must be prepared by registered professionals (i.e., California Registered Civil Engineer or Certified Engineering Geologist). Recommendations of the report pertaining to structural design and construction recommendations for earthwork, grading, slopes, foundations, pavements, and other necessary geologic and seismic considerations must be incorporated into the design and construction of the proposed project.

PPP HYD-1 As required by Municipal Code Chapter 6.05.050, Storm Water/Urban Runoff Management and Discharge Controls, Section B (1), any person performing construction work in the city shall comply with the provisions of this chapter, and shall control stormwater runoff so as to prevent any likelihood of adversely affecting human health or the environment. The City Engineer shall identify the BMPs that may be implemented to prevent such deterioration and shall identify the manner of implementation. Documentation on the effectiveness of BMPs implemented to reduce the discharge of pollutants to the MS4 shall be required when requested by the City Engineer.

PPP HYD-2 As required by Municipal Code Chapter 6.05.050, Storm Water/Urban Runoff Management and Discharge Controls, Section B (2), any person performing construction work in the city shall be regulated by the State Water Resources Control Board in a manner pursuant to and consistent with applicable requirements contained in the General Permit No. CAS000002, State Water Resources Control Board Order Number 2009-0009-DWQ. The city may notify the State Board of any person performing construction work that has a noncompliant construction site per the General Permit.

PPP HYD-3 As required by Municipal Code Chapter 6.05.050, Storm Water/Urban Runoff Management and Discharge Controls, Section C, new development or redevelopment projects shall control stormwater runoff so as to prevent any deterioration of water quality that would impair subsequent or competing uses of the water. The City Engineer shall identify the BMPs that may be implemented to prevent such deterioration and shall identify the manner of implementation. Documentation on the effectiveness of BMPs implemented to reduce the discharge of pollutants to the MS4 shall be required when requested by the City Engineer. The BMPs may include, but are not limited to, the following and may, among other things, require new developments or redevelopments to do any of the following:

(1) Increase permeable areas by leaving highly porous soil and low lying area undisturbed by:

(a) Incorporating landscaping, green roofs and open space into the project design;

(b) Using porous materials for or near driveways, drive aisles, parking stalls and low volume roads and walkways; and

(c) Incorporating detention ponds and infiltration pits into the project design.

(2) Direct runoff to permeable areas by orienting it away from impermeable areas to swales, berms, green strip filters, gravel beds, rain gardens, pervious pavement or other approved green infrastructure and French drains by:

(a) Installing rain-gutters oriented towards permeable areas;

(b) Modifying the grade of the property to divert flow to permeable areas and minimize the amount of storm water runoff leaving the property; and

c) Designing curbs, berms or other structures such that they do not isolate permeable or landscaped areas.

(3) Maximize storm water storage for reuse by using retention structures, subsurface areas, cisterns, or other structures to store storm water runoff for reuse or slow release.

(4) Rain gardens may be proposed in-lieu of a water quality basin when applicable and approved by the City Engineer.

PPP HYD-4 As required by Municipal Code Chapter 6.05.050, Storm Water/Urban Runoff Management and Discharge Controls, Section E, any person or entity that owns or operates a commercial and/or industrial facility(s) shall comply with the provisions of this chapter. All such facilities shall be subject to a regular program of inspection as required by this chapter; any NPDES permit issued by the State Water Resource Control Board, Santa Ana Regional Water Quality Control Board, Porter-Cologne Water Quality Control Act (Wat. Code Section 13000 et seq.), Title 33 U.S.C. Section 1251 et seq. (Clean Water Act); any applicable state or federal regulations promulgated thereto; and any related administrative orders or permits issued in connection therewith.

5.5.4.2 PROJECT DESIGN FEATURES

There are no project design features that apply to geology and soils.

5.5.5 Environmental Impacts

The following impact analysis addresses thresholds of significance for geology and soils.

Impact GEO-1(i) Threshold: Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)

Alquist-Priolo Earthquake Fault Zones are regulatory zones established by the California Geological Survey (CGS) around active faults with the potential to cause surface rupture. The zones vary in width, but the average is approximately one-quarter mile wide. The CGS has not published any Alquist-Priolo map containing the project site. The City of Jurupa Valley General Plan states that there are no known active faults within the city (Jurupa Valley 2017b).

Level of Significance before Mitigation: Impact GEO-1(i) would cause no impact.

Impact GEO-1(ii),(iii),(iv) Threshold: Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking, seismic-related ground failure including liquefaction, or landslides?

Ground Shaking

Although the proposed project would introduce new buildings and associated workers and visitors, the project itself would not exacerbate ground shaking onsite. The southern California region regularly experiences seismic activity, and there are several nearby active faults that could cause moderate to strong ground shaking. Nearby active or known faults include the Rialto-Colton Fault about four miles northeast and the San Jacinto Fault approximately five miles northeast of the site.

However, the project site is not in an Alquist-Priolo earthquake fault zone, and there are no active faults onsite that could subject the site to surface ground rupture. Additionally, future development in accordance with the Specific Plan would be designed and constructed to comply with seismic design parameters in the geotechnical report and the 2016 CBC, which would minimize potential for building collapse and general building damage during seismic ground shaking. Adherence to the seismic design parameters and the 2016 CBC would be confirmed at plan check and building design review with the City of Jurupa Valley.

For the Open Space District, the geotechnical investigation concluded that adverse impacts from seismic hazards are primarily due to rockfall. Rockfall is common in this portion of the site, but mainly concentrated in areas that have been disturbed by blasting, quarry operations, and project site grading. Rock slopes that have been left very steep by quarrying activities are particularly susceptible. However, since the Open Space District would be undeveloped and does not include human occupation, rockfall hazards would not be significant.

The City has a local hazard mitigation plan (2017) that provides a framework for planning for major natural hazards, including earthquakes that have the potential to impact Jurupa Valley. It identifies the City's hazards, reviews and assesses past disaster occurrences, estimates the probability of future occurrences, and sets a framework to reduce or eliminate hazardous risks to people and property from natural and man-made hazards (Jurupa Valley 2017a).

Seismic Related Ground Failure Including Liquefaction

The City of Jurupa Valley General Plan shows the east portion of the site in an area with low liquefaction susceptibility and the western portion in an area with medium liquefaction susceptibility.

Groundwater data was collected from 2012 to 2016 at a well about 100 feet from the site, and the groundwater elevation was reported at approximately 825 feet amsl (depth of 137 feet). In 2016, groundwater levels were also measured at two onsite wells, identified as Monitoring Well and Well MW-3. The groundwater elevation at the Monitoring Well was approximately 818 feet amsl (approximate depth of 134 feet) and at Well MW-3 the groundwater elevation was approximately 806 feet amsl (approximate depth of 84 feet).

The site is in the San Bernardino Valley on the eastern part of the Chino Hydrologic Basin. Published hydrogeologic studies by the US Geological Survey indicate that the historic groundwater levels in this part of the Chino Basin are influenced by the Rialto-Colton Basin and the Santa Ana River. Groundwater level fluctuations in the Chino Basin on the order of 40 to 50 feet have been documented between wet and dry periods.

As stated above, groundwater elevations measured at the site ranged from 806 feet amsl to 818 feet amsl from onsite wells. Based on the preliminary grading plans, proposed building elevations range from approximately 920 to 940 feet amsl. Assuming a wet precipitation period and a 50-foot rise in groundwater elevation, the depth to groundwater would rise to approximately 856 to 868 feet amsl in the two onsite wells. This would still be more than 50 feet below the proposed building pad elevations; thus, liquefaction susceptibility would have a less than significant impact on the proposed development.

Landslides

Based on the County of Riverside General Plan and City of Jurupa Valley General Plan, the site is not in an earthquake-induced landslide area. Documented evidence of historical landslides was not observed at the site.

Level of Significance before Mitigation: With implementation of PPP GEO-1, Impact GEO-1(ii), (iii), (iv) would be less than significant.

Impact GEO-2 Threshold: Would the project result in substantial soil erosion or the loss of topsoil?

Project Construction

Site grading and project construction activities would disturb and expose large amounts of soil and could thus accelerate erosion if effective soil erosion measures are not used. Generally, the earthwork plan for the project involves a cut-and-fill grading plan that would involve approximately 2.1 million cubic yards of soil handling. The project site is expected to balance; however, as a conservative measure, it is estimated that up to 20,000 cubic yards of soil may need to be exported offsite.

Construction projects of one acre or more, including the proposed project, are regulated under the Statewide CGP, Order No. 2012-0006-DWQ, issued by the State Water Resources Control Board in 2012. Projects obtain coverage by developing and implementing a SWPPP estimating sediment risk from construction activities to receiving waters, and specifying BMPs that would be used by the project to minimize pollution of stormwater. Categories of BMPs used in SWPPPs are described below in Table 5.5-1. Implementation of BMPs would reduce construction impacts on stormwater quality and soil erosion to less than significant levels.

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Table 5.5-1 Construction BMPs

Category	Purpose	Examples
Erosion Controls and Wind Erosion Controls	Consists of using project scheduling and planning to reduce soil or vegetation disturbance (particularly during the rainy season), preventing or reducing erosion potential by diverting or controlling drainage, as well as preparing and stabilizing disturbed soil areas.	Scheduling, preservation of existing vegetation, hydraulic mulch, hydroseeding, soil binders, straw mulch, geotextile and mats, wood mulching, earth dikes and drainage swales, velocity dissipation devices, slope drains, streambank stabilization, compost blankets, soil preparation/roughening, and non-vegetative stabilization
Sediment Controls	Filter out soil particles that have been detached and transported in water.	Silt fence, sediment basin, sediment rrap, check dam, fiber rolls, gravel bag bern, street sweeping and vacuuming, sandbag barrier, straw bale barrier, storm drain inlet protection, manufactured linear sediment controls, compost socks and berms, and biofilter bags
Wind Erosion Controls	Consists of applying water or other dust palliatives to prevent or minimize dust nuisance.	Dust control soil binders, chemical dust suppressants, covering stockpiles, permanent vegetation, mulching, watering, temporary gravel construction, synthetic covers, and minimization of disturbed area
Tracking Controls	Minimize the tracking of soil offsite by vehicles	Stabilized construction roadways and construction entrances/exits, and entrance/outlet tire wash.
Non-storm Water Management Controls	Prohibit discharge of materials other than stormwater, such as discharges from the cleaning, maintenance, and fueling of vehicles and equipment. Conduct various construction operations, including paving, grinding, and concrete curing and finishing, in ways that minimize non-stormwater discharges and contamination of any such discharges.	Water conservation practices, temporary stream crossings, clear water diversions, illicit connection/discharge, potable and irrigation water management, and the proper management of the following operations: paving and grinding, dewatering, vehicle and equipment cleaning, fueling and maintenance, pile driving, concrete curing, concrete finishing, demolition adjacent to water, material over water, and temporary batch plants.
Waste Management and Controls (i.e., good housekeeping practices)	Management of materials and wastes to avoid contamination of stormwater.	Stockpile management, spill prevention and control, solid waste management, hazardous waste management, contaminated soil management, concrete waste management, sanitary/septic waste management, liquid waste management, and management of material delivery storage and use.

Source: CASQA 2012.

Project Operation

In compliance with the NPDES small municipal separate storm sewer system (MS4) permit and Riverside County Drainage Area Management Plan, a water quality management plan was prepared for the proposed project that identifies BMPs to be used onsite to control pollutant runoff (see Appendix H). The BMP measures that would be implemented on site are described in the Hydrology and Water Quality section under impact HYD-1 and include site design measures, source control measures, and stormwater treatment measures. Post-Development water quality impacts would be less than significant with the operation and maintenance of the BMPs specified in the water quality management plan.

Level of Significance before Mitigation: With implementation of PPP HYD-1, PPP HYD-2, PPP HYD-3 and PPP-HYD-4, Impact GEO-2 would be less than significant.

Impact GEO-3	**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?**

Landslides

As concluded above, the site is not located within an earthquake-induced landslide area, and no evidence of historical landslides was identified (as shown in Figure 8-6 of the City's General Plan). Development of the project would not exacerbate existing landslide hazards.

Lateral Spreading

Lateral spreading occurs when surface soils displace and are transported downslope or in the direction of a slope by earthquake and gravitational forces. As stated above, the potential for liquefaction under the design earthquake is anticipated to be low, and therefore the potential for lateral spreading is also considered low.

Subsidence

The major cause of ground subsidence is excessive withdrawal of groundwater through groundwater pumping. Land subsidence may also be induced from withdrawal of oil. However, the project site is not over a groundwater basin, and significant groundwater pumping would not occur onsite. In addition, no active oil, gas, or geothermal wells are identified within the project site. Thus, ground subsidence is not considered a significant hazard.

Liquefaction

As analyzed under Impact GEO-1(ii), (iii),(iv), the potential for soil liquefaction at the project site is anticipated to be low under the design earthquake.

Collapse

Collapsible soils, or soils susceptible to significant hydroconsolidation, are unconsolidated, low-density, loose, dry soils that have a porous structure, susceptible to collapse when water is introduced. Based on the reported geologic conditions and subsurface information reviewed for the site, soils potentially susceptible to significant hydroconsolidation are anticipated.

Based on the collapsible soil evaluation conducted on soil samples, the collapse potential varies between 0.2 to 1.5 percent within the upper 20 feet and less than 0.5 percent for samples collected at greater depths. Samples that had a collapse potential greater than 1 percent were located in borings LB-4 and LB-8, approximately in the center of the project site at depths of approximately 5 to 6.5 feet and 15 to 16.5 feet, respectively. Thus, impacts related to collapsible soils are potentially significant and mitigation is required.

Furthermore, the Riverside Cement Plant operations included quarries, and an underground mining operation (i.e., the Crestmore Mine) was used to obtain limestone for use in manufacturing cement. The quarries were located south of the proposed buildings. Underground mining was initially performed beneath the Chino Quarry, which is located about 700 feet south of the proposed development. Mining progressed north and east as successively lower mining levels were excavated. A Mine Deformation Study was performed to estimate potential deformations at the belowground mine chambers and corresponding ground surface deflections due to the proposed project. The document review, literature review, and modeling performed indicated that the presence of the former mine workings would not impact the proposed development. The results of the modeling indicate that a loss of soil support is not anticipated in the proposed new building foundation bearing zone.

Development of the proposed project would not exacerbate existing hazards related to landslides, lateral spreading, subsidence, and liquefaction; however, collapsible soils onsite could be exacerbated during grading and construction of the proposed buildings.

Level of Significance before Mitigation: Impact GEO-3 would be potentially significant. Mitigation Measures GEO-1 and GEO-2 are required to reduce Impact GEO-3 to less than significant.

Impact GEO-4 Threshold: Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial director indirect risks to life or property?

Expansive soils occur when the moisture content in the soil causes swelling or shrinking as a result of cyclic wet/dry conditions. Portions of the site are underlain by alluvial soils that could have expansive clays, although expansive clays have not been identified on the site yet. Other expansive soils include cohesive soils (e.g., clays, sandy clays, or silty clays), which are difficult to break up when dry and exhibit significant cohesion when submerged.

As part of the geotechnical report, field investigation was conducted, and cohesive soil was not encountered within the upper 15 feet of borings. Cohesive soils were encountered in boring LB-5 at a depth of 15 to 16.5 feet and, based on laboratory results, the material has a medium expansive potential. Expansive soils can be found in areas underlain by alluvial soils. If not properly planned and executed, grading operations could exacerbate the extent of expansive soils beneath the building pads. Thus, impacts related to expansive soils are potentially significant, and further testing and evaluation should be performed during final design and following rough grading.

Level of Significance before Mitigation: Impact GEO-4 would be potentially significant. Mitigation Measures GEO-1 and GEO-2 are required to reduce Impact GEO-4 to less than significant.

Impact GEO-5 Threshold: Would the proposed 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?

Future development onsite would require infrastructure improvements to connect to existing Rubidoux Community Services District's neighboring sewer lines in Brown Avenue to the east, Rubidoux Boulevard to the west, and in Agua Mansa Road to the south to accommodate additional flows generated by the proposed development. The project would not use alternative wastewater disposal systems such as septic tanks; thus, no impact would occur.

Level of Significance before Mitigation: Impact GEO-5 will cause no impact.

Impact GEO-6 Threshold: Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Unique Geologic Features

A predominant geologic feature within the site is the large limestone boulder and hill, approximately 985 feet above mean sea level, adjacent to what remains of the flooded Chino Quarry in the southern portion of the site. The limestone boulder and hill will be maintained and there will be no impacts to unique geological features on site.

Paleontological Resources

No known paleontological resources from the NHMLAC records were recorded within the study area or within a one-mile radius, and no resources were identified during the pedestrian survey. The County of Riverside General Plan shows the study area mapped as having a low potential for paleontological resources (Jurupa Valley 2017b). Nevertheless, the results of the literature review and the search at the NHMLAC indicate that the western portion of the study area is composed of younger Quaternary Alluvium derived as alluvial fan deposits from the elevated terrain adjacent to the west and also contains surface deposits of younger Quaternary drift sands. Both of these younger Quaternary deposits are unlikely to contain significant vertebrate fossils in the uppermost layers, but at relatively shallow depths ranging from six to eight feet there may be older Quaternary deposits that contain significant fossil vertebrate remains. Excavations in these older Quaternary deposits may have a potential to impact paleontological resources. As a result, mitigation measures are included to reduce potentially significant impacts to previously undiscovered paleontological resources or unique geological features that may be accidentally encountered during project implementation to a less than significant level.

Level of Significance before Mitigation: Impact GEO-6 would be potentially significant. Mitigation Measures GEO-3 and GEO-4 are required to reduce Impact GEO-6 to less than significant.

5.5.6 Cumulative Impacts

Geology and soils impacts related to the proposed project would be specific to the project site and its users and would not be common or contribute to the impacts (or shared with, in an additive sense) on other sites. Compliance with applicable state and local building regulations would be required of all development in the City. Individual projects would be designed and built in accordance with applicable standards in the CBC and the individual building regulations of local jurisdictions (see PPP GEO-1), including pertinent seismic design criteria. Site-specific geologic hazards would be addressed by the engineering geologic report and/or geotechnical report required for each building. These geologic investigations would identify the specific geologic and seismic characteristics on a site and provide guidelines for engineering design and construction to maintain the structural integrity of proposed structures and infrastructure. Therefore, compliance with applicable state and local building regulations and standard engineering practices related to seismic and geologic hazard reduction would prevent significant cumulative adverse impacts associated with geologic and seismic hazards.

Implementation of the proposed project in conjunction with other planned projects in the City could result in cumulative impacts to paleontological resources. However, other development projects would be required to undergo discretionary review and would be subject to the same resource protection requirements and CEQA review as the proposed project. For example, other development projects may require some degree of ground-disturbance but would be required to comply with applicable regulations, which would minimize the potential to disturb significant paleontological resources. If paleontological resources were found, they would be addressed through the necessary testing, archiving, and recovery prior to development of the site. Additionally, the proposed project has incorporated mitigation that would reduce the potential for the project to contribute to cumulative impacts to paleontological resources. In consideration of the preceding factors, the project's contribution to cumulative paleontological resource impacts would be rendered less than significant; therefore, project impacts would not be cumulatively considerable.

5.5.7 Level of Significance Before Mitigation

Impacts GEO-1(i) and GEO-5 would have no impact.

Upon implementation of PPP GEO-1, Impact GEO-1(ii), (iii), (iv) would be less than significant.

Upon implementation of PPP HYD-1, PPP HYD-2, PPP HYD-3 and PP-HYD-4, Impact GEO-2 would be less than significant. Without mitigation, these impacts would be **potentially significant**:

- **Impact GEO-3** The site contains collapsible soils that may be exacerbated by development of the proposed project.
- **Impact GEO-4** Expansive soils onsite may cause geologic hazards to workers and visitors.
- **Impact GEO-6** Previously undiscovered paleontological resources may be accidentally encountered during project implementation.

5.5.8 Mitigation Measures

Impact GEO-3

MM GEO-1 Prior to commencement of mass excavation and grading, the project applicant shall coordinate with the excavation/grading contractor, civil engineer and geotechnical consultant to provide a detailed work schedule to the City. This team shall be available to meet onsite with the City inspector, if requested, to address schedule details and any issues related to the geotechnical aspects of site grading.

MM GEO-2 Prior to construction, to reduce hazards related to geologic conditions onsite, including the potential for settlement from collapsible soils and foundational damage from expansive soils, remedial grading may include but shall not be limited to the following:

- All vegetation and deleterious materials shall be disposed of offsite prior to initiation of grading operations.
- Soil over-excavation shall extend laterally a distance equal to the depth of removal but no less than five feet beyond the limits of the structures. In addition, within building limits, existing soil shall be removed and replaced as engineered fill (over-excavated) to a depth of at least five feet below the bottom of the building foundations, to the bottom of artificial fill, or five feet below existing grade, whichever is the greater depth. Beyond building limits, existing soil shall be removed and replaced as engineered fill (over-excavated) to a depth of at least two feet below proposed grade. The actual depths of removal shall be evaluated in the field by a representative of the geotechnical consultant based on actual conditions exposed during grading.
- All surficial units consisting of artificial fill, upper five feet of alluvial soils, soil with roots, and loose surficial soil are considered unsuitable for support of the proposed fills and improvements following removal of vegetation and deleterious materials. These materials shall be over-excavated to expose competent soil.
- Environmentally unsuitable soils encountered during the excavation process shall be properly disposed of offsite in accordance with all state and local regulations. Over-excavated soils, free of deleterious and environmentally unsuitable materials, may be reused as compacted fill.
- All over-excavation bottoms shall be observed by the geotechnical consultant prior to fill placement. Prior to placement of fill material, the over-excavation bottom shall be scarified to a depth of at least six inches, moisture conditioned to within one to two percent of optimum moisture content, and proof-rolled.
- The geotechnical consultant shall be provided with appropriate survey staking during grading to verify that depths and locations of recommended over-excavations have been achieved. Observations and detailed geologic mapping of over-excavations should be

performed by the engineering geologist or geotechnical engineer to verify the anticipated conditions.

- Any foundation remnants or construction debris associated with former structures or developments encountered within excavations shall be fully removed, and any void spaces that may be created shall be backfilled with approved compacted structural fill.
- Onsite excavated materials to be used as compacted fill shall be placed in uniform lifts restricted to about six inches in thickness, moisture conditioned to near optimum moisture content, then mechanically compacted. Fill placement shall be subject to controlled engineering inspection by the engineer.
- Fill slopes shall be designed at a slope ratio of 2:1 (horizontal:vertical) or flatter and be overbuilt and subsequently cut back to a compacted core. Fill slopes shall be constructed with keyways, backcuts, and backdrains. Keyways shall be a minimum of 15 feet wide for slopes up to 30 feet high and a minimum of half the slope height for slopes higher than 30 feet. Keyways shall be tilted a minimum 2 percent toward the back of the keyway and embedded a minimum of three feet into competent material at the toe. Backcut benches shall be excavated to expose competent material where fill is placed on slopes steeper than approximately 5:1 (horizontal:vertical).

Notes should be added to the grading plan to indicate these mitigation measures.

Impact GEO-4

Mitigation Measures MM GEO-1 and MM GEO-2 are also applicable to Impact GEO-4.

Impact GEO-6

MM GEO-3 **Paleontological Monitoring.** A qualified paleontologist shall be retained by the developer prior to the issuance of a grading permit. The project paleontologist will be on call to monitor ground-disturbing activities and excavations on the project site following identification of potential paleontological resources by project personnel. If paleontological resources are encountered during implementation of the project, ground-disturbing activities will be temporarily redirected from the vicinity of the find. The project paleontologist will be allowed to temporarily divert or redirect grading or excavation activities in the vicinity in order to make an evaluation of the find. If the resource is significant, Mitigation Measure CR-14 shall apply.

MM GEO-4 **Paleontological Treatment Plan.** If a significant paleontological resource(s) is discovered on the property, the qualified paleontologist shall develop a plan of mitigation in consultation with the project proponent and the City. The plan shall include salvage excavation and removal of the find, removal of sediment from around the specimen (in the laboratory), research to identify and categorize the find, curation of the find in a local qualified repository, and preparation of a report summarizing the find.

5.5.9 Level of Significance After Mitigation

Impact GEO-3

Implementation of Mitigation Measure MM GEO-3 would require the project applicant to coordinate with the excavation/grading contractor, civil engineer and geotechnical consultant to provide a detailed work schedule to the City. This team shall be available to meet onsite with the City inspector, if requested, to address schedule details and any issues related to the geotechnical aspects of site grading. Compliance with mitigation measure MM GEO-4 would ensure remedial grading occurs prior to construction of the proposed structures. This would involve over-excavating unsuitable soils and replacing them with properly compacted fill materials to ensure onsite soils can adequately support the proposed buildings. Thus, impacts related to collapsible soils would be reduced to less than significant levels upon implementation of the required mitigation.

Impact GEO-4

Similar to Impact GEO-3, implementation of mitigation measures MM GEO-3 and MM GEO-4 would ensure expansive soils are over-excavated and replaced with properly compacted fill that is moisture conditioned to within 1 to 2 percent of optimum moisture content. Thus, geologic impacts related to expansive soils onsite would be reduced to less than significant levels.

Impact GEO-6

Implementation of mitigation measures MM GEO-5 and MM GEO-6 would ensure that no unique paleontological resource or unique geologic feature on site will be directly or indirectly destroyed due to project implementation. Thus, impacts would be reduced to less than significant.

5.5.10 References

California Stormwater Quality Association (CASQA). 2012, July. California Construction Best Management Practices Handbook.

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