APPENDIX D6

Geotechnical Report

REPORT
GEOTECHNICAL REVIEW

County of Santa Barbara Calle Real Campus Master Plan Program Environmental Impact Report (PEIR)

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NOVA Project 3023006
August 18, 2023

GEOTECHNICAL

MATERIALS

SPECIAL INSPECTION

DVBE ♦ SBE ♦ SDVOSB ♦ SLBE

UltraSystems Environmental
Betsy A. Lindsay, President
16431 Scientific Way
Irvine, CA 92618

August 18, 2023
NOVA Project 3023006

Subject: Geotechnical Review
County of Santa Barbara Calle Real Campus Master Plan
Program Environmental Impact Report (PEIR)
Project #21010 (RFQ 21010-1)

Dear Ms. Lindsay:

NOVA Services, Inc. (NOVA) is pleased to present the above-referenced report to UltraSystems Environmental, Inc. The report addresses a screening-level review of potential geologic and geotechnical issues that could be associated with implementation by Santa Barbara County of the proposed redevelopment of the Calle Real Campus as defined in the Conceptual Calle Real Campus Master Plan. The work reported herein was completed by NOVA for UltraSystems in accordance with NOVA's proposal dated January 25, 2023.

NOVA appreciates the opportunity to be of continued service to UltraSystems on this most interesting project. Should you have any questions regarding this report or other matters, please do not hesitate to call us at 691.791.4379.

Sincerely,
NOVA Services, Inc.

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REPORT
GEOTECHNICAL REVIEW

County of Santa Barbara Calle Real Campus Master Plan
Program Environmental Impact Report (PEIR)

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1.0 INTRODUCTION

1.1 Terms of Reference

This report presents the findings by NOVA Services, Inc. (NOVA) of a geotechnical assessment of planning by the County of Santa Barbara ('the County') for redevelopment of the Calle Real Campus as defined in the Conceptual Calle Real Campus Master Plan. This report will be used by UltraSystems Environmental, Inc. (UltraSystems) work in development of a Program-Level Environmental Impact Report (PEIR).

The County's Calle Real Campus is located between the cities of Goleta and Santa Barbara. Figure 1-1 depicts the location of the Calle Real Campus in the County.

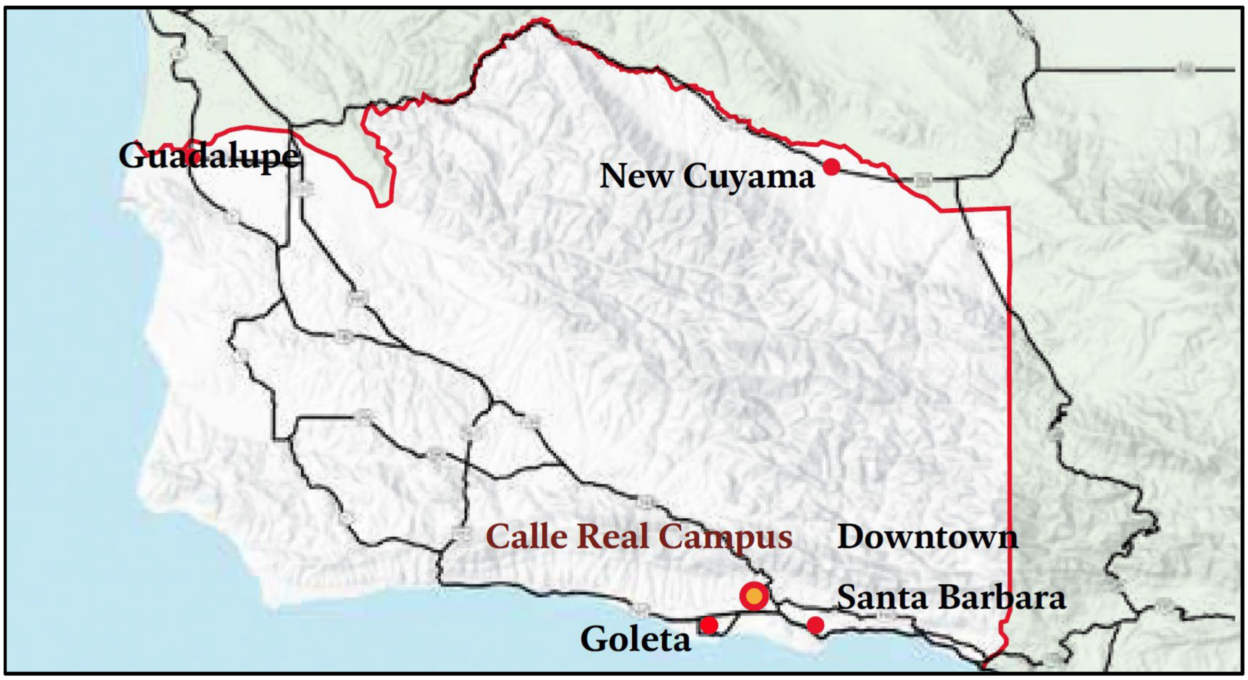

Figure 1-1. Calle Real Campus Location in Santa Barbara County

The work reported herein was completed by NOVA for UltraSystems in conformance with the scope of work described in NOVA's January 25, 2023 proposal to UltraSystems. NOVA was authorized to proceed with the work on March 14, 2023.

1.2 Objective, Scope, and Limitations of This Work

1.2.1 Objective

The objective of the work reported herein is to utilize information available from the public record to characterize the Campus physical setting (i.e., geology and subsurface conditions) in a manner sufficient to identify potential geologic, subsurface, and siting-related constraints to the Master Plan, thereafter identifying design or other actions that may address/mitigate these constraints.

1.2.2 Scope

In order to accomplish the above objective, NOVA undertook the task-based scope of work described below.

1. Task 1, Review. NOVA has reviewed readily available background data regarding the Campus area, including geotechnical reports, topographic maps, geologic data, fault maps and reports, and prospective development/redevelopment. The review has sourced publicly available documents, addressing the elements of review listed below.
    a. Element 1, Geologic and Seismic. This element of review has addressed documentation related to the geologic setting, to include seismicity, faulting, potential for surface fault rupture, landsliding, ground lurching, groundwater levels, etc.
    b. Element 2, Geotechnical. This element of review has addressed documentation related to potential soil hazards across the Campus, to include expansive soils, collapsible soils, soft/compressible soils, soil creep, liquefaction, lateral spreading, seismic compression, seismic embankment instability, erosive soil environments, soil excavation, potential for corrosive soils, etc.
    c. Element 3, Siting. This element of review has addressed physical hazards relating to the location of the Campus, to include the potential effects of tsunamis/seiches, subsidence due to oil/gas/groundwater withdrawals, flood hazards, etc.
2. Task 2, Assessment. Utilizing the above understanding of the site physical setting, NOVA identified the manner by which this setting would affect implementation of the Master Plan.
3. Task 3, Reporting. Submittal of this report concludes the scope of this review. The report includes a record of all work and provides geologic and geotechnical-related recommendations regarding development per the Master Plan. Reporting is provided in two events, as abstracted below.
    a. *Subtask 2-1, Draft Report*. This draft report is submitted for review and comment by UltraSystems and its team.
    b. *Subtask 2-2, Final Report*. A final report will be submitted after receiving comments on the draft report. The final report will be signed by both a California-registered geotechnical engineer and an engineering geologist.

1.3 Limitations

This report is limited to only the specific elements of inquiry identified above and the information reasonably obtainable by the scope of work. The recommendations provided in this report have been developed by NOVA using judgment and opinion and based upon the information available from the review of public documentation.

No invasive work (borings, test pits, etc.) was performed, such that no structure-specific subsurface information is available. Therefore, the guidance regarding the development of structures should be understood to be general, subject to change as more structure-specific information is developed. Future work to implement the Master Plan will require more focused and in-depth geotechnical investigations.

This report does not address any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, soil gas, groundwater, or surface water within or beyond the area of study.

1.4 Understood Use

NOVA expects that the information provided herein will be utilized by UltraSystems and its team in decision-making regarding geotechnical-related elements of the PEIR.

1.5 Report Organization

The remainder of this report is organized as described below.

- Section 2 reviews the presently available Master Plan information.
- Section 3 reviews the geologic setting.
- Section 4 describes the likely hazards associated with the setting.
- Section 5 describes the likely geotechnical conditions, addressing soil-related hazards common to this area of California, considering each for its potential to affect implementation of the Master Plan.
- Section 6 reviews the siting-related hazards.
- Section 7 provides recommendations for geotechnical planning associated with modernization of existing structures or construction of new structures, with particular focus on mitigation of identified potential risks to structures and infrastructure.
- Section 8 cites the principal references used in preparation of this report.

Figures and tables are embedded in the text at their point of reference.

2.0 PROJECT INFORMATION

2.1 Campus Description

2.1.1 Location

The County's Calle Real Campus encompasses approximately 324 acres on the Santa Barbara City/Goleta City border in Goleta, California. The Campus is located near the US 101 and CA-54 freeways. The Campus extends north of Cathedral Oaks Road and is bordered by Hollister Avenue at the south end.

Figure 2-1 shows the Campus vicinity.

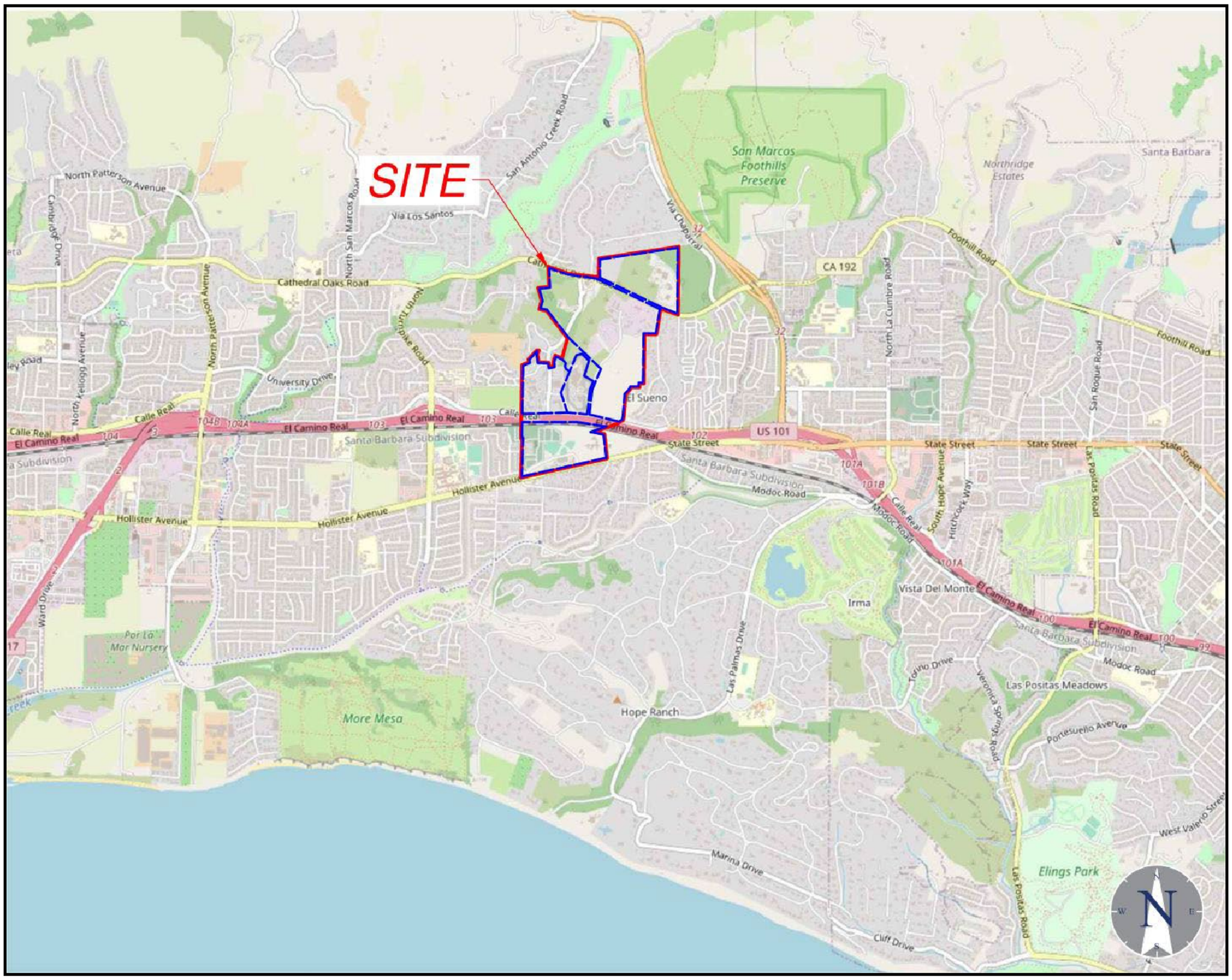

Figure 2-1. Campus Vicinity Map

2.1.2 'Sub-Campus' Descriptions

The site is currently occupied by the existing Santa Barbara County Calle Real Campus and consists of several sub-Campuses. Sub-Campuses include the Public Safety Campus north of Cathedral Oaks Road, the County Yards, Main Jail, and Health and Government Center Campuses, which are located south of Cathedral Oaks Road and north of US 101, and the Community Services Campus south of US 101. Each sub-Campus supports a variety of buildings, pavements, and open space areas.

Figure 2-2 depicts the locations of the separate Campuses addressed by the Master Plan.

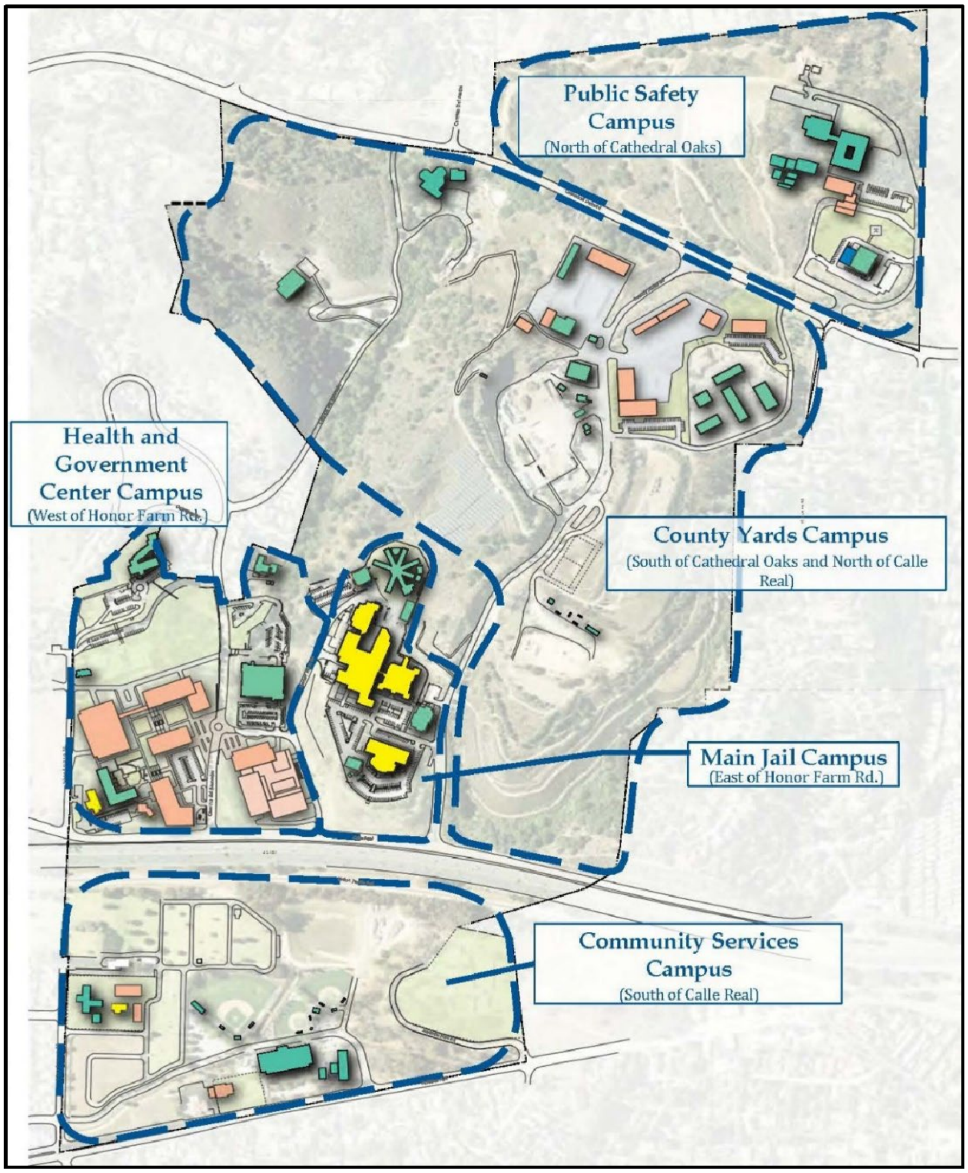

Figure 2-2. Site Location and Sub-Campus Limits
(source: Calle Real Master Plan)

2.2 Historic and Current Use

2.2.1 Historic

Review of historical aerial imagery of the Campus area indicates that the site was largely undeveloped since the County's 1910 purchase of the land until at least 1947 (the date of the earliest available historical imagery). By 1967, some of the extant Public Works, Public Safety, and County Jail facilities had been constructed.

Additional facility buildings and improvements have been added over the intervening years. The latest major addition apparent in aerial photography is the Office of Emergency Management building constructed on the Public Safety sub-Campus around 2010.

2.2.2 Current

The Calle Real Campus is situated in an area characterized by elevated mesas incised by roughly north-south oriented drainages. The current County facility buildings are generally located atop the elevated mesas. A principal feature of the Campus is the closed Foothill Landfill. Formerly a regional landfill serving the South Coast of Santa Barbara County, the landfill was closed in 1967.

The Campus currently supports numerous Santa Barbara County office buildings providing County administration services. Current facilities include the County Jail, Social Services, Elections Office, Public Works, Sheriff Headquarters, and the Office of Emergency Management, among others.

2.3 Improvements Planned by the Master Plan

In August of 2019, the County retained M. Arthur Gensler Jr. & Associates ("Gensler") and their consultants to evaluate the existing Calle Real Campus (Campus) conditions, assess the projected program needs, and create a Master Plan to guide Campus growth and expansion in a thoughtful and deliberate manner.

The Master Plan provides for renovation, demolition, and development of new county facilities that will total nearly 1,000,000 square feet (sf) of structure across the Campus, as is depicted on Figure 2-3.

EXISTING COUNTY BUILDINGS	±791,700 GSF
REMAIN	±256,400 GSF
RENOVATE	±229,000 GSF
DEMOLISH	±306,300 GSF
NEW COUNTY FACILITIES	±538,800 GSF
FUTURE TOTAL COUNTY GSF	±1,024,200 GSF

Figure 2-3. Scope of the Master Plan for Buildings
(source: Calle Real Master Plan)

3.0 REVIEW OF THE GEOLOGIC SETTING

3.1 Regional Geologic Setting

The Campus is located in the western portion of the Transverse Ranges Geomorphic Province.

The Transverse Ranges Geomorphic Province is a series of east-west trending mountain ranges separated by steep valleys, which characterize the southwest portion of California. This geomorphic province encompasses an area that extends from the San Bernardino Mountains to the San Miguel, Santa Rosa, and Santa Cruz Islands. The Campus is located in the foothills and coastal plain that descend from the Santa Ynez Mountains to the north.

Geologic mapping of the Campus area shows that the naturally occurring surficial soils consist of older alluvial deposits, Santa Barbara Formation, Rincon Shale, and a minor exposure of the Lower Calcareous Unit of the Monterey Formation forming the elevated mesas, and younger alluvium and colluvium mantling these sedimentary rocks in the valley floors in the western and southern parts of the Campus.

Figure 3-1 reproduces geologic mapping of the Campus vicinity.

3.2 Soils Within the Campus Limits

3.2.1 General

Based on review of published geologic mapping and geotechnical reporting, the site is underlain by potentially three surficial soils and four geologic formations. The surficial soils consist of mapped and unmapped artificial fill (currently undocumented), likely unmapped young colluvium associated with the numerous slopes around the Campus, and mapped alluvium and colluvium in the valley floors.

Mapped geologic formations underlying the site include older alluvial deposits, the Santa Barbara Formation, the Rincon Mudstone, and a minor surface expression of the Lower Calcareous Unit of the Monterey Formation.

A small rockslide is mapped underlying the part of the Main Jail sub-Campus near the Sheriff Headquarters. The current condition of the rockslide debris is unknown; this rockslide may have been mitigated during grading for the Sheriff Headquarters. Artificial fill, possibly associated with the closed landfill, is mapped in the east-central part of the site. Additionally, BA 2020 reports up to 10 feet of unmapped artificial fill at the location of the Sheriff Administration Building. It is likely that similar or greater amounts of fill have been placed during various grading events over the past several decades. Review of historical topographic mapping indicates that up to 30 feet of fill may have been placed in the main jail area.

The soils anticipated to underlie the Campus are discussed in the following subsections.

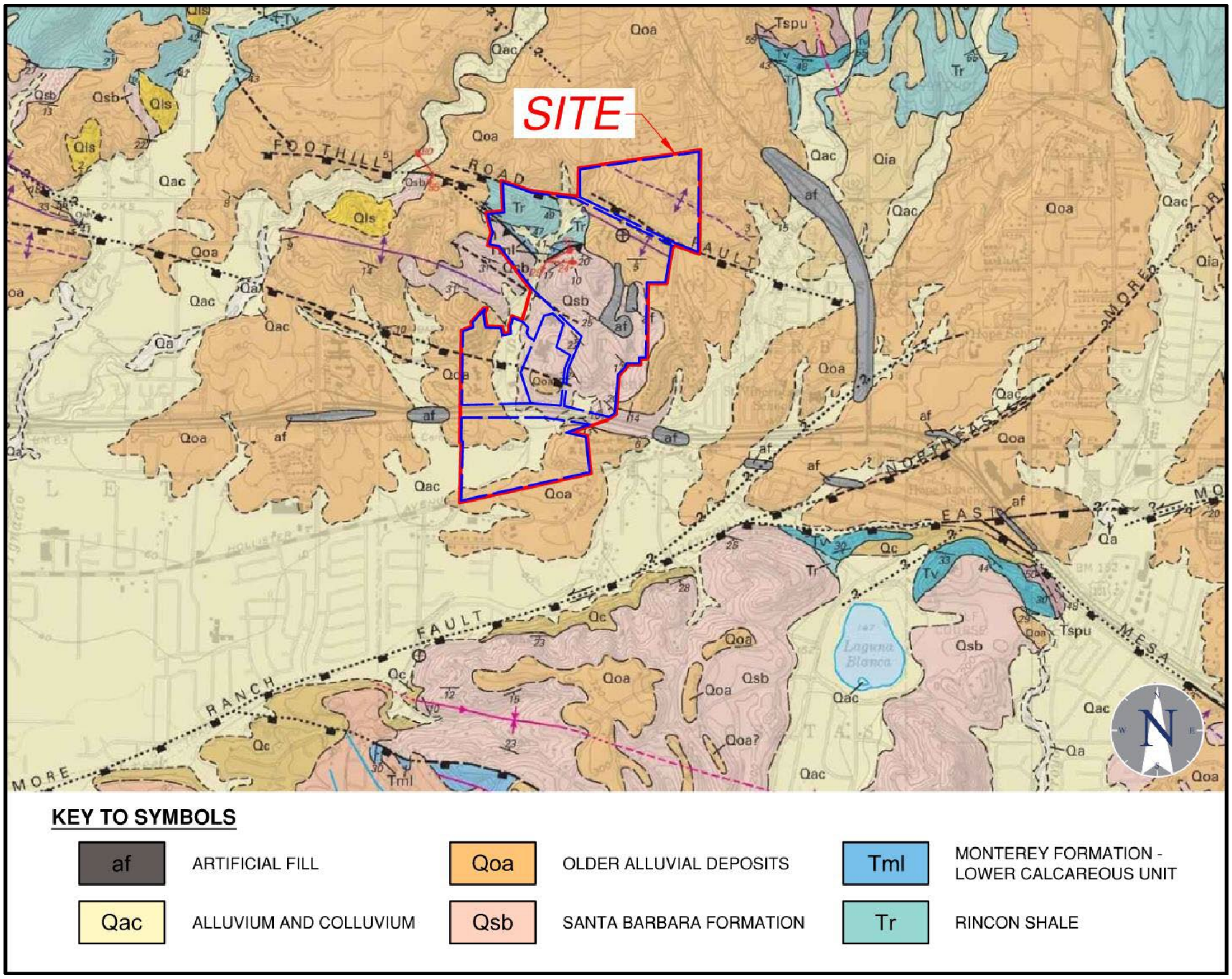

Figure 3-1. Geologic Mapping of the Campus Vicinity

3.2.2 Artificial Fill (af) (mapped and unmapped)

Artificial fill was encountered during explorations for BA 2020. This fill consisted of medium dense silty and clayey sands with low expansion potential. Other unexplored areas of the Campus may have similar or greater amounts of undocumented fill placed during various grading events over the past several decades. Additionally, geologic mapping indicates surficial artificial fill occurs in the vicinity of the Foothill Landfill. At the time of this report, NOVA is unaware of any documentation for the placement of these fill soils.

The characteristics of undocumented fill are subject to significant variation and can only be estimated by site-specific soil testing.

3.2.3 Colluvium (unmapped)

Colluvium may occur as slope deposits emplaced by shallow surface flow like slope wash or mass movement like creep and sliding. The occurrence of unmapped colluvium may be anticipated on and below the sloped areas of the Campus.

Colluvium generally consists of a heterogeneous mix of soils, including clays, sands, and larger rock fragments. Colluvium is typically loose and unconsolidated and may be expansive and compressible. If encountered in the area of any planned improvements, these soils will require remediation, such as removal and recompaction, in order to provide structural support.

3.2.4 Alluvium and Colluvium (Qac)

Alluvial and colluvial deposits are mapped within the valley floors in the west and south areas of the Campus. These soils were deposited during the Late Pleistocene to Holocene (about 11,700 years before present) and generally consist of poorly consolidated silts, sands, and gravels. In the Santa Barbara coastal foothills region, these soils typically occur as a relatively thin mantling (<10m in thickness) over the bedrock. Similar to colluvium, alluvial soils may be anticipated to be loose and potentially expansive and compressible. If encountered in the area of any planned improvements, these soils will require remediation, such as removal and recompaction, in order to provide structural support.

3.2.5 Older Alluvial Deposits (Qoa)

The older alluvial deposits generally consist of moderately consolidated sandstones with gravel and occasional interbeds of clay deposited in the middle to late Pleistocene as alluvial fans shed from the Santa Ynez Mountains. As encountered during investigations completed for PML 2005 and PML 2008, these soils consisted of interbedded sequences of silt, silty sand, and sandy clay. The soils were found to be of medium dense to dense and stiff to hard consistency. The clayey soils were tested to be of very low to low expansion potential. Along with the Santa Barbara Formation described below, this unit comprises the majority of the elevated mesa areas of the Campus.

3.2.6 Santa Barbara Formation (Qsb)

The early to middle Pleistocene-aged Santa Barbara Formation typically consists of friable, massive marine, fine- to medium-grained sandstones and pebbly sandstones. The sandstone can be locally weak to strongly cemented and can contain substantial carbonate concretions. Along with the Qoa described above, this unit comprises the majority of the elevated mesa areas of the Campus.

3.2.7 Rincon Shale (Tr)

The Miocene-aged Rincon Shale consists of a fossiliferous, massive to thickly-bedded marine mudstone with occasional interbeds of dolomite and sparse interbeds of sandstone. The mudstone is generally hard in consistency and the dolomite interbeds can occur as very dense concretions. This unit occurs in the northwest portion of the Campus.

3.2.8 Monterey Formation - Lower Calcareous Unit (Tml)

The Lower Calcareous subunit of the Miocene-aged Monterey Formation consists of a moderately hard calcareous mudstone and shale. A minor surface exposure of this unit is mapped adjacent to the Rincon Shale in the northwest part of the Campus.

3.3 Groundwater

Groundwater was not encountered in subsurface explorations completed for BA 2020, PML 2005, or PML 2008, which extended to depths of up to 20 feet, 30 feet, and 50 feet, respectively.

Groundwater monitoring wells in the area of Public Works in the northeast part of the Campus recorded static groundwater elevations of about 150 feet Mean Sea Level (MSL), corresponding to depths of about 100 feet below ground surface, from April 1995 through July 2014. Additionally, the California Department of Water Resources maintains records for a groundwater monitoring well approximately 400 feet east of the Campus, near Cathedral Oaks Road. Groundwater elevations recorded in this well range from about 114 feet MSL to about 154 feet MSL, from January 2005 to March 2023.

This groundwater condition can be anticipated broadly for the elevated mesa portions of the Campus. Groundwater likely occurs at shallower depths in the valley floors and may fluctuate seasonally in these drainage areas.

4.0 REVIEW OF GEOLOGIC HAZARDS

4.1 Strong Ground Motion

By virtue of the location of the Campus in one of the most seismically active regions of the country, the potential for strong ground motion is high. The site may experience an earthquake with Richter magnitude (M) in the range M ~ 6.5 to 7.5 and related peak ground surface acceleration (PGA_M) of PGA_M ~ 1.176g.

4.2 Fault Rupture

No portion of the Campus is located within a State of California Earthquake Fault Zone (formerly known as an Alquist-Priolo Special Studies Zone). No known active faults are mapped on the site area. The nearest known 'active' faulting (i.e., a fault that has displaced in Holocene or later time, about the last 11,000 years) is associated with the Mission Ridge Fault system, located approximately 4.4 miles east of the Campus. The San Andreas Fault Zone is located about 39 miles northeast of the Campus. Figure 4-1 depicts faulting in the region of the Calle Real Campus.

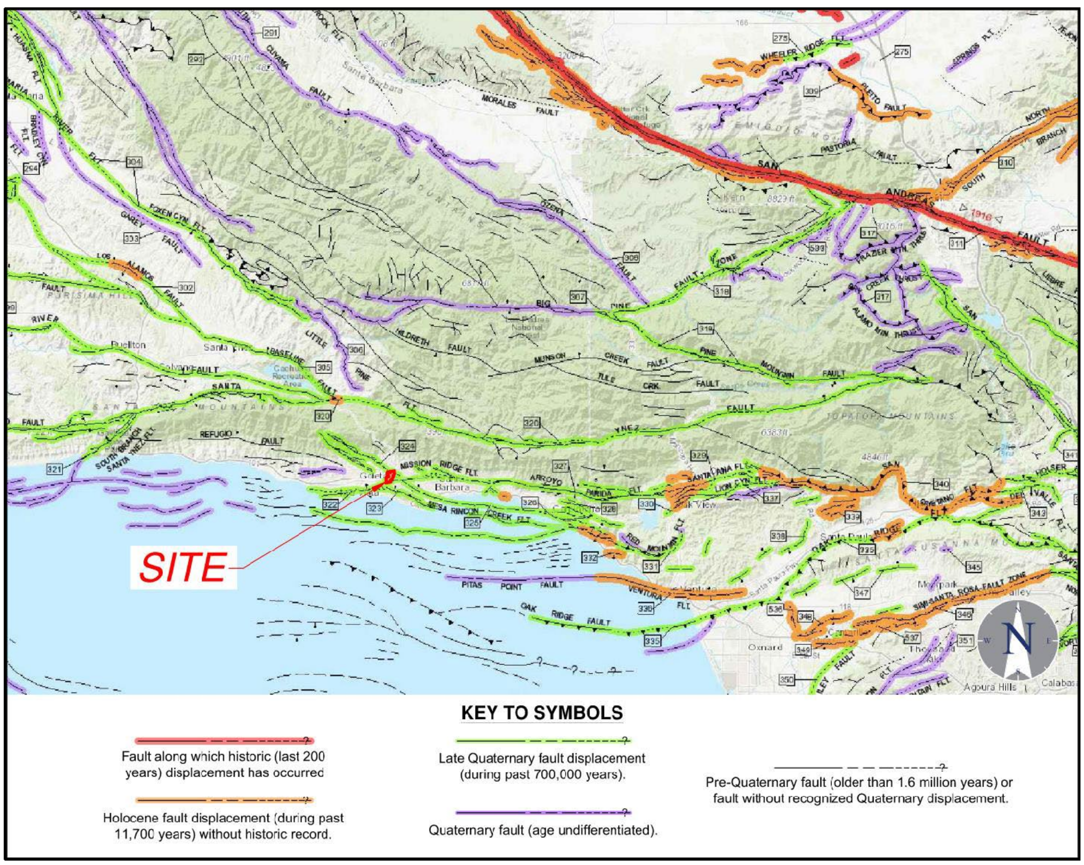

Figure 4-1. Fault Activity in the Campus Area
(source: CGS 2023)

Several potentially active faults are mapped to underlie parts of the Campus. CSB 2015 identifies inferred and concealed traces of the 'Mesa Fault' and the 'MODOC Fault' crossing the northern and central portions of the Campus, respectively. CGS 2023 identifies the traces of the 'San Jose Fault' crossing the northern part of the site roughly corresponding to the 'Mesa Fault' trace identified by CSB 2015. USGS 2023 identifies additional traces of the 'San Jose Fault' in the northwestern part of the Campus as well as a trace of the 'San Pedro Fault' in the west-central area.

These faults are indicated to be potentially active and have been dated to have been active within the Late Quaternary time (<130,000 years) but not within the Holocene (<11,400 years). Figures 4-2 and 4-3 reproduce fault mapping for the Campus vicinity adapted from the above-discussed sources.

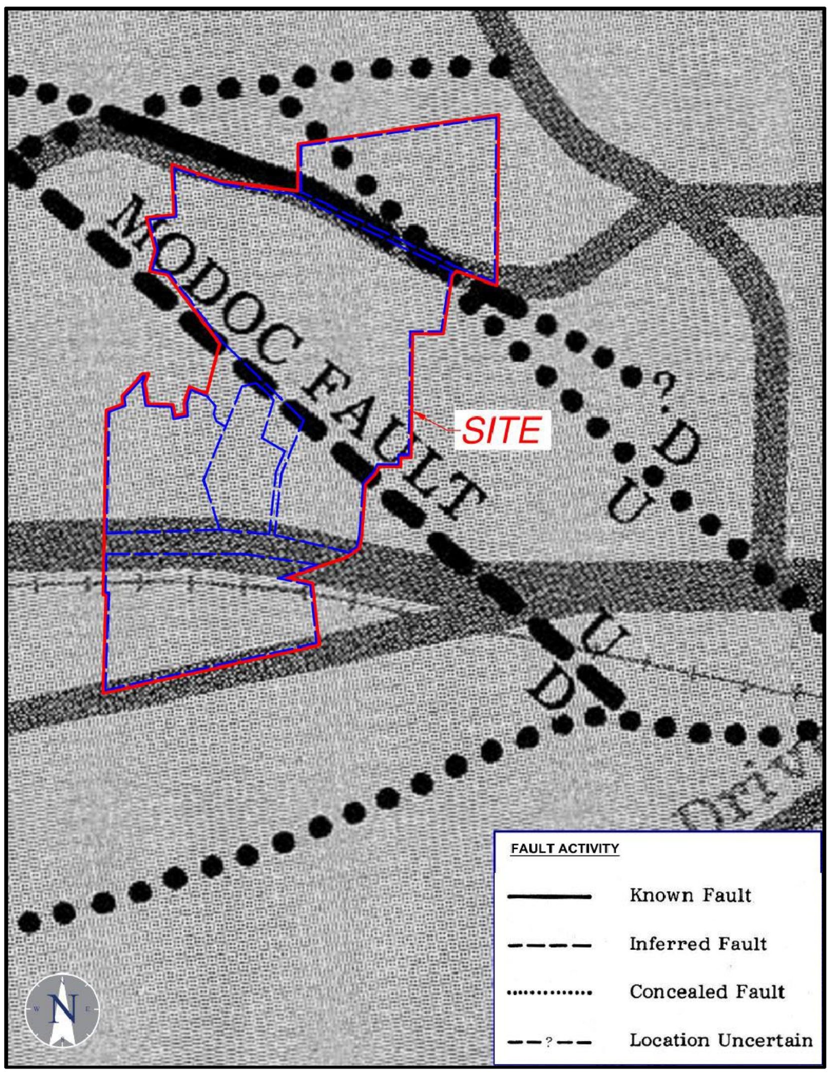

Figure 4-2. Faulting in the Campus Area
(source: CSB 2015)

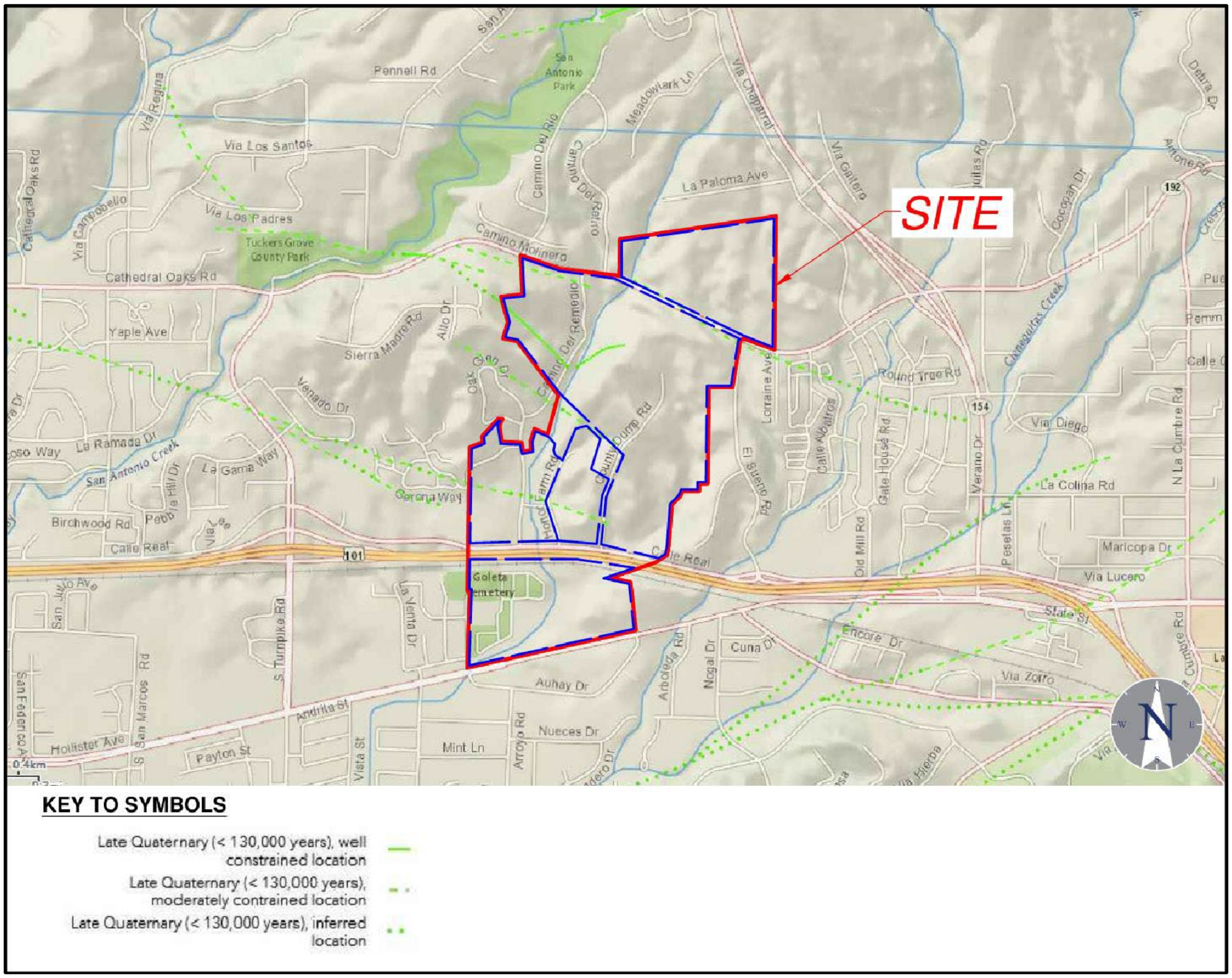

Figure 4-3. Faulting in the Campus Area
(source: USGS 2023)

In consideration of the foregoing review, the potential for new or existing structures or infrastructure to be affected by fault rupture is considered low.

4.3 Landslide

As used herein, 'landslide' describes downslope displacement of a mass of rock, soil, and/or debris by sliding, flowing, or falling. Such mass earth movements are generally greater than about 10 feet thick and larger than 300 feet across. Landslides typically include cohesive block glides and disrupted slumps that are formed by translation or rotation of the slope materials along one or more slip surfaces. These mass displacements can also include similarly larger scale, but more narrowly confined modes of mass wasting such as 'mud flows' and 'debris flows'.

Generally, the elevated mesas in this region are susceptible to landsliding. Several mapped landslides occur in the vicinity of the Campus. CGS 2000a indicates the majority of the Campus to have a 'Moderate' to 'High' landslide potential, with only the southwestern quarter of the Campus being indicated as having 'Low' or 'Very Low' potential. Figure 4-4 reproduces mapping from CGS 200a.

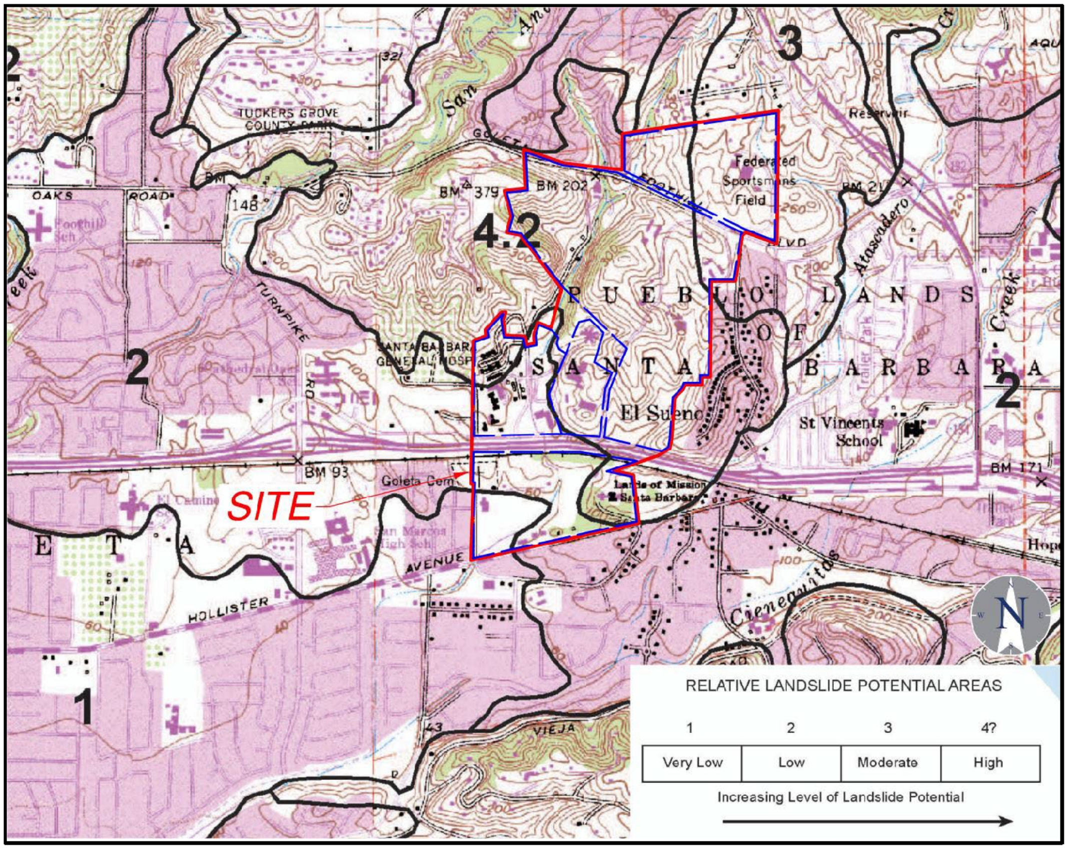

Figure 4-4. Landslide Susceptibility Zones in the Campus Area
(source: CGS 2000a)

CGS 2000b identifies a mapped rockslide near the Sheriff Headquarters. This rockslide is described as 'dormant' with no recorded historic movement.

Susceptibility mapping in CSB 2015 indicates a 'Low' to 'Moderate' "problem rating" for the majority of the northern and eastern parts, with a small area of 'High' problem rating in the northwest. For the scope of this review, 'problem rating' as utilized in the CSB 2015 may be considered as an equivalent determination as 'potential' or 'risk', with respect to geologic and soil hazards. Figure 4-5 on the following page reproduces mapping by CSB 2015.

Based on review of these sources, NOVA considers the landslide potential to be low for most of the Calle Real Campus, to include the areas of existing and planned structures.

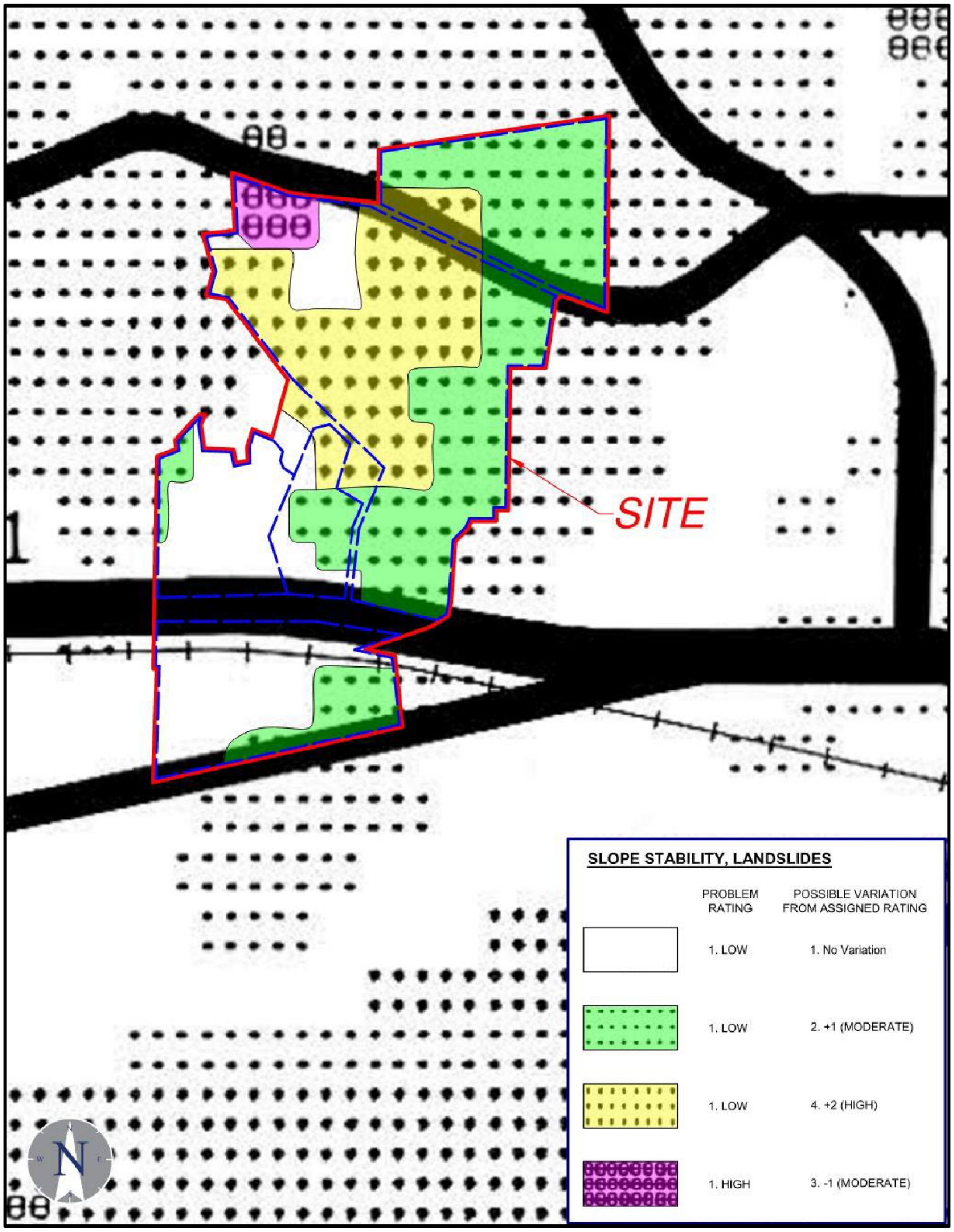

Figure 4-5. Landslide Susceptibility Zones in the Campus Area
(source: adapted from CSB 2015)

4.4 Ground Lurching

Seismically induced ground lurching occurs when weaker soil masses move at right angles to a cliff or steep slope in response to seismic waves. Structures built on these masses can experience significant lateral and vertical deformations if ground lurching occurs.

The phenomenon is usually associated with soft, unconsolidated soils with low cohesion adjacent to a slope. The Campus has a low risk for ground lurching. This risk should be evaluated on a site-specific basis as the separate buildings are developed.

4.5 Erosion

The Santa Barbara Formation and older alluvial deposits are subject to erosion (CSB 2015). The Santa Barbara Formation occurs in patches on the coastal hills and in the lower foothills from Carpinteria to Goleta. Because it is generally soft and weakly cemented, the Santa Barbara Formation is rapidly gullied and washed away when vegetation is removed making it hazardous, especially on steep slopes.

5.0 SCREENING OF SOILS-RELATED HAZARDS

5.1 Embankment Stability

As used herein, 'embankment stability' is intended to mean the safety of localized natural or man-made embankments against failure. Unlike landslides described above, embankment stability pertains to localized failures of created or natural ground due to development. Embankment stability can include conditions such as erosion-related washouts and more subtle, less evident processes such as slope 'creep.'

As discussed above, the Campus landforms generally consist of elevated mesas and fluvial valley areas. Slopes in excess of 20% are found throughout the Campus. Considering the potentially friable nature of the sandy soils that underlie much of the Campus, NOVA considers embankment stability to be a potential concern for some areas of proposed redevelopment.

5.2 Seismic Stability

5.2.1 Liquefaction

'Liquefaction' refers to the loss of soil strength during a seismic event, often presenting a risk to civil works developed on liquefaction susceptible soils. Liquefaction is observed in areas that include a shallow water table and coarse-grained (i.e., 'sandy') soils of loose to medium dense consistency. The ground motions increase soil water pressures, decreasing grain-to-grain contact among the soil particles, causing the soil mass to lose strength. Liquefaction resistance increases with increasing soil density, plasticity (associated with clay-sized particles), geologic age, cementation, and stress history.

The Campus is within an area that has not been evaluated by the State of California for liquefaction hazard. However, CSB 2015 maps the valley floor areas in the west and south as having a moderate 'problem rating'. NOVA considers the mesa portions of the Campus to have low to no risk for liquefaction and the valley floors to have a moderate potential for liquefaction. Figure 5-1 reproduces liquefaction potential mapping from CSB 2015.

Despite the mapping of Figure 5-1, it is important to note that there is no historic evidence of liquefaction in Santa Barbara County (CSB 2015). Most of the low coastal plain and valley bottoms are underlain by alluvium and are at a moderate risk with respect to liquefaction potential by the Santa Barbara County Comprehensive Plan Seismic Safety and Safety Element. Alluvial areas where the water depth was uncertain in the County were given a moderate-high to low rating, areas underlain with bedrock were given a low rating with no variation, and areas with geologically recent granular materials were rated low with a possible variation to moderate or high. This rating is largely based on the probable depth to groundwater with consideration given to probable soil characteristics (i.e., classification, grain size, density) and probable earthquake intensity and duration (CSB 2015).

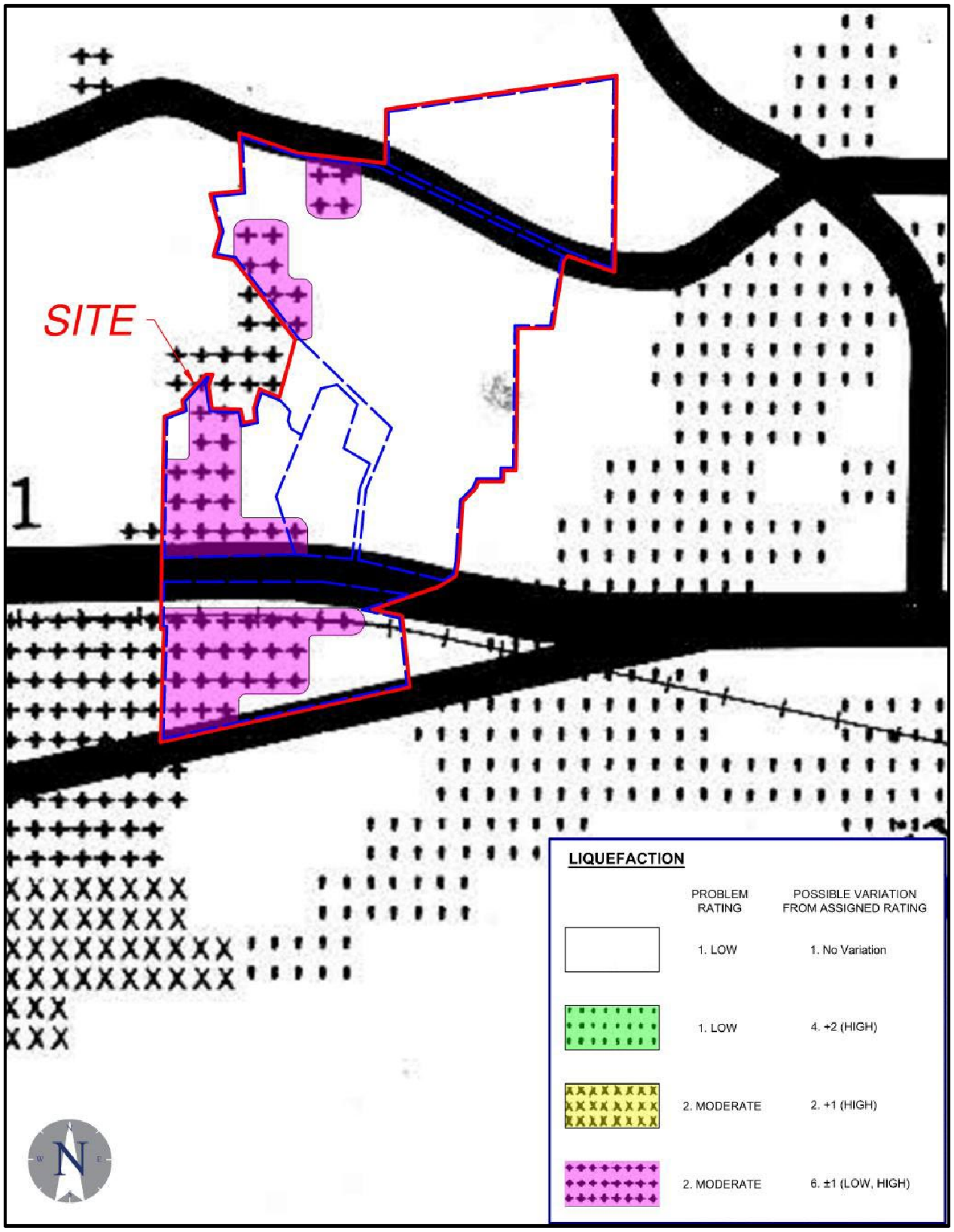

Figure 5-1. Liquefaction Potential Zones in the Campus Area
(source: adapted from CSB 2015)

5.2.2 Lateral Spreading

Lateral spreading is a phenomenon in which large blocks of intact, non-liquefied soil move downslope on a liquefied soil layer. Lateral spreading is often a regional event. For lateral spreading to occur, a liquefiable soil zone must be laterally continuous and unconstrained, free to move along sloping ground.

As is noted above, the potential for liquefaction to occur is low. However, should liquefaction occur, the event will likely be associated with lateral spreading driven by the topographic differential that occurs over most of the Campus.

5.2.3 Seismic Compression

As used herein, seismic compression is intended to describe the accrual of contractive volumetric strains in unsaturated sands and silts as a result of a seismic event. Also referenced as ‘dynamic settlement’ and ‘dry sand settlement’, the phenomenon is well recognized as a cause of seismically induced damage to structures and infrastructure. Given the known subsurface conditions, the potential for seismic compression will be evaluated as part of the geotechnical investigation for each of the planned structures.

5.3 Expansive Soil

Expansive soils are characterized by their ability to undergo significant volume changes (shrinking or swelling) due to variations in moisture content, the magnitude of which is related to both clay content and plasticity (i.e., the clay mineralogy). These volume changes can be damaging to structures. Nationally, the annual value of real estate damage caused by expansive soils is exceeded only by that caused by termites.

Based upon the indications of the subsurface obtained by review of the referenced geotechnical studies (BA 2020, PML 2005, PML 2008), NOVA generally considers the risk of expansive soils to be low in the elevated mesas underlain by the Santa Barbara Formation and the older alluvium and colluvium. However, the referenced reports only evaluated a small portion of the Campus acreage. Due to the size of the Campus, the expansion potential of subsurface soils may vary significantly from what was encountered in the previous investigations. Additionally, no subsurface information was available to NOVA at the time of this report for valley floor areas and the Rincon Formation Mudstone area in the northwest.

CSB 2015 maps the majority of the site as having a ‘Low’ to ‘Moderate’ expansive soil problem rating, with an area in the northwest being indicated as a ‘High’ problem rating. Figure 5-2 reproduces expansive soil mapping from CSB 2015.

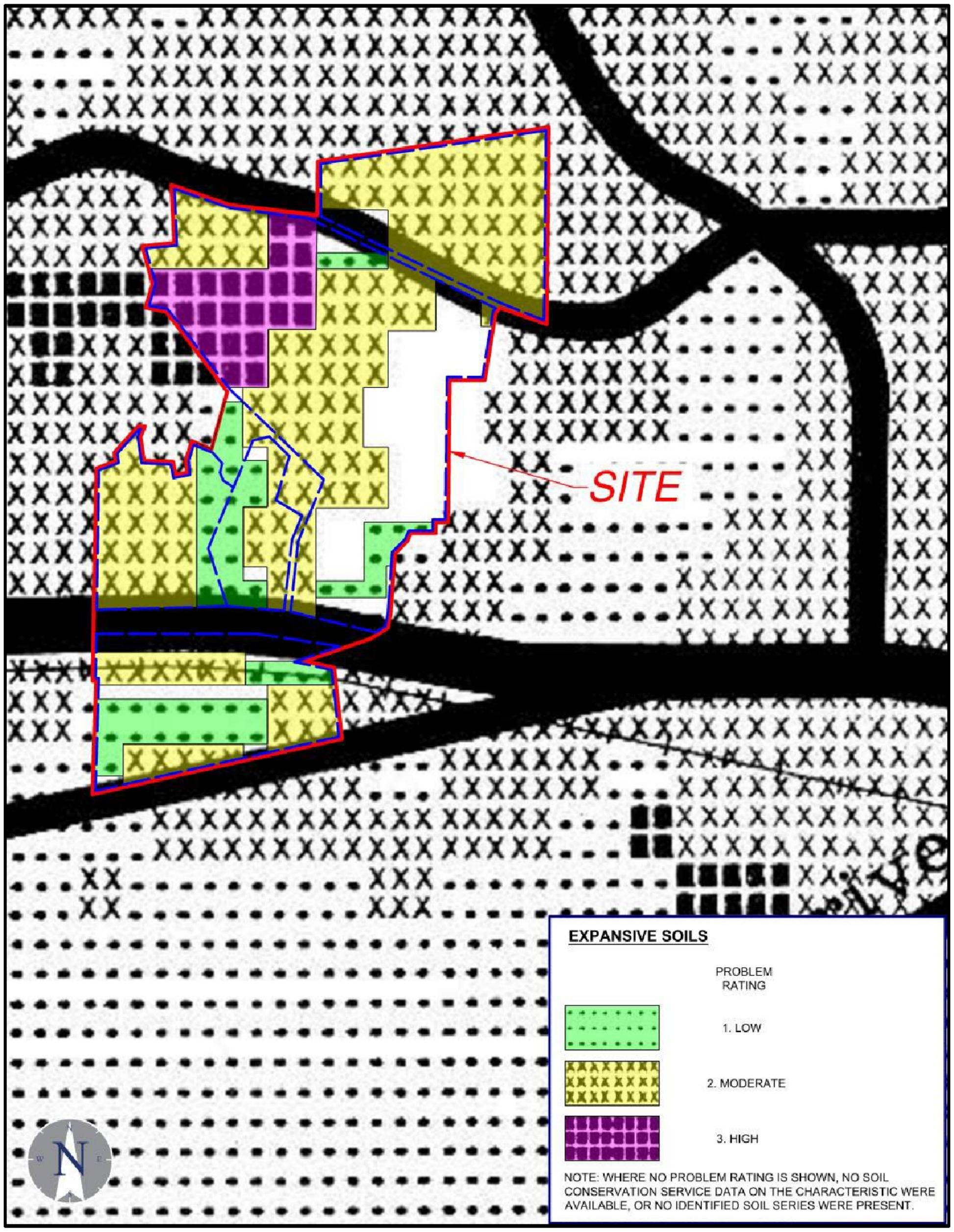

Figure 5-2. Expansive Soil Zones in the Campus Area
(source: adapted from CSB 2015)

5.4 Collapsible Soils

Collapsible soils (sometimes referenced as 'hydro-collapsible' soils) are soils prone to substantial subsidence/settlement upon wetting. These soils are common in the arid climates of the western United States in specific depositional environments - principally, in areas of young alluvial fans, debris flow sediments, dune sands, playa deposits, and loess (wind-blown sediment) deposits. These soils are characterized by low *in situ* density, low moisture contents, and relatively high unwetted strength.

Collapsible soils can be anthropogenic: very loose, poorly placed fill can have a collapsible soil structure.

The soil grains of collapsible soils were formed in a loose state (i.e., high initial 'void ratio') under conditions of rapid deposition, and thereafter lightly bonded by water sensitive binding agents (e.g., clay particles, low-grade cementation, etc.). Collapsible soils are generally associated with an open structure formed by sharp grains, low initial density, low natural water content, low plasticity, relatively high stiffness and strength in the dry state, and often by particle size in the silt to fine sand range.

While relatively strong in a dry state, the introduction of water into these soils causes the binding agents to fail. Destruction of the bonds/binding while a soil is loaded by new fills or structures causes relatively rapid densification and volume loss (collapse) of the soil. This change is manifested at the ground surface as subsidence or settlement. Ground settlements from the wetting can be damaging to structures and civil works.

The depositional history of the soils across the Campus is such that the concern cannot be ignored but is unlikely to be of a scale sufficient to affect structures. BA 2020 described surficial fill soils encountered during the investigation as 'compressible'. CSB 2015 maps the entirety of the site as having a 'Low' to 'Moderate' problem rating for 'compressible-collapsible soils'. There is some possibility that the soils of the near subsurface may be prone to settlement on wetting. In particular, areas with significant amounts of canyon fill can be prone to longer-term settlements. Figure 5-3 reproduces collapsible soil mapping from CSB 2015.

5.5 Corrosive Soil

NOVA was not able to obtain records of geochemical testing of the soils in the Campus area. Such testing would include electrical resistivity, chloride content, and pH level as indicators of the soils' tendency to corrode unprotected ferrous metals. Testing to determine levels of water-soluble sulfates would be correlated with the potential for sulfate attack to concrete.

Corrosivity testing should be part of every geotechnical investigation. A corrosion engineer should be contacted to provide specific corrosion control recommendations in the event that potentially corrosive soils are encountered during a geotechnical investigation.

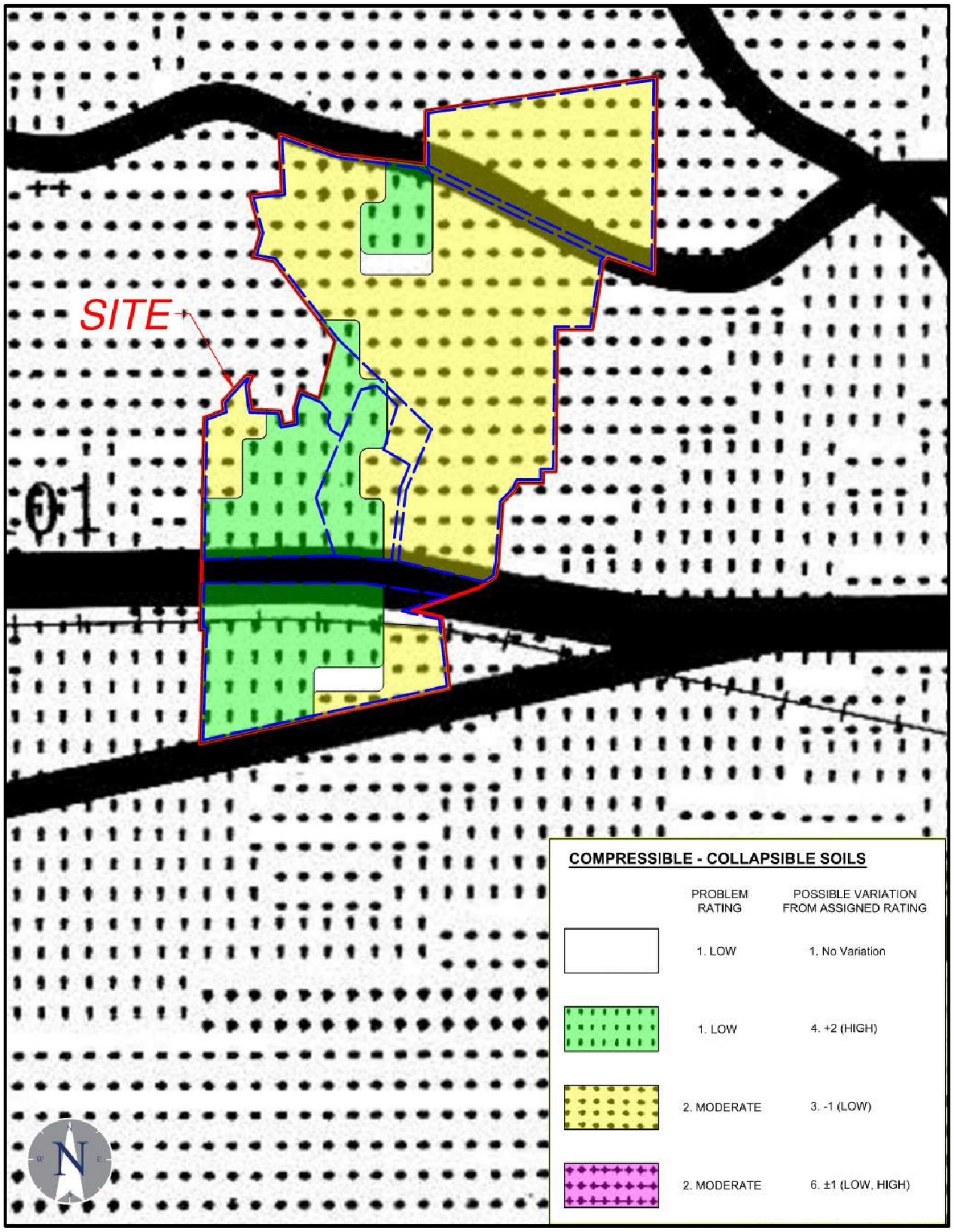

Figure 5-3. Collapsible Soil Zones in the Campus Area
(source: adapted from CSB 2015)

6.0 REVIEW OF SITING HAZARDS

6.1 Effect on Adjacent Development

The structural integrity of existing public improvements and street rights-of-way located adjacent to work should be evaluated on a site-specific basis as the separate buildings are developed.

The Campus is now and will continue to be sited adjacent to the closed Foothill Landfill. This former municipal solid waste ('MSW') landfill includes relatively steeply sloping sides that must be maintained to avoid impact to the Campus area. Similarly, the MSW landfill is likely generating gases that must be controlled. The owner of the closed facility is responsible for this control.

6.2 Inundation

6.2.1 Flood

The Campus is located within a FEMA-designated flood zone designated as Flood "Zone X". Zone X is an "*area of minimal flood hazard*." Figure 6-1 reproduces flood mapping of the area.

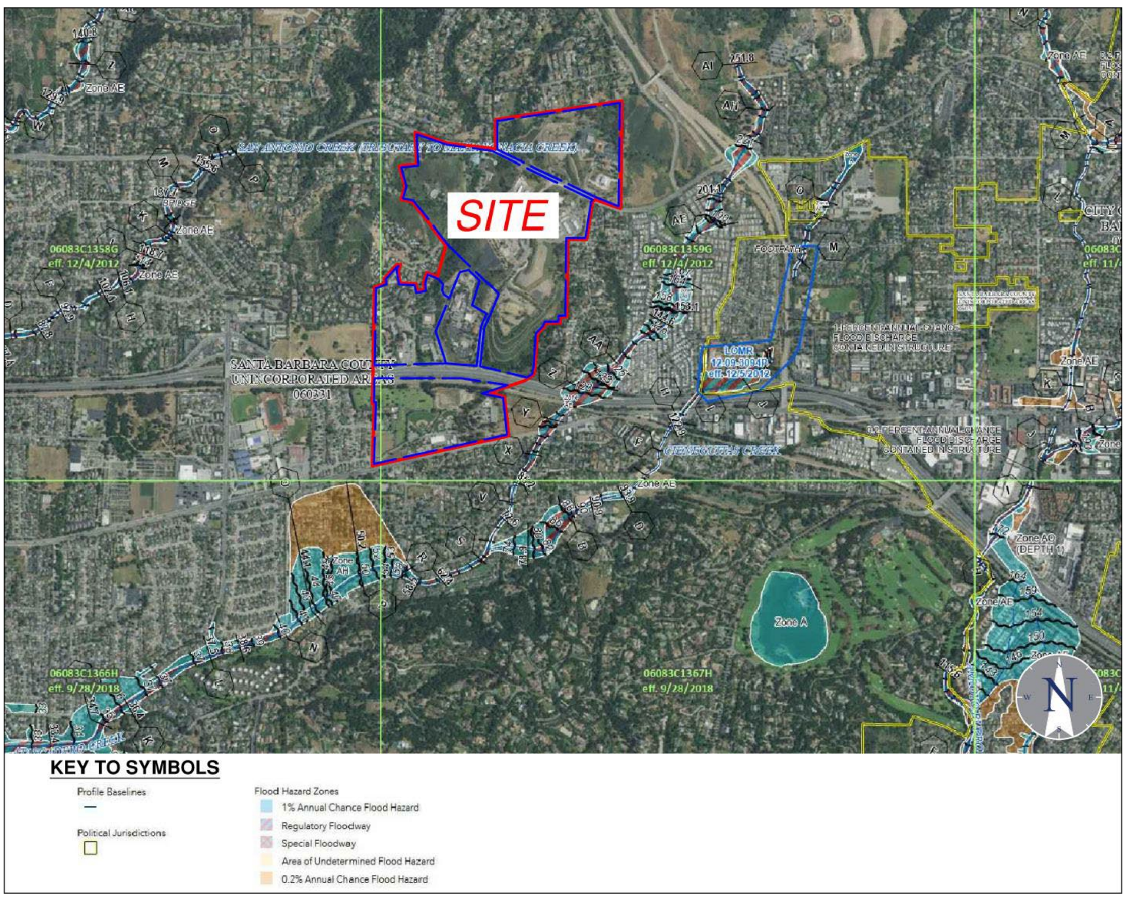

Figure 6-1. Flood Mapping of the Campus Vicinity

6.2.2 Surface Water Structures

The site is not located near any surface water structures (dams, canals, levees, etc.), the failure of which could inundate the site.

6.2.3 Tsunami

Tsunamis are seismic sea waves with a long wavelength (long compared to the ocean depth) generated by sudden movements of the ocean bottom during earthquakes, landslides, or volcanic activity. By virtue of its altitude and distance from the coastline, the Campus is not at risk of being directly affected by a tsunami.

6.2.4 Seiche

Seiches are standing waves that develop in an enclosed or partially enclosed body of water such as lakes or reservoirs. Harbors or inlets can also develop seiches. Most commonly caused by wind and atmospheric pressure changes, seiches can be affected by seismic events and tsunamis.

The Campus is not near a body of water capable of generating a seiche that could affect the Campus.

6.3 Subsidence

The site is not located in an area of known subsidence associated with fluid withdrawal (groundwater or petroleum); therefore, the potential for subsidence due to the extraction of fluids is considered negligible.

Groundwater withdrawals have occurred since the 1940s in the groundwater basins of the County. In particular, overdrafting of the Cuyama Valley groundwater basin northeast of the site has resulted in water-level declines of as much as 300 feet. Subsidence has been documented in the Cuyama Valley as a result of extensive groundwater extraction. However, CSB 2015 notes that no evidence of significant subsidence or problems related to subsidence have been reported in Santa Barbara County in the vicinity of the Calle Real Campus.

7.0 REVIEW OF GEOLOGY, SEISMIC, AND SOILS IMPACTS

7.1 Standards for Assessment of Environmental Impacts

Per Appendix G of the State CEQA Guidelines, implementation of the Calle Real Campus Master Plan would be considered to have a significant impact related to geology, seismic, and soils if implementation would result in any of the conditions listed below.

1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving the conditions listed below.
    a. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42.
    b. Strong seismic ground shaking.
    c. Seismic-related ground failure, including liquefaction.
    d. Landslides.
2. Result in substantial soil erosion or the loss of topsoil.
3. Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.
4. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.
5. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater.

Impacts related to geology, seismic, and soils have the potential to be significant if the proposed project involves any of the characteristics listed below.

1. The site or any part of a project is located on land having substantial geologic constraints. Areas constrained by geology include parcels located near active or potentially active faults and property underlain by rock types associated with compressible/collapsible soils or susceptible to landslides or severe erosion, flood hazards, and other physical limitations to development.
2. A project results in potentially hazardous geologic conditions such as the construction of cut slopes exceeding a grade of 1.5 horizontal to 1 vertical.
3. A project involves construction of a cut slope over 15 feet in height as measured from the lowest finished grade.

4. A project is located on slopes exceeding 20% grade.

7.2 Assessment of Impacts

7.2.1 Overview

Table 7-2 provides a summary of the impacts of implementation of the Calle Real Campus Master Plan related to geology, seismic and soils. A discussion of each impact follows Table 7-2.

Table 7-2. Summary of Geology, Seismic, and Soils Impacts

Geology, Seismic, and Soils Impacts	Mitigation Measure(s)	Residual Significance
Impact GEO-1: Ground motions from a seismic event cause structural damage and/or collapse.	As required by the CBC[1], new structures must include Code specified seismic-resistant design. Existing or rehabilitated structures must include assessment and upgrades to seismic resistant design as necessary or appropriate.	Less than significant
Impact GEO-2: Liquefaction related to a seismic event causes structural damage and/or collapse.	The geotechnical investigation for new structures or rehabilitated structures must include assessment of liquefaction potential, with foundation design adapted as appropriate.	Less than significant
Impact GEO-3: Dormant rockslide at the location of the Sheriff Office activates and damages the structure.	The geotechnical investigation for new structure and rehabilitation of the existing structure should reassess the presence of this feature.	Less than significant
Impact GEO-4: Ground movement related to swelling and shrinking of expansive soils damages new and/or existing structures.	As required by the CBC, the geotechnical investigation for new structures and rehabilitation of the existing structures must assess the presence of expansive soils, providing measures to mitigate effects.	Less than significant
Impact GEO-5: By embankment failure or release of gases to the soil, the closed Foothill Landfill affects new or existing structures.	As required by statute, maintenance of the closed Foothill Landfill should include control of landfill gases and maintenance of the embankments by the owner of the Landfill. Implementation of the Master Plan should ensure such care is active.	Less than significant
Cumulative Impacts	None required	Less than significant

Note 1: CBC indicates ‘California Building Code’, latest edition, and related codes, standards, and ordinances.

Note 2: Provided the mitigation measures are implemented the results of these impacts will be less than significant.

7.2.2 Impact GEO-1: Ground Motions from a Seismic Event Cause Structural Damage and/or Collapse.

As is discussed in Section 4, the Calle Real Campus is at risk for moderate-to-severe ground shaking in response to a large-magnitude earthquake during the lifetime of the planned structures. Unmitigated by structural design, structures would be at risk for serious damage, including collapse. The users of these structures would be at risk for injury or death.

Design of new structures or rehabilitation of existing structures will be subject to seismic resistant design in conformance with the California Building Code and related codes, standards, and ordinances. Such design will limit the magnitude of structural damage and largely eliminate the risk of injury or death to users of the structures.

Building code-driven structural design should substantially reduce the seismic hazard impacts. The resulting impacts would be *less than significant*.

7.2.3 Impact GEO-2: Liquefaction Related to a Seismic Event Causes Structural Damage and/or Collapse.

As is discussed in Section 5, the Calle Real Campus is at risk for moderate-to-severe ground shaking in response to a large-magnitude earthquake during the lifetime of the planned structures.

Building code-driven geotechnical design should substantially reduce the liquefaction hazard impacts. The resulting impacts would be *less than significant*.

7.2.4 Impact GEO-3: Dormant Rockslide at the Sheriff Office Activates and Damages the Structure.

As is discussed in Section 4, the existing Sheriff Office is potentially located atop a dormant rockslide. This lifeline structure will be investigated as a part of the planned improvements to this area. Planning for these investigations should include a requirement that the presence or absence of the dormant rockslide be reassessed. Regardless of the findings of this reassessment, design for the Sheriff Office will need to address this potential hazard. The result of this action would reduce this hazard to *less than significant* impact.

7.2.5 Impact GEO-4: Expansive Soils Damages New and/or Existing Structures.

Design of new structures or rehabilitation of existing structures will be subject to design in conformance with the California Building Code and related codes, standards, and ordinances. Such design will identify the presence or absence of expansive soils, allowing final design sufficient to mitigate this threat. The resulting impacts would be *less than significant*.

7.2.6 Impact GEO-5: The Closed Foothill Landfill Affects New or Existing Structures.

As is discussed in Section 6, the Campus is now and will continue to be sited adjacent to the closed Foothill Landfill. This former MSW landfill includes relatively steeply sloping sides that must be maintained to avoid impact to the Campus area. Similarly, the MSW landfill is likely generating gases that must be controlled. Final planning and design for structures should include verification that the owner of the Foothill Landfill has taken actions sufficient to reduce this hazard to *less than significant* impact.

7.2.7 Cumulative Impacts

Implementation of the Calle Real Campus Master Plan will expose structures, infrastructure, and future users to the geologic and soils impacts associated with the planned work. As is described by the preceding assessment of impacts, the potential for landslide, liquefaction, expansive soils, or failure of controls for the closed the Foothill Landfill will be limited by the Building Code and statute-required engineering and design.

In consideration of the discrete, controllable nature of the identified geologic, seismic, and soil impacts, the potential is low that two or more individual impacts, when considered together, are considerable or which compound or exacerbate other impacts. Therefore, the potential for cumulative impacts is considered less than significant.

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