3.6 - Geology, Soils, and Seismicity

3.6.1 - Introduction

This section describes the existing geology, soils, and seismicity setting and potential effects from project implementation on the site and its surrounding area. Descriptions and analysis in this section are based on information collected from Santa Clara County, the United States Geological Survey (USGS), and the United States Department of Agriculture Natural Resources Conservation Service.

3.6.2 - Environmental Setting

Regional Geologic Setting

Morgan Hill is located in southern portion of the Santa Clara Valley (also referred to as the Coyote Valley). The Santa Clara Valley is a broad, northwest trending, alluvial-filled basin between the Santa Cruz Mountains to the west and the Mount Hamilton Range to the east. The alluvial sediments forming the valley floor are divided into older alluvial deposits that make up the majority of the valley fill, with younger deposits of alluvium confined to active stream channels. The Quaternary age-old alluvium consists of inter-layered, poorly sorted gravel, sand, silt, and clay.

Regional Seismicity

The term seismicity describes the effects of seismic waves that are radiated from an earthquake as it ruptures. While most of the energy released during an earthquake results in the permanent displacement of the ground, as much as 10 percent of the energy may dissipate immediately in the form of seismic waves. The probability of one or more earthquakes of magnitude 6.7 (Richter scale) or higher occurring in the project area has been evaluated by the USGS. Based on the results of the USGS evaluation, there is a 62-percent likelihood that such an earthquake event will occur in the Bay Area between 2003 and 2032. The faults with the greater probability of movement with a magnitude of 6.7 or higher earthquake are the Hayward Fault at 27 percent, the San Andreas Fault at 21 percent, and the Calaveras Fault at 11 percent. To understand the implications of seismic events, a discussion of faulting and seismic hazards is provided below.

Faulting

Faults form in rocks when stresses overcome the internal strength of the rock, resulting in a fracture. Large faults develop in response to large, regional stresses operating over a long time, such as those stresses caused by the relative displacement between tectonic plates. According to the elastic rebound theory, these stresses cause strain to build up in the earth’s crust until enough strain has built up to exceed the strength along a fault and cause a brittle failure. The slip between the two stuck plates or coherent blocks generates an earthquake. Following an earthquake, strain will build once again until the occurrence of another earthquake. The magnitude of slip is related to the maximum allowable strain that can be built up along a particular fault segment. The greatest buildup in strain that is due to the largest relative motion between tectonic plates or fault blocks over the longest period of time will generally produce the largest earthquakes. The distribution of these earthquakes is a study of much interest for both hazard prediction and the study of active deformation of the earth's crust. Deformation is a complex process, and strain caused by tectonic forces is not only accommodated through faulting but also by folding, uplift, and subsidence, which can be gradual or in direct response to earthquakes.

Faults are mapped to determine earthquake hazards, since they occur where earthquakes tend to recur. A historic plane of weakness is more likely to fail under stress and strain than a previously unbroken block of crust. Faults are, therefore, a prime indicator of past seismic activity, and faults with recent activity are presumed to be the best candidates for future earthquakes. However, since slip is not always accommodated by faults that intersect the surface along traces, and since the orientation of stresses and strain in the crust can shift, predicting the location of future earthquakes is complicated. Earthquakes sometimes occur in areas with previously undetected faults or along faults previously thought inactive.

Santa Clara County is situated in one of the most geologically active regions in North America. According to the Morgan Hill General Plan, several faults have been mapped or are inferred to underlie the eastern portion of the City, including the Range Front, Silver Creek, and Coyote Creek faults, an unnamed fault, and the Calaveras Fault Zone. Movement associated with more distant and major faults have historically affected Morgan Hill. These faults are summarized in Table 3.6-1.

Table 3.6-1: Fault Summary

Fault	Fault Classification	Direction	Distance from Project Site (miles)
Range Front	Unknown	East	0.0
Silver Creek	Unknown	North	2.9
Coyote Creek	Unknown	East	0.3
Calaveras	Historically Active	East	1.3
Hayward	Active	West	62.0
San Andreas	Active	West	70.0
Source: United States Geological Survey, City of Morgan Hill, County of Santa Clara.			

Seismic Hazards

Seismic hazards pose a substantial danger to property and human safety and are present because of the risk of naturally occurring geologic events and processes impacting human development. Therefore, the hazard is influenced as much by the conditions of human development as by the frequency and distribution of major geologic events. Seismic hazards present in California include ground rupture along faults, strong seismic shaking, liquefaction, ground failure, landsliding, and slope failure.

Fault Rupture

Fault rupture is a seismic hazard that affects structures sited above an active fault. The hazard from fault rupture is the movement of the ground surface along a fault during an earthquake. Typically, this movement takes place during the short time of an earthquake, but it also can occur slowly over many years in a process known as creep. Most structures and underground utilities cannot accommodate the surface displacements of several inches to several feet commonly associated with fault rupture or creep.

There are six parcels in the far eastern portion of the project site are either entirely or partially within a fault rupture hazard zone as indicated by the Santa Clara County Geologic Hazard Zones Map. Exhibit 3.6-1 illustrates the location of fault rupture hazard zones in relation to the project location.

Ground Shaking

The severity of ground shaking depends on several variables such as earthquake magnitude, epicenter distance, local geology, thickness, seismic wave-propagation properties of unconsolidated materials, groundwater conditions, and topographic setting. Ground shaking hazards are most pronounced in areas near faults or with unconsolidated alluvium.

Based on observations of damage from recent earthquakes in California (San Fernando 1971, Whittier-Narrows 1987, Landers 1992, Northridge 1994), ground shaking is responsible for 70 to 100 percent of all earthquake damage. The most common type of damage from ground shaking is structural damage to buildings, which can range from cosmetic stucco cracks to total collapse. The overall level of structural damage from a nearby large earthquake would likely be moderate to heavy, depending on the characteristics of the earthquake, the type of ground, and the condition of the building. Besides damage to buildings, strong ground shaking can cause severe damage from falling objects or broken utility lines. Fire and explosions are also hazards associated with strong ground shaking.

While Richter magnitude provides a useful measure of comparison between earthquakes, the moment magnitude is more widely used for scientific comparison since it accounts for the actual slip that generated the earthquake. Actual damage is due to the propagation of seismic or ground waves as a result of initial failure, and the intensity of shaking is as much related to earthquake magnitude as is the condition of underlying materials. Loose materials tend to amplify ground waves, while hard rock can quickly attenuate them, causing little damage to overlying structures. For this reason, the Modified Mercalli Intensity (MMI) Scale provides a useful qualitative assessment of ground shaking. The MMI Scale is a 12-point scale of earthquake intensity based on local effects experienced by people, structures, and earth materials. Each succeeding step on the scale describes a progressively greater amount of damage at a given point of observation. The MMI Scale is shown in Table 3.6-2, along with relative ground velocity and acceleration.

Table 3.6-2: Modified Mercalli Intensity Scale

Richter Magnitude	Modified Mercalli Intensity	Effects	Average Peak Ground Velocity (centimeters/seconds)	Average Peak Acceleration
0.1–0.9	I	Not felt. Marginal and long-period effects of large earthquakes	—	—
1.0–2.9	II	Felt by only a few persons at rest, especially on upper floors of building. Delicately suspended objects may swing.	—	—
3.0–3.9	III	Felt quite noticeable indoors, especially on upper floors of building, but many people do not recognize it as an earthquake. Standing cars may rock slightly. Vibration like a truck passing. Duration estimated.	—	0.0035–0.007 g
4.0–4.5	IV	During the day, felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensations like heavy truck striking building. Standing cars rocked noticeably.	1–3	0.015–0.035 g
4.6–4.9	V	Felt by nearly everyone, many awakened. Some dishes, windows, broken; cracked plaster in a few places; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.	3–7	0.035–0.07 g
5.0–5.5	VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of falling plaster and damaged chimneys. Damage slight.	7–20	0.07–0.15 g
5.6–6.4	VII	Everyone runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well built, ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving cars.	20–60	0.15–0.35 g

Table 3.6-2 (cont.): Modified Mercalli Intensity Scale

Richter Magnitude	Modified Mercalli Intensity	Effects	Average Peak Ground Velocity (centimeters/seconds)	Average Peak Acceleration
6.5–6.9	VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monument walls, and heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving in cars disturbed.	60–200	0.35–0.7 g
7.0–7.4	IX	Damage considerable in specially designed structures; well-designed frame strictures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	200–500	0.7–1.2 g
7.5–7.9	X	Some well-built structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Railway lines bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed, slopped over banks.	≥ 500	>1.2 g
8.0–8.4	XI	Few, if any masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	≥ 500	>1.2 g
≥ 8.5	XII	Total damage. Waves seen on ground. Lines of sight and level distorted. Objects thrown into the air.	≥ 500	>1.2 g
Source: United States Geologic Survey.				

Ground Failure

Ground failure includes liquefaction and the liquefaction-induced phenomena of lateral spreading, and lurching.

Liquefaction is a process by which sediments below the water table temporarily lose strength during an earthquake and behave as a viscous liquid rather than a solid. Liquefaction is restricted to certain geologic and hydrologic environments, primarily recently deposited sand and silt in areas with high groundwater levels. The process of liquefaction involves seismic waves passing through saturated granular layers, distorting the granular structure, and causing the particles to collapse. This causes the granular layer to behave temporarily as a viscous liquid, resulting in liquefaction.

Liquefaction can cause the soil beneath a structure to lose strength, which may result in the loss of foundation-bearing capacity. This loss of strength commonly causes the structure to settle or tip. Loss of bearing strength can also cause light buildings with basements, buried tanks, and foundation piles to rise buoyantly through the liquefied soil.

Lateral spreading is lateral ground movement, with some vertical component, caused by liquefaction. In effect, the soil rides on top of the liquefied layer. Lateral spreading can occur on relatively flat sites with slopes less than 2 percent, under certain circumstances, and can cause ground cracking and settlement.

Lurching is the movement of the ground surface toward an open face when the soil liquefies. An open face could be a graded slope, stream bank, canal face, gully, or other similar feature.

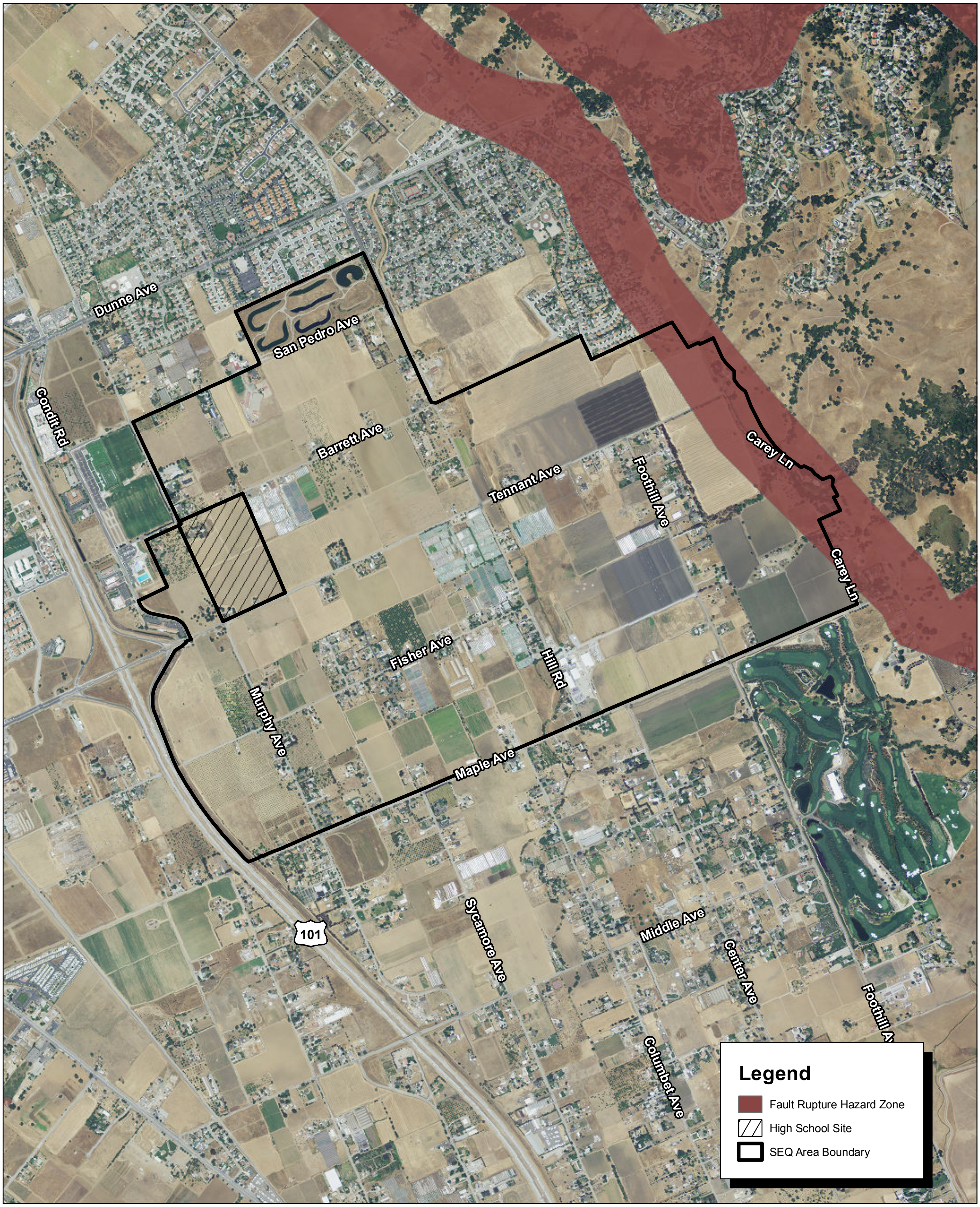
As indicated by the Santa Clara County Liquefaction Hazard Zones Map, there are no areas identified as susceptible to liquefaction within the Southeast Quadrant Area (SEQ Area) (Santa Clara County 2010b).

Landslides and Slope Failure

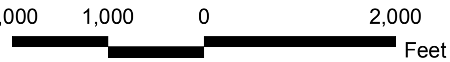
Landslides and other forms of slope failure form in response to the long-term geologic cycle of uplift, mass wasting, and disturbance of slopes. Mass wasting refers to a variety of erosional processes from gradual downhill soil creep to mudslides, debris flows, landslides and rock fall—processes that are commonly triggered by intense precipitation, which varies according to climactic shifts. Often, various forms of mass wasting are grouped together as landslides, which are generally used to describe the downhill movement of rock and soil.

Geologists classify landslides into several different types that reflect differences in the type of material and type of movement. The four most common types of landslides are translational, rotational, earth flow, and rock fall. Debris flows are another common type of landslide similar to earth flows, except that the soil and rock particles are coarser. Mudslide is a term that appears in non-technical literature to describe a variety of shallow, rapidly moving earth flows.

As indicated by the Santa Clara County Landslide, Compressible Soils, and Dike Failure Flooding Hazard Zones Map, there are no areas identified as susceptible to landslides or slope failure within the SEQ Area.



Source: NAIP Santa Clara County, CA (2009), Santa Clara County.



Michael Brandman Associates

Exhibit 3.6-1
Fault Rupture Hazard Zones

Soils

SEQ Area

The United States Department of Agriculture Natural Resources Conservation Service indicates that majority of the SEQ Area is underlain by Arbuckle, Azule, Clear Lake, Cropley, Hillgate, Pleasanton Rincon, and San Ysidro soil types. The soil properties are summarized in Table 3.6-3. Exhibit 3.2-2 in Section 3.2, Agricultural Resources illustrates the project sites soils. The SEQ Area is not included in an area defined by Santa Clara County as containing compressible soils (soils susceptible to subsidence).

Table 3.6-3: SEQ Area – Soil Properties Summary

Soil Name	Surface Texture	Source Material	Hydrologic Group	Drainage Class
Arbuckle	Gravelly loam, 0–2% slopes	Alluvium	Group B	Well drained
Azule	Clay Loam, 9–5% slopes, eroded	Alluvium	Group C	Well drained
Clear Lake Clay	Clay	Alluvium	Group D	Poorly drained
Cortina	Very gravelly loam, 0–5% slopes	Alluvium	Group A	Somewhat excessively drained
Cropley	Clay, 2–9% slopes	Alluvium	Group D	Well drained
Hillgate	Silt loam, 2–9% slopes	Alluvium	Group D	Well drained
Pleasanton	Loam, 0–2% slopes	Alluvium	Group B	Well drained
Pleasanton	Gravelly loam, 2–9% slopes	Alluvium	Group B	Well drained
Rincon	Clay loam, 2–9%	Alluvium	Group D	Well drained
Rincon	Clay loam, 2–9%, eroded	Alluvium	Group D	Well drained
San Ysidro	Loam, 0–2% slopes	Alluvium	Group D	Moderately well drained

Notes:

Hydrologic group definitions

Group A: Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B: Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C: Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D: Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Source: United States Department of Agriculture, Natural Resources Conservation Service, 2010.

High School Site

The United States Department of Agriculture Natural Resources Conservation Service indicates that majority of the High School site is underlain by Arbuckle soil types, while an approximately 1.5-acre portion of the northwestern corner is underlain by San Ysidro soil types; refer to Exhibit 3.2-2. The High School site is not included in an area defined by Santa Clara County as containing compressible soils (soils susceptible to subsidence).

3.6.3 - Regulatory Framework

Federal

Federal Earthquake Hazards Reduction Act

In 1977, the U.S. Congress passed the Earthquake Hazards Reduction Act 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. The act established the National Earthquake Hazards Reduction Program (NEHRP). The National Earthquake Hazards Reduction Program Act (NEHRPA) significantly amended this program in 1990 by refining the description of the agency responsibilities, program goals, and objectives.

NEHRP's mission includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improved building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improved mitigation capacity; and accelerated application of research results. The NEHRPA designates the Federal Emergency Management Agency (FEMA) as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Other NEHRPA agencies include the National Institute of Standards and Technology, National Science Foundation and the USGS.

State

California Building Standards Code

The California Building Standards Code establishes building requirements for construction and renovation. The most recent version of the California Building Standards Code was adopted in 2010 by the California Building Standards Commission and took effect January 1, 2011, and it is based on the International Code Council's Building and Fire Codes. Included in the California Building Standards Code are the Electrical Code, Mechanical Code, Plumbing Code, Energy Code, and Fire Code.

The State of California provides minimum standards for building design through the California Building Standards Code (California Code of Regulations, Title 24). Where no other building codes apply, Chapter 29 regulates excavation, foundations, and retaining walls. Finally, the 2010 California Building Standards Code regulates grading activities, including drainage and erosion control and construction on unstable soils, such as expansive soils and areas subject to liquefaction.

California Seismic Hazards Mapping Act

The California Seismic Hazards Mapping Act of 1990 (California Public Resources Code Section 1690-2699.6) addresses seismic hazards other than surface rupture, such as liquefaction and induced landslides. The Seismic Hazards Mapping Act specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils.

Alquist-Priolo Earthquake Fault Zoning Act

In response to the severe fault rupture damage of structures by the 1971 San Fernando earthquake, the State of California enacted the Alquist-Priolo Earthquake Fault Zoning Act in 1972. This act required the State Geologist to delineate Earthquake Fault Zones along known active faults that have a relatively high potential for ground rupture. Faults that are zoned under the Alquist-Priolo Act must meet the strict definition of being "sufficiently active" and "well-defined" for inclusion as an Earthquake Fault Zones. The Earthquake Fault Zones are revised periodically, and they extend 200 to 500 feet on either side of identified fault traces. No structures for human occupancy may be built across an identified active fault trace. An area of 50 feet on either side of an active fault trace is assumed to be underlain by the fault, unless proven otherwise. Proposed construction in an Earthquake Fault Zone is permitted only following the completion of a fault location report prepared by a California Registered Geologist.

National Pollutant Discharge Elimination System Permit

In California, the State Water Resources Control Board (SWRCB) administers the federal Environmental Protection Agency's promulgated regulations (55 Code of Federal Regulations 47990) requiring the permitting of stormwater-generated pollution under the National Pollutant Discharge Eliminations System (NPDES). In turn, the SWRCB's jurisdiction is administered through Regional Water Quality Control Boards. Pursuant to these federal regulations, an operator must obtain a General Permit under the NPDES Stormwater Program for all construction activities with ground disturbance of one acre or greater. The General Permit requires the implementation of best management practices (BMPs) to reduce pollutant loads into the waters of the State and measures to reduce sediment and erosion control. In addition, a Stormwater Pollution Protection Plan (SWPPP) must be prepared. The SWPPP addresses water pollution control during construction. SWPPPs require that all stormwater discharges associated with construction activity, where clearing, grading, and excavating results in soil disturbances, must by law be free of site pollutants.

Local

City of Morgan Hill

General Plan

The City of Morgan Hill General Plan establishes the following goals and policies related to geology and soils that are applicable to the proposed project.

Open Space and Conservation

- **OSC Policy 6d:** Development shall be designed to conserve soil and avoid erosion. (SCJAP13.06)

Public Health and Safety

- **PHS Policy 1a:** Limit uses on lands with geologic hazards.
- **PHS Policy 1b:** Where urban development has already occurred and there has been extensive capital improvements made, use mitigation procedures for development on lands with geologic hazards, including geologic investigations on a scale commensurate with development where geologic data indicates there is a known or suspected problem.
- **PHS Policy 1f:** Design and construct critical structures to resist minor earthquakes without damage, resist moderate earthquakes without structural damage, and resist major earthquakes of the intensity or severity of the strongest experienced in California without collapse.
- **PHS Policy 1h:** Hillsides should be protected, and development should be carefully controlled on steep slopes. When hillside land is developed, it should be done with minimum disruption of topography and vegetative cover. (SCJAP 15.00)
- **PHS Policy 1j:** Keep development in hazardous areas to a minimum by encouraging low density, low-intensity uses and the types of uses least disruptive to the soil and vegetative cover. (SCJAP 15.02a)
- **PHS Policy 1l:** Prohibit development on known active landslides and limit development in areas where such development might initiate sliding or be affected by sliding on adjacent parcels. (SCJAP 15.02c)
- **PHS Policy 1m:** Prohibit development in areas where increased runoff from the addition of impervious surfaces and drainage would increase the probability of downslope landsliding, or where additional projects would add to the cumulative effect of increased runoff, unless a downslope drainage improvement plan has been approved. (SCJAP 15.02d)

County of Santa Clara

General Plan

The Santa Clara County General Plan establishes the following policies related to geology and soils that are applicable to the proposed project.

Countywide Issues and Policies

- **Policy C-GD-6**: Hazard and resource areas with the following characteristics shall be considered unsuited for urban development: [...]
    d. Areas of soil creep, saturated soils, and areas where the water table is 3 feet or less below the surface; […]

Rural Unincorporated Area Issues and Policies

- **Policy R-GD 20:** Grading and terrain alteration to conduct lawful activities and use of property should conserve the natural landscape and resources, minimize erosion impacts, protect scenic resources, habitat, and water resources. Grading should not exacerbate existing natural hazards, particularly geologic hazards.
- **Policy R-GD 21:** For grading, terrain alteration, or other work that is subject to a grading permit, the grading approval shall be required concurrently with any other required land use authorization or discretionary, conditional permit review process. Grading approval shall not precede other requisite land use or development approvals, including building permit issuance.
- **Policy R-GD 22:** The amount, design, location, and the nature of any proposed grading may be approved only if determined to be: (a) appropriate, justifiable, and reasonably necessary for the establishment of a allowable use; (b) the minimum necessary given the various site characteristics, constraints, and potential environmental impacts that may be involved, and, (c) that which causes minimum disturbance to the natural environment, slopes, and other natural features of the land.
- **Policy R-GD 23:** Proposals to balance cut and fill amounts where such grading would exceed that which is deemed minimally necessary and reasonable for the site may be considered based on environmental impacts, the ability of the site to accommodate the additional fill without causing additional adverse impacts, the remoteness of the site, the overall amount of material that would otherwise need to be removed from the site, and the impacts of any truck traffic that could be involved, including travel distances, local road impacts, safety, noise, dust, and similar issues.
- **Policy R-HS 6:** Inventories and mapping of natural hazards shall be adequately maintained for use in planning and decision-making, including:
  - Relative Seismic Stability Maps;
  - Composite Geologic Hazards Maps;
  - Soil Creep;
  - Saturated, Unstable Soils;
  - Slope Maps; […]
- **Policy R-HS 14:** Critical structures and infrastructure vital to the public health, safety, and general welfare, such as water supply facilities, other utilities, police and fire stations, and communications facilities, shall not be located in areas subject to significant impacts from geologic or seismic hazards unless there is no feasible alternative site. Projects shall be designed to mitigate any seismic hazards associated with their sites.
- **Policy R-HS 15:** No structure proposed for involuntary occupancy, such as schools, hospitals or correctional facilities, and no structure proposed for high voluntary occupancy, such as theaters, churches, or offices shall be approved in areas of high geologic or seismic hazard.
- **Policy R-HS 16:** No new building site shall be approved on a hazardous fault trace, active landslide, or other geologic or seismic hazard area that poses a significant risk.

- **Policy R-HS 17**: Subdivisions shall be designed to minimize placement of road and other improvements on unstable lands and shall demonstrate suitable, stable building sites approved by the County Geologist.
- **Policy R-HS 19:** In areas of high potential for activation of landslides, there shall be no avoidable alteration of the land or hydrology which is likely to increase the hazard potential, including:
    a. Due to drainage or septic systems;
    b. Removal of vegetative cover; and
    c. Steepening of slopes or undercutting the base of a slope.
- **R-HS 20:** Lands where soils are in a continually saturated condition should not be used for structural purposes or filled with heavy earth fills due to their inherently weak and unstable nature. Uses requiring septic systems in such areas should not be allowed.
- **R-HS 21:** Proposals involving potential geologic or seismic hazards shall be referred to the County Geologist for review and recommendations.

3.6.4 - Methodology

MBA evaluated potential impacts on geology, soils, and seismicity through review of the Morgan Hill General Plan, Santa Clara County General Plan, seismic hazards mapping, and the Natural Resources Conservation Service Web Soil Survey.

3.6.5 - Thresholds of Significance

According to Appendix G, Environmental Checklist, of the CEQA Guidelines, geology, soils, and seismicity impacts resulting from the implementation of the proposed project would be considered significant if the project would:

a.) 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?

b.) Result in substantial soil erosion or the loss of topsoil?

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

d.) 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?

e.) 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?

3.6.6 - Project Impacts and Mitigation Measures

This section discusses potential impacts associated with the development of the project and provides mitigation measures where appropriate.

Seismic Hazards

Impact GEO-1:	**The proposed project has the potential to expose people or structures to seismic hazards.**

Impact Analysis

Seismic hazards are those related to seismic fault rupture, strong ground shaking, ground failure, and landsliding. The analysis considers individual impacts associated with the implementation of the SEQ Area and the High School site.

SEQ Area (Program Level)

Fault Rupture

There are no Alquist-Priolo zones within the SEQ Area. There is, however, a fault rupture hazard zone (associated with the Range Front Thrust Fault), as defined by the County of Santa Clara, located along the eastern boundary of the SEQ Area. Exhibit 3.6-1 depicts the location of the fault rupture hazard zone. However, the properties crossed by the fault are proposed for open space, agriculture and limited clustered residential home sites where development rights will be transferred from existing lots of record within the SEQ, and therefore, would not experience a significant change in land use activities. This precludes the possibility of related impacts.

Strong Ground Shaking

The SEQ Area may be exposed to moderate to severe ground shaking during an earthquake. If unabated, structures may be at risk of failure during a seismic event.

Individual development applications within the SEQ Area will be subject to project-level review, including compliance with applicable seismic design requirements of the California Building Standards Code.

Seismic-Related Ground Failure

As indicated by the Santa Clara County Liquefaction Hazard Zones Map, there are no areas identified as susceptible to liquefaction within the SEQ Area. This condition precludes the possibility of liquefaction occurring onsite.

Landsliding

The majority of the SEQ Area is characterized by flat relief and therefore would not be susceptible to landslides. A small portion of the western edge of the landslide hazard zone extends into the SEQ Area along the eastern boundary. However, these properties are proposed for open space, agriculture and limited clustered residential home sites where development rights will be transferred from existing lots of record within the SEQ, and therefore, would not experience a significant change in land use activities. This precludes the possibility of related impacts.

High School Site (Project Level)

Fault Rupture

There are no faults or fault traces located within the project site boundaries. In addition, no Alquist-Priolo zones are designated within the project site. This condition precludes the possibility of fault rupture occurring on the project site. No impacts would occur.

Strong Ground Shaking

The High School site may be exposed to moderate to severe ground shaking during an earthquake. If unabated, structures may be at risk of failure during a seismic event.

Mitigation Measure GEO-1 is proposed requiring the project applicant to submit a seismic hazards technical report prepared by a qualified geotechnical engineer to the City of Morgan Hill for review and approval. This report would identify potential ground shaking impacts and identify structural design measures necessary to reduce the risks of strong seismic ground shaking to acceptable levels. Following the City's approval of the report, the structural design measures would be incorporated into the proposed High School's plans. The implementation of this mitigation measure would ensure that potential ground shaking impacts are reduced to a level of less than significant.

Seismic-Related Ground Failure

As indicated by the Santa Clara County Liquefaction Hazard Zones Map, there are no areas identified as susceptible to liquefaction within the SEQ Area. This condition precludes the possibility of liquefaction occurring onsite.

Landsliding

The High School site is characterized by flat relief and is not located within an area identified as being susceptible to landslides. This condition precludes the possibility of earthquake-induced landslides inundating the project site. No impacts would occur.

Level of Significance Before Mitigation

SEQ Area (Program Level)

Less than significant impact.

High School Site (Project Level)

Potentially significant impact.

Mitigation Measures

MM GEO-1 **High School Site.** Prior to issuance of building permits, the project applicant shall submit a geotechnical and seismic hazards technical study prepared by a qualified geotechnical engineer to the City of Morgan Hill for review and approval. The report shall be prepared in accordance with the requirements of the Seismic Hazards Mapping Act and the latest version of the California Building Standards Code. The study shall identify necessary design measures to reduce potential seismic ground shaking impacts and unstable geologic conditions to acceptable levels. The project applicant shall incorporate the approved design measures into the project plans.

Level of Significance After Mitigation

SEQ Area (Program Level)

Less than significant impact.

High School Site (Project Level)

Less than significant impact.

Erosion Hazards

Impact GEO-2: **Construction activities associated with the proposed project may result in substantial soil erosion or the loss of topsoil.**

Impact Analysis

This impact evaluates the proposed project's potential to result in substantial soil erosion or the loss of topsoil. The analysis considers individual impacts associated with the implementation of the SEQ Area and the High School site.

SEQ Area (Program Level)

Future development that occurs within the SEQ Area would have the potential to result in new sources of polluted runoff. Construction and operational activities have the potential to contribute to erosion and sedimentation in downstream waterways. Individually development applications will be subject to project-level CEQA review, as well as federal, state, and local water quality standards.

It should be noted that some SEQ Area soils possess highly permeable characteristics; thus, runoff that ponds within those areas infiltrates into the water table relatively quickly. Future development that occurs within the SEQ Area will be required to employ onsite or offsite retention, which would serve to minimize the potential for erosion and sedimentation in downstream runoff; refer to Impact HYD-3 for further discussion. As such, impacts would be less than significant with the required onsite or offsite retention.

High School Site (Project Level)

Construction activities associated with the proposed High School would involve grading and excavation activities that could expose barren soils to sources of wind or water, resulting in the potential for erosion and sedimentation on and off the project site. NPDES stormwater permitting programs regulate stormwater quality from construction sites, which includes erosion and sedimentation. Under the NPDES permitting program, the preparation and implementation of a SWPPP are required for construction activities that would disturb an area of 1 acre or more. The SWPPP must identify potential sources of erosion or sedimentation that may be reasonably expected to affect the quality of stormwater discharges as well as identify and implement BMPs that ensure the reduction of these pollutants during stormwater discharges. Typical BMPs intended to control erosion include sand bags, detention basins, silt fencing, storm drain inlet protection, street sweeping, and monitoring of water bodies.

These requirements have been incorporated into the proposed project as Mitigation Measure HYD-1a. The implementation of a SWPPP and its associated BMPs would reduce potential erosion impacts to a level of less than significant.

Level of Significance Before Mitigation

SEQ Area (Program Level)
Less than significant impact.

High School Site (Project Level)
Potentially significant impact.

Mitigation Measures

SEQ Area (Program Level)
No mitigation is necessary.

High School Site (Project Level)
Implement Mitigation Measure HYD-1a.

Level of Significance After Mitigation

SEQ Area (Program Level)
Less than significant impact.

High School Site (Project Level)
Less than significant impact.

Unstable Geologic Units or Soils

Impact GEO-3:	**The proposed project would not expose people or structures to unstable geologic units or soils.**

Impact Analysis

This impact evaluates the proposed project's impact on unstable geologic units or soils. The analysis considers individual impacts associated with the implementation of the SEQ Area and the High School site.

SEQ Area (Program Level)

The SEQ Area is largely characterized by flat terrain and permeable soils. In addition, the SEQ Area is not underlain by poorly consolidated soils or experiences high groundwater levels, which are conditions associated with liquefaction and liquefaction-phenomena. As such, unstable geologic units or soils do not occur in the SEQ Area. This precludes the possibility of related impacts. Impacts would be less than significant.

High School Site (Project Level)

As previously noted, the High School site is characterized by flat terrain and permeable soils. In addition, the High School site is not underlain by poorly consolidated soils or experiences high groundwater levels, which are conditions associated with liquefaction and liquefaction-phenomena. As such, unstable geologic units or soils do not occur within the High School site. This precludes the possibility of related impacts. Impacts would be less than significant.

Level of Significance Before Mitigation

SEQ Area (Program Level)

Less than significant impact.

High School Site (Project Level)

Less than significant impact.

Mitigation Measures

No mitigation is necessary.

Level of Significance After Mitigation

SEQ Area (Program Level)

Less than significant impact.

High School Site (Project Level)

Less than significant impact.

Expansive Soils

Impact GEO-4: The proposed project may result in the exposure of persons or structures to hazards associated with expansive soils.

Impact Analysis

This impact evaluates the proposed project's potential to expose persons or structures to hazards associated with expansive soils. The analysis considers individual impacts associated with the implementation of the SEQ Area and the High School site.

SEQ Area (Program Level)

Expansive soils tend to increase or decrease in volume with the addition of water and generally consist of clay. When dry, clay soils are extremely strong; when exposed to water, clay soils have the potential to expand and soften, thereby loosing their structural integrity. The repeated exposure of expansive soils to alternating dry and wet conditions can cause shrinking and swelling of soils, resulting in potential damage to structures constructed upon them.

Soils within the SEQ Area are summarized in Table 3.6-3. As shown in the table, the soils have a mixture of hydrologic group ratings. According to the United States Department of Agriculture, Natural Resources Conservation Service's Web Soil Survey, soils characterized as hydrologic Group D consist chiefly of clays that have a high shrink-swell potential. Six of the 11 soils within the SEQ Area are defined as belonging to hydrologic Group D. These soils are primarily located in the eastern half of the SEQ Area, which will be designated Open Space on the General Plan Land Use Diagram and prezoned Open Space (Planned Development). A limited number of clustered residential home sites are anticipated to occur within the Planned Development area through transfer of development rights from existing lots of record within the SEQ. These home sites would be subject to California Building Standards Code requirements for soil engineering and foundations.

Future urban development activities would occur in the western portion of the SEQ Area, where soils possess less amount of clay content and, therefore, are considered non-expansive. As such, development activities in this area would not be exposed to expansive soils. Regardless, new construction would be subject to California Building Standards Code requirements for soil engineering and foundations. Impacts would be less than significant.

High School Site (Project Level)

The majority of the High School site is underlain by Arbuckle soil types, while an approximately 1.5 acre portion of the northwestern corner is underlain by San Ysidro soil types. Arbuckle soil types do not contain a large portion of clay and are therefore not considered expansive. However, San Ysidro soil types are classified in hydrologic group D, which indicates that a high shrink-swell potential may exist and the soils may be considered expansive. Implementation of Mitigation Measure GEO-1 would identify any areas of expansive soils and would provide recommendations to mitigate any potential impacts. As such, impacts would be reduced to less than significant.

Level of Significance Before Mitigation

SEQ Area (Program Level)

Less than significant impact.

High School Site (Project Level)

Potentially significant impact.

Mitigation Measures

SEQ Area (Program Level)

No mitigation is necessary.

High School Site (Project Level)

Implement Mitigation Measure GEO-1.

Level of Significance After Mitigation

SEQ Area (Program Level)

Less than significant impact.

High School Site (Project Level)

Less than significant impact.

Septic or Alternative Wastewater Systems

Impact GEO-5:	**The proposed project may 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.**

Impact Analysis

This impact evaluates the proposed project's capability to support the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater. The analysis considers individual impacts associated with the implementation of the SEQ Area and the High School site.

SEQ (Program Level)

Properties that would be annexed into the City of Morgan Hill and the USA would be eligible for wastewater service and would connect to city wastewater.

The eastern portion of the SEQ Area proposed to be prezoned Open Space (Planned Development)—including the 307-acre Chiala programmatic application—is not proposed to be added to the City's Urban Service Area. Instead, this area would be served by septic systems. New septic tanks would be subject to the applicable provisions of the Santa Clara County Code of Ordinances Section B11-60 including having a minimum lot size of 1 acre. As part of compliance, the applicant would need to demonstrate that site soils are capable of supporting the function of a private septic system in accordance with Section B11-60. Development will not be allowed if site soils are not capable of supporting the function of a private septic system. As such, impacts would be less than significant.

High School (Project level)

Many of the rural properties within the SEQ (including the High School site) currently use septic or alternative wastewater disposal systems. The proposed project would expand the City of Morgan Hill Urban Service Area, which would make these properties eligible for municipal sewer service, thereby obviating the need for septic or alternative wastewater disposal systems. The proposed High School would be served by municipal sewer service. No impact would occur.

Level of Significance Before Mitigation

SEQ Area (Program Level)

Less than significant impact.

High School Site (Project Level)

No impact.

Mitigation Measures

SEQ Area (Program Level)

No mitigation is necessary.

High School Site (Project Level)

No mitigation is necessary.

Level of Significance After Mitigation

SEQ Area (Program Level)

Less than significant impact.

High School Site (Project Level)

No impact.