5.5 GEOLOGY AND SOILS

This section of the Draft Environmental Impact Report (DEIR) evaluates the potential for implementation of the Proposed Project to impact geological and soil resources, paleontological resources, or unique geologic features in the City of San Juan Capistrano. The analysis in this section is based in part on the following technical report(s):

- *Cultural and Paleontological Resources Assessment for the Creekside Specific Plan, San Juan Capistrano, Orange County, California*, Cogstone, January 2020.
- *Preliminary Geotechnical Review of Proposed Creekside Residential Development, Southeast of Rancho Viejo Road and Malaspina Road, Vesting Tentative Tract Map No. 19009*, San Juan Capistrano, California., LGC Geotech, Inc, July 30, 2019.

Complete copies of these studies are included in Appendix D and Appendix E to this DEIR.

5.5.1 Environmental Setting

5.5.1.1 REGULATORY BACKGROUND

California Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was signed into state law in 1972. Its 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 delineates "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.

Seismic Hazard Mapping Act

The Seismic Hazard Mapping Act (SHMA) was adopted by the state in 1990 to protect 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 California Geological Survey prepares seismic hazard zone maps that identify areas susceptible to amplified shaking, liquefaction, earthquake-induced landslides, and other ground failures. SHMA requires responsible agencies to only approve projects within seismic hazard zones following a site-specific investigation to determine if the hazard is present, and if so, the inclusion of appropriate mitigation. In addition, the SHMA requires real estate sellers and agents at the time of sale to disclose whether a property is within one of the designated seismic hazard zones.

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. The most recent building standard adopted by the legislature and used throughout the state is the 2016 version of the CBC (effective January 1, 2017), often with local, more restrictive amendments that are based on local geographic, topographic, or climatic conditions. These codes provide 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 on-site, and the strength of ground shaking with a specified probability of occurring at a site.

Soils Investigation Requirements

Requirements for soils investigations for subdivisions requiring tentative and final maps and for other specified types of structures are 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 expansiveness.

Paleontological Resources Preservation Act

The Paleontological Resources Preservation Act was enacted as Public Law 111-11, Title VI, Subtitle D of the Omnibus Public Land Management Act of 2009 (16 U.S. Code §§ 470aaa–470aaa-11) and directs the Department of Agriculture (US Forest Service) and the Department of the Interior (National Park Service, Bureau of Land Management, Bureau of Reclamation, and Fish and Wildlife Service) to implement comprehensive paleontological resource management programs. The US Forest Service published the Department of Agriculture version of the Preservation Act regulations in the Federal Register in April 2015.

5.5.1.2 EXISTING CONDITIONS

Regional Geology

The Project Site is on the southwestern border of the Peninsular Ranges. Specifically, the site lies within the sedimentary basin known as the Capistrano Embayment, a subhorizontal deposit consisting of marine siltstone and clayey, siltstone bedrock of the Tertiary Period (late Miocene to early Pliocene Epoch: approximately 5 to 15 million years old) Capistrano Formation. This sedimentary unit, in excess of 3,000 feet thick near the center of the embayment, was uplifted, gently folded, and eroded to produce the low, rolling hillside topography observed today. More recently, the local geology has also been influenced by a rapid drop in sea level, resulting in extensive erosion and creating numerous steep-sided drainage channels and relatively steep slopes that are prone to landslides. Portions of the off-site slopes to the east are mapped within a seismic hazard zone for

earthquake-induced landslide. However, the majority of hillsides in Southern California are within similar geologic settings and are also mapped for potential for earthquake-induced landslide.

Site-Specific Geology

The Project Site is not located within a mapped State of California Earthquake Fault-Rupture Hazard Zone per compiled maps released by the California Geological Survey, and no known active faults cross the site. The closest significant fault to the site is the active San Joaquin Thrust Fault, approximately 5.5 miles north of the Project Site. Based on the State of California Seismic Hazard Zone Report for the San Juan Capistrano 7.5 Minute Quadrangle, the Project Site is not in a potential liquefaction zone but is partially within a zone of potential earthquake-induced landslides. The approximate lateral extent of the geologic units encountered is presented on Sheet 1 of 2, Geotechnical Map, of the Preliminary Geotechnical Review (Appendix E to the DEIR). The geologic materials identified on the Project Site include alluvium, older artificial fill, and the bedrock of the Capistrano Formation. The typical on-site characteristics of the materials are described here from youngest to oldest.

- **Artificial Fill, Older (Map Symbol: Afo).** Older artificial fill soils were encountered within the central area of the Project Site. The material consists of variable layers of brown, grayish brown, and gray silt, clayey silt, sandy clay with scattered gravel and few cobbles, generally moist to very moist, stiff to very stiff.

- **Quaternary Alluvium (Map Symbol: Qal).** Quaternary alluvium was encountered during previous subsurface investigation, during rough grading activities in the 1970s, and during the subsurface investigation by LGC in 2019. The material consists of dark brown and dark gray silt, clay, and sandy clay with scattered gravels and cobbles. The material was very moist, moderately stiff to stiff, with few root casts and iron oxide staining.

- **Tertiary Capistrano Formation (Map Symbol: Tc).** Tertiary Capistrano Formation material underlies the entire Project Site at depth. This material generally consists of very fine sandy siltstone, clayey siltstone, and few thin sandstone and very thin clay interbeds. Within the upper oxidized (weathered) portion of the formation, this material is typically light gray to brown in color and commonly has gypsum and iron oxide along joints and fractures. The unoxidized portion of the Capistrano Formation is dark gray, very stiff to hard, fresh bedrock. In general, the Capistrano Formation material was found to be thickly bedded to massive with rare, very thin clay beds, and few concretionary nodules.

Groundwater

A groundwater table was not encountered during the subsurface field evaluation conducted as part of the geotechnical investigation in 2019, which extended a maximum depth of 93 feet below existing grade. However, seepage was observed during downhole logging of the bucket auger borings, and seasonal fluctuations of groundwater elevations should be expected over time. In general, groundwater levels fluctuate with the seasons, and local zones of perched groundwater may be present within the near-surface deposits due to local seepage or during rainy seasons. Local perched groundwater conditions or surface seepage may develop once site development is completed and landscape irrigation commences.

Paleontological Records Search

A search for paleontological records was completed by the Natural History Museum of Los Angeles County, and published literature, unpublished paleontological reports, and fossil databases were also searched for fossil records (Cogstone 2020). The search result is summarized below.

Late Miocene to Early Pliocene Capistrano Formation: Numerous fossils of marine and terrestrial animals have been recovered in nearly 100 localities from the Capistrano Formation in San Juan Capistrano and southern Orange County. In San Juan Capistrano, seven of these localities in the siltstone facies of the Capistrano Formation have produced fossils of pinnipeds, baleen and toothed whales, camels, pronghorn, elephant, birds, bony fish, sharks and rays, and marine invertebrates.

Pleistocene Deposits: Eight localities within the city have produced numerous fossils of terrestrial and marine animals. These localities have produced fossils of ground sloth, dolphin, mammoth, mastodon, horse, tapir, bison, fish, sharks, and marine invertebrates. The nearest locality from the Project Site is approximately 1.15 miles to the south and just southwest of Rancho Viejo Road and Ortega Highway, which is the remains of a Columbian mammoth. Over 100 other fossil localities are known from Pleistocene-aged sediments in southern Orange County. The largest of these is known as Costeau Pit in Laguna Hills, which recovered coyote, dire wolf, saber-toothed cat, camel, llama, diminutive pronghorn, long-horned bison, rabbits, rodents, and birds.

5.5.2 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would:

G-1 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.

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

G-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.

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

G-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.

G-6 Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The Initial Study, included as Appendix A, substantiates that impacts associated with the following thresholds would be less than significant:

- Threshold G-1(i)
- Threshold G-1(ii)
- Threshold G-1(iii)
- Threshold G-1(iv)
- Threshold G-2
- Threshold G-3
- Threshold G-5

These impacts will not be addressed in the following analysis.

5.5.3 Plans, Programs, and Policies

Regulatory Requirement

PPP GEO-1 The Proposed Project is required to be constructed in compliance with California Building Code, Title 24, Part 2 of the California Code of Regulations.

5.5.4 Environmental Impacts

5.5.4.1 IMPACT ANALYSIS

The following impact analysis addresses thresholds of significance for which the Initial Study disclosed potentially significant impacts. The applicable thresholds are identified in brackets after the impact statement.

Impact 5.5-1: The Project Site is on expansive soil, as defined in Table 18-1B of the Uniform building Code (1994), creating substantial direct or indirect risks to life or property. [Threshold G-4]

Based on the results of the subsurface evaluation and geotechnical review of the Proposed Project and preliminary grading plan, the geotechnical study concluded that the proposed improvements are feasible from a geotechnical standpoint, provided that PPP GEO-1 and the recommendations in the geotechnical study are incorporated during site grading and development. However, the geotechnical study indicated that for the preliminary design purposes, the Project Site has a high expansion potential. The design parameters were determined based on the geotechnical investigator's expert experience with similar projects, test results

performed by others, and the anticipated nature of the soil. Implementation of the Proposed Project could be impacted by expansive soils, and impacts could be potentially significant.

Level of Significance Before Mitigation: Potentially significant.

Impact 5.5-2: The Proposed Project could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. [Threshold G-6]

Fossil resources occur in geologic units (e.g., formations or members). The probability for finding significant fossils in a project area can be broadly predicted from previous records of fossils recovered from the geologic units present in and/or adjacent to the study area. The geological setting and the number of known fossil localities help determine the paleontological sensitivity according to the Potential Fossil Yield Classification (PFYC) criteria developed by Bureau of Land Management. The PFYC system has a multilevel scale based on demonstrated yield of fossils. Using the PFYC system, geologic units are classified according to the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts within the known extent of the geological unit. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher PFYC value; instead, the relative abundance of localities is the major determinant for the value assignment.

Though Pleistocene fossils typically can begin occurring at depths of about 8 to 10 feet below the existing ground surface in valley areas, locations with a higher topography and, by extension, more erosion than deposition can have Pleistocene fossils at shallower depths. This is seen locally in a Columbian mammoth found at approximately 3 feet deep in San Juan Capistrano southeast of Rancho Viejo Road and Ortega Highway. Based on recorded localities identified in San Juan Capistrano and southern Orange County, both the middle-to-late Pleistocene deposits and the siltstone facies of the Capistrano Formation are assigned a PFYC 3a, a moderate but patchy sensitivity. If encountered, the early-to-middle Pleistocene, very old axial channel deposits are also assigned a PFYC 3a. Considering a moderate sensitivity of the underlying native geologic units, paleontological monitoring is recommended for all excavations into native sediments. Therefore, this impact is considered potentially significant.

Level of Significance Before Mitigation: Potentially Significant.

5.5.5 Cumulative Impacts

Geology and Soils

Geology and soils impacts related to the Proposed Project would be specific to that site and its users and would not contribute to the impacts on other sites. Compliance with applicable state and local building regulations would be required of all development in the City of San Juan Capistrano. Individual projects would be designed and built in accordance with applicable standards in the CBC and the individual site-specific recommendations of project-specific geotechnical investigations that include pertinent seismic design criteria. 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. Individual project impacts of the Proposed Project and other development projects on geology and

soils would be reduced to a less than significant level with and/or without mitigations and with compliance with existing regulations and would not result in a cumulatively considerable impact.

Paleontological Resources

The Project Site has been previously graded and disturbed, and other cumulative project sites include developed and undeveloped sites. Similar to the Project Site, although some areas have been developed, ground disturbance could potentially unearth previously unidentified cultural resources. The Proposed Project has moderate sensitivity for paleontological resources, and a mitigation measure has been incorporated to mitigate impacts to a less than significant level. Paleontological impacts are site specific, and provided that site-specific impacts for development projects in the City are provided as with the Proposed Project, cumulatively significant impacts would be reduced to a less than significant level.

Level of Significance Before Mitigation: Potentially Significant

5.5.6 Level of Significance Before Mitigation

Without mitigation, these impacts would be **potentially significant**:

- **Impact 5.5-1** Implementation of the Proposed Project could be impacted by expansive soils.
- **Impact 5.5-2** The Proposed Project could adversely impact paleontological resources or a unique geologic feature if grading occurs beyond artificial fill.

5.5.7 Mitigation Measures

Impact 5.5-1

GEO-1 The project applicant shall design the foundation system to resist the impacts of expansive soils and fill settlement in accordance with the allowable deflection criteria of applicable codes and the requirements of the structural designer/architect, as described in the Geotechnical Investigation prepared for the Creekside Specific Plan project by LGC, dated July 30, 2019, or any updates therein. At the completion of grading, if soils with "very high" expansion potential are encountered by the qualified geotechnical professional, supplemental geotechnical foundations shall be provided and implemented in accordance with the California Building Code and the City of San Juan Capistrano's Grading Ordinance.

Impact 5.5-2

GEO-2 The project applicant shall implement a Paleontological Resource Impact Mitigation Program and conduct full-time monitoring by a qualified paleontologist when disturbing native deposits with a PFYC ranking of 3 or greater (i.e., all sediments of the middle-to-late Pleistocene old axial channel deposits, early-to-middle Pleistocene very old axial channel deposits, and the siltstone facies of the Capistrano Formation). If unanticipated fossils are unearthed during construction, work shall be halted in that area until a qualified paleontologist can assess the

significance of the find. Sediment samples shall be collected in the deposits and processed to determine the small-fossil potential in the project area, and any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution. Work may resume immediately a minimum of 50 feet away from the find.

5.5.8 Level of Significance After Mitigation

Impact 5.5-1

Implementation of Mitigation Measure GEO-1 would ensure that potential impacts from expansive soils are reduced to a less than significant level. However, implementation of the mitigation measure and other required regulations related to geology and soils would not eliminate foundation movement (and related distress) should the moisture content of the subgrade soils fluctuate. It is the intent of the mitigation to help maintain the integrity of the proposed structures and reduce, not eliminate, movement, based upon the anticipated site soil conditions. Should future homeowners not properly maintain the areas surrounding the foundation, for example by overwatering and/or incorrect landscape design, then the maximum differential movement of a couple of inches could be anticipated for highly expansive soils. However, this would not be considered a significant impact. Soils of lower expansion potential are anticipated to show less movement. No significant and unavoidable impact related to expansive soils is anticipated.

Impact 5.5-2

Implementation of Mitigation Measures GEO-2 would reduce potential impacts associated with paleontological resources to a level that is less than significant. Therefore, no significant unavoidable adverse impacts relating to geology and soils have been identified.

5.5.9 References

LGC Geotech, Inc. 2019, July 30. Preliminary Geotechnical Review of Proposed Creekside Residential Development, Southeast of Rancho Viejo Road and Malaspina Road, Vesting Tentative Tract Map No. 19009, San Juan Capistrano, California.

Cogstone. 2020, January. Cultural and Paleontological Resources Assessment for the Creekside Specific Plan, San Juan Capistrano, Orange County, California.