8. GEOLOGY AND SOILS

Like many jurisdictions in the State of California, the City of Hollister is located in a geographic area which is susceptible to significant seismic events and related hazards which occur due to the presence of earthquake faults and soil composition in the region. This chapter describes the existing geology and soil, seismic, and paleontological characteristics in the General Plan Planning Area.

8.1 REGULATORY FRAMEWORK

This section summarizes regulations for geology and soils at the federal, State, regional, and City level.

8.1.1 FEDERAL REGULATIONS

8.1.1.1 Paleontological Resources Preservation Act

The federal Paleontological Resources Preservation Act of 2002 limits the collection of vertebrate fossils and other rare and scientifically significant fossils to qualified researchers who have obtained a permit from the appropriate State or federal agency. Additionally, it specifies these researchers must agree to donate any materials recovered to recognized public institutions, where they will remain accessible to the public and to other researchers. This Act incorporates key findings of a report, *Fossils on Federal Land and Indian Lands*, issued by the Secretary of Interior in 2000, which establishes that most vertebrate fossils and some invertebrate and plant fossils are considered rare resources.[1]

8.1.2 STATE REGULATIONS

8.1.2.1 Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface fault rupture to structures used for human occupancy. The main purpose of this Act is to prevent the construction of buildings used for human occupancy on top of active faults. This Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards, such as earthquake-induced liquefaction or landslides.[2]

[1] U.S. Department of the Interior, May 2000, *Fossils on Federal & Indian Lands, Report of the Secretary of the Interior*, May 2000. https://www.blm.gov/sites/blm.gov/files/programs_paleontology_quick%20links_Assessment%20of%20Fossil%20Management%20on%20Federal%20%26%20Indian%20Lands%2C%20May%202000.pdf, accessed on April 25, 2020.

[2] California Geological Survey, Alquist-Priolo Earthquake Fault Zoning Act, https://www.conservation.ca.gov/cgs/alquist-priolo, accessed on April 25, 2020.

This Act requires the State Geologist to establish regulatory zones (known as Earthquake Fault Zones or Alquist-Priolo Zones) around surface traces of active faults, and to issue appropriate maps.[3] The maps, which are developed using existing United States Geological Survey's (USGS) 7.5-minute quadrangle map bases, are then distributed to all affected cities, counties, and State agencies for their use in planning and controlling new or renewed construction. Generally, construction within 50 feet of an active fault zone is prohibited.

8.1.2.2 Seismic Hazards Mapping Act

The 1990 *Seismic Hazards Mapping Act* addresses seismic hazards such as liquefaction and seismically induced landslides.[4] Under this Act, seismic hazard zones are mapped by the State Geologist to assist local governments in land use planning. Section 2691(c) of this Act states that "it is necessary to identify and map seismic hazard zones in order for cities and counties to adequately prepare the safety element of their general plans and to encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety." Section 2697(a) of the Act states that "cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard."

8.1.2.3 California Building Code

The State of California provides a minimum standard for building design through Title 24 of the California Code of Regulations (CCR), commonly referred to as the "California Building Code" (CBC). The CBC is in Part 2 of Title 24 of the CCR. The CBC is updated every three years. It is generally adopted on a jurisdiction-by-jurisdiction basis, subject to further modification based on local conditions. The City of Hollister regularly adopts each new CBC update under the Hollister Municipal Code (HMC) Title 15, Buildings and Construction, Section 15.04.050, Construction Codes Adopted by Reference. Through the CBC, the State provides a minimum standard for building design and construction. The CBC contains specific requirements for seismic safety, excavation, foundations, retaining walls, and site demolition. It also regulates grading activities, including drainage and erosion control.

8.1.2.4 California Public Resources Code Section 5097

California Public Resources Code (PRC) Section 5097.5 prohibits the destruction or removal of any paleontological site or feature from public lands without the permission of the jurisdictional agency.

8.1.2.5 California Penal Code Section 622.5

The California Penal Code Section (PC) 622.5 details the penalties for damage or removal of paleontological resources, whether from private or public lands.

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[3] California Geological Survey, Alquist-Priolo Earthquake Fault Zoning Act, https://www.conservation.ca.gov/cgs/alquist-priolo, accessed on April 25, 2020.

[4] California Geological Survey, Alquist-Priolo Earthquake Fault Zoning Act, https://www.conservation.ca.gov/cgs/alquist-priolo, accessed on April 25,2020.

8.1.3 REGIONAL REGULATIONS

8.1.3.1 San Benito County Emergency Operations Plan

The San Benito County *Emergency Operations Plan* (EOP), adopted August 2015, formalizes the County's emergency management approach to reduce vulnerabilities to both natural and man-made disasters. The EOP provides basic guidance for earthquakes, flooding, fire, landslides, severe weather, pandemics and epidemics, as well as hazardous material emergencies. The EOP further includes mitigation programs, which are split into three categories: emergency prevention and protection; response concept of operations; and recovery concept of operations. The City of Hollister does not have an Office of Emergency Services or an assigned emergency planner. Therefore, responsibility for preparation and response to a disaster is enforced by the San Benito County Office of Emergency Services.[5]

8.1.3.2 San Benito County Multi-Jurisdictional Hazard Mitigation Plan

San Benito County's hazard mitigation programs are enforced through the *Multi-Jurisdictional Local Hazard Mitigation Plan* (LHMP), which was adopted concurrently with the County EOP. The LHMP includes hazard mitigation goals, strategies, and priorities, and provides a comprehensive assessment of the county's hazards and vulnerabilities. The priorities of the mitigation programs are to reduce the loss of life, minimize structural damage, reduce disruption of essential services, protect the environment, and promote hazard mitigation as an integrated public policy. The LHMP covers all jurisdictions in San Benito County, including the City of Hollister.[6]

8.1.4 LOCAL REGULATIONS

8.1.4.1 Hollister 2005 General Plan

The City of Hollister 2005 General Plan includes goals, policies, and implementation measures related to geology, soils, seismicity, and paleontology in the Health and Safety (HS) Element. Applicable goals, policies, and implementation measures in the Hollister General Plan serve to protect community health and safety from man-made and natural disasters and prepare for emergency situations within the General Plan Planning Area. As part of the General Plan Update, some existing General Plan goals, policies, and implementation measures could be amended, substantially changed, or new policies could be added. A list of policies applicable to geology and soils is provided in Table 8-1 below.

[5] San Benito County Office of Emergency Services, August 2015, San Benito County Operational Area Emergency Operations Plan, http://www.cosb.us/wp-content/uploads/SBC-EOP-2015.pdf, accessed on April 25, 2020.

[6] San Benito County Office of Emergency Services, August 2015, San Benito County Operational Area Multi-Jurisdictional Local Hazard Mitigation Plan, http://www.cosb.us/wp-content/uploads/Local-Hazard-Mitigation-Plan-_-SBC-FEMA-Approved.pdf, accessed on April 25, 2020.

TABLE 8-1 2005 HOLLISTER GENERAL PLAN RELEVANT GEOLOGY AND SOIL POLICIES

Policy No.	Policy
HS1.1	Location of Future Development. Permit development only in those areas where potential danger to the health, safety, and welfare of the residents of the community can be adequately mitigated, including development which would be subject to severe flood damage or geological hazard due to its location and/or design. Development also should be prohibited where emergency services, including fire protection, cannot be provided.
HS1.2	Safety Considerations in Development Review. Require appropriate studies to assess identified hazards and assure that impacts are adequately mitigated.
HS1.4	Seismic Hazards. Assure existing and new structures are designed to protect people and property from seismic hazards. Review all development proposals for compliance with the Alquist- Priolo Earthquake Fault Zoning Act and the Uniform Building Code as a way to reduce the risk of exposure to seismic hazards for those who will be living and working within the Hollister Planning Area.
HS1.5	Geotechnical and Geologic Review. Require all geologic hazards be adequately addressed and mitigated through project development. Development proposed within areas of potential geological hazards shall not be endangered by, nor contribute to, the hazardous conditions on the site or on adjoining properties.
HS1.6	Engineering Tests for Geologic Conditions. Require engineering tests for those development projects which may be exposed to impacts associated with expansive soils, so that building foundation footings, utility lines, roadways and sidewalks can be designed to accept the estimated degree of soil contraction, expansion and settlement, according to the standards of the Uniform Building Code.
HS1.7	Design of Safe Structures and Utilities. Require new roads, bridges and utility lines are constructed to accommodate possible fault movement and withstand the expected ground motion induced during an earthquake.
HS2.1	High Occupancy Structures. High-occupancy structures (such as schools, hospitals, office buildings and apartments) or critical emergency facilities (such as fire and police stations, emergency relief storage facilities, and water storage tanks) should not be located within an active fault's "zone of potential surface deformation". In addition, high-occupancy structures should be designed or redesigned to protect human life to the highest degree possible during the "maximum probable event" of seismic activity. High occupancy structures should also have emergency plans approved by the City.
HS2.2	Emergency Services Facilities. The structures designated to house local command control of emergency/disaster services should be designed or redesigned to withstand a "maximum probable event" to remain operational. Secondary facilities should be identified and equipped as back-up.
HS2.3	Hazard Awareness. Publicize disaster plans and promote resident awareness and caution regarding hazards, including soil instability, earthquakes, flooding, and fire.

Source: City of Hollister, *2005 General Plan*.

8.1.4.2 Hollister Municipal Code

In addition to the General Plan, the Hollister Municipal Code (HMC) regulates geology, soil, and seismic related issues in the city. The HMC includes requirements to preserve the integrity of the city's geologic and soil resources and to reduce impacts from seismic events, landslides, erosion, and subsidence. The HMC is organized by Title, Chapter, and Section. Most provisions related to geology, soils, and seismic events are in Title 15, Buildings and Constructions, and Title 16, Subdivisions as follows:

- Chapter 15.24, *Grading and Stormwater Best Management Practices Control* provides best practices required to be followed to ensure safe grading operations that reduce erosion and other soil influences. This Chapter includes specific sections related to soils and geology as follows:
  - Section 15.24.140, *Soils Engineering Report* establishes the method to collect data and prepare a soils engineering report.

- Section 15.24.141, *Engineering Geology Report* requires a project applicant submit an Engineering Geology Report to describe the effect a site's geologic conditions would have on the proposed development.

- Chapter 16.28, *Soil and Seismic Reports* requires a soils investigation for subdivision applications to assess the whether the site has expansive soils or other soil issues which, if not mitigated, would lead to structural defects.

8.2 EXISTING CONDITIONS

This section describes the existing geology and soils characteristics, natural hazards which pose a health and safety risk, and the presence of paleontological resources in the General Plan Planning Area.

8.2.1 GEOLOGY

The General Plan Planning Area is located in the Hollister Valley, a lowland basin surrounded by coastal mountain ranges, remnant of a prehistoric lake.[7] The Hollister Valley is within the coastal ranges geomorphic province (coast ranges), which is characterized by relatively flat land composed of alluvial soils. The alluvial soils of the coastal ranges are characterized as fertile, supporting various agricultural activities.[8] The geology of the General Plan Planning Area is shown in Figure 8-1.

The Hollister Valley was formed by the surrounding mountains uprising through tectonic uplift, which occurred in the Pleistocene era approximately 2 to 3 million years ago, ultimately forming the Diablo Mountain Gabilan Mountain Ranges to the west. The Hollister Valley is structurally controlled by faulting from the San Andreas and Calaveras Faults. Fault activity has resulted in the disruption of deep subsurface marine and non-marine sediments, referred to as the Hollister Basin, which has therefore filled a majority of the Hollister Valley. Drainage in the Hollister Basin trends west towards the San Benito River.[9]

In 1998, a geological survey divided the Hollister Valley into a series of mapping units based on topographic position, and identified that the Younger Flood Plain Deposits- medium textured (referred to as "Qyfm") is the predominant geological unit underneath the General Plan Planning Area and neighboring unincorporated lands of San Benito County. The Qyfm geologic unit consists of medium-textured sandy silt clay with layers of clean sand anticipated to be approximately 82- to 98-feet in thickness.[10] Additional explorations identified the presence of sedimentary structures within the Qyfm geologic unit which suggests a fluvial deposit,[11] with the exception of a location along 6th Street in the General Plan Planning Area which is underlain by clay and silt.[12]

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[7] City of Hollister, 2005, General Plan Final Program EIR, 4.10-24.

[8] County of San Benito, March 2015, 2035 San Benito County General Plan Update, State Clearinghouse No. 2011111016, page 10-5.

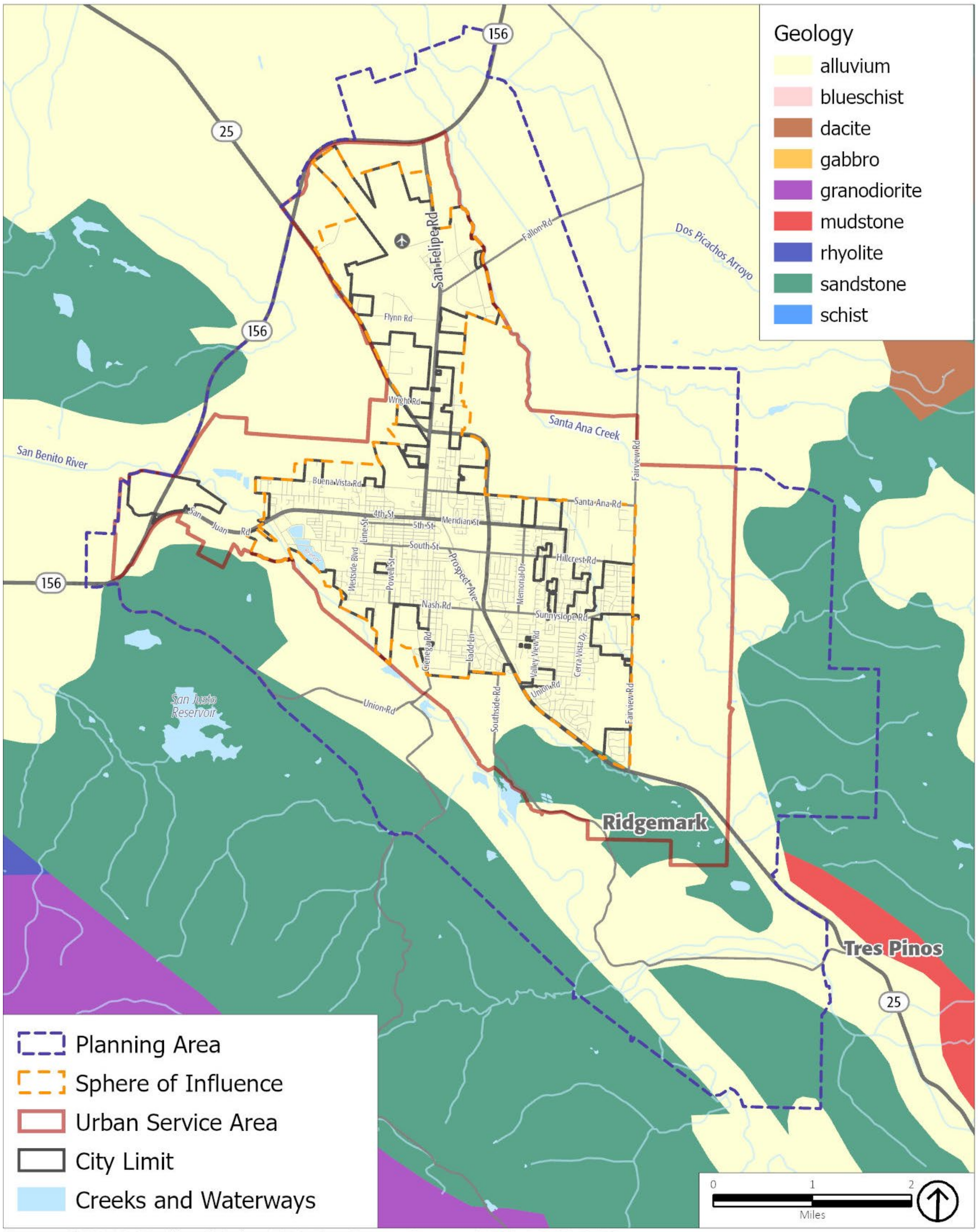
[9] City of Hollister, July 2017, Design Level Geologic and Geotechnical Evaluation of the Allendale Residential Subdivision North of North Street, page 13.

[10] County of San Benito, 1998, Liquefaction Susceptibility of the Hollister Area in San Benito County, National Earthquake Hazards Reduction Program.

[11] Fluvial deposits are characterized as sediments that have been transported and deposited by rivers.

[12] City of Hollister, 1991, City of Hollister, California: Unpublished Report Prepared for City of Hollister Redevelopment Agency, File No. A0-2280-S1.

Figure 8-1 Geology Map



Source: ESRI, 2020; PlaceWorks, 2020; San Benito County, 2020; USGS, 2019

In the immediate vicinity of the General Plan Planning Area lies the San Benito Formation, characterized by Holocene lacustrine and fluvial deposits in low lying alluvial plains. This indicates that the sedimentary fill of the Hollister Basin is primarily from alluvial fan deposits, which are fan-shaped sediments that form at the base of mountain slopes or at the mouth of rivers. Alluvial fan sediment is deposited via water which drains the soil into low-lying plains. Alluvial deposits in the Hollister Basin are estimated to average about 500 feet in thickness.[13]

8.2.2 SOILS

As shown in Figure 8-2, soils in the General Plan Planning Area primarily consist of alluvial soils. Alluvial soils are characterized by complex layering of gravel, silty sands, sand, and clayey soils. These soils in the General Plan Planning Area have been deposited into the Hollister Valley over thousands of years by the San Benito River.[14] Alluvial soils are highly fertile and therefore suitable for the growing of various crops. There are two specific types of soils within the General Plan Planning Area which include soils of Terraces, Alluvial Fans, and Flood Plains, and soils of the Uplands.

8.2.2.1 Soils of the Terraces, Alluvial Fans, and Flood Plains

Soils of the Terraces, Alluvial Fans, and Flood Plains are located in flat geographic areas such as the Hollister Valley and are built from erosion and of sedimentary and igneous rock formations. These soils support the natural growth of annual grasses, forbs, and oak trees, but are generally considered highly fertile and suitable for crop cultivation. There are three specific soil types which include the following:[15]

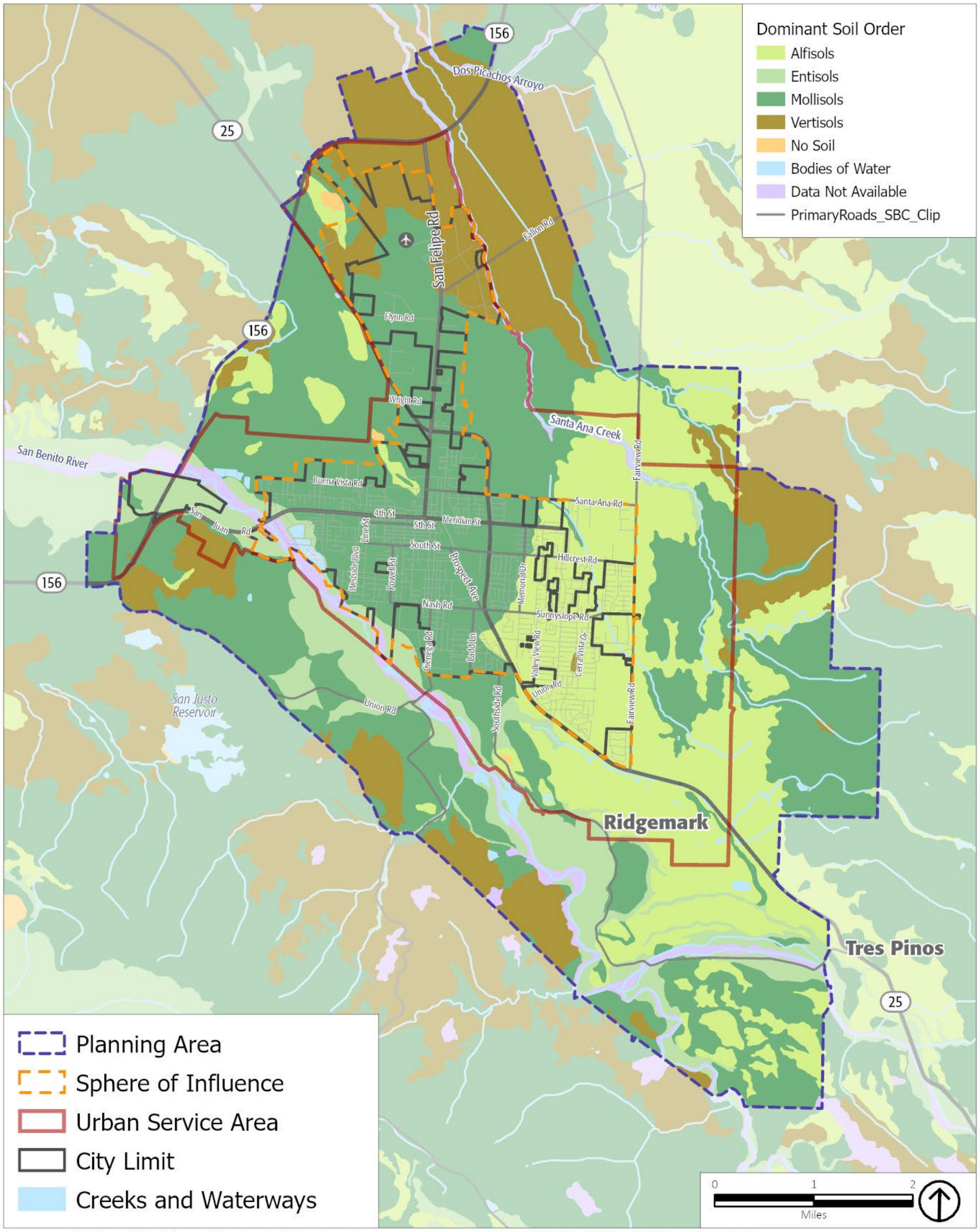
- Sorrento Yolo Mocho soils are nearly level and sloping, well-drained, medium-textured soils on flood plains and alluvial fans. Such soils are suitable for irrigated fruits and nuts, row and field crops, alfalfa, and pastures.
- Clear Lake Pacheco Willows soils are nearly level yet gently sloping, poorly drained to somewhat poorly drained, fine- and medium-textured soils on flood plains and in basins. Such soils are suitable for row and field crops, alfalfa, and small grains.
- Rincon Antioch Cropley soils which are nearly level to strongly sloping, well-drained to moderately well-drained, medium- to fine-textured soils on terraces and alluvial fans. Such soils suitable for irrigated fruits and nuts, row and field crops, alfalfa, and pastures.

[13] City of Hollister, July 2017, Design Level Geologic and Geotechnical Evaluation of the Allendale Residential Subdivision North of North Street, page 14.

[14] City of Hollister, 2005, General Plan Final Program EIR, page 4.10-24. Most of the text in this sentence comes directly from the EIR with little alteration.

[15] County of San Benito, March 2015, 2035 San Benito County General Plan Update, State Clearinghouse No. 2011111016, page 10-5.

Figure 8-2 Soils Map



Source: ESRI, 2020; PlaceWorks, 2020; San Benito County, 2020; USGS, 2019; SSURGO, 2017

8.2.2.2 Soils of the Uplands

Soils of the Uplands are composed of igneous and sedimentary rocks. There is only one such soil associated with Uplands in the General Plan Planning Area- San Benito Gazos Linne, a soil which consists of rolling to very steep hills, is well drained to somewhat excessively drained, moderately- to fine-textured soils formed over sandstone and shale. These soils are largely eroded, but may still be used for cultivating small grains, annual grass pastures, and ranges.[16]

8.2.3 REGIONAL SEISMICITY

The Earth's crust includes tectonic plates that locally collide with or slide past one another along plate boundaries. California is particularly susceptible to such plate movements, notably the largely horizontal or "strike-slip" movements of the Pacific Plate, as it impinges on the North American Plate. In general, earthquakes occur when the accumulated stress along a plate boundary or fault is suddenly released, resulting in seismic slippage. This slippage can vary widely in magnitude, ranging in scale from a few millimeters or centimeters, to tens of feet.

The performance of man-made structures during a major seismic event varies widely due to a number of factors, including location, with respect to active fault traces or areas prone to liquefaction or seismically-induced landslides; the type of building construction (i.e., wood frame, unreinforced masonry, non-ductile concrete frame); the proximity, magnitude, depth, and intensity of the seismic event itself; and many other factors. In general, evidence from past earthquakes shows that wood frame structures tend to perform well during a seismic event, especially when their foundations are properly designed and anchored. Conversely, older, unreinforced masonry structures and non-ductile reinforced concrete buildings (especially those built in the 1960s and early 1970s), do not perform as well, especially if they have not undergone appropriate seismic retrofitting. Applicable building code requirements, such as those found in the CBC, include seismic requirements that are designed to ensure the satisfactory performance of building materials under prescribed seismic conditions.

The City of Hollister is located in a great seismically active region as shown in Figure 8-3. There are four major fault zones in the vicinity of the General Plan Planning Area- the San Andreas, the Quien Sabe, the Tres Pinos, and the Calaveras Faults. The San Andreas Fault system runs approximately 2.5 miles to the west of the General Plan Planning Area and is capable of generating an earthquake of up to 8.3 magnitude. The Quien Sabe Fault is located 3 miles east of the General Plan Planning Area and has been recorded to have generated an earthquake of maximum 5.5 magnitude. The Calaveras Fault system bisects Hollister's downtown on a north-south axis and has the capacity to generate an earthquake of up to approximately 7 magnitude. Lastly, the Tres Pinos Fault is a minor off-shoot of the Calaveras Fault in the downtown, then running southeast through the General Plan Planning Area. However, the Tres Pinos Fault is not considered to be active. Due to the active fault lines within and surrounding it, the General Plan Planning Area is historically susceptible to all earthquake-related hazards which include ground rupture, ground shaking, and liquefaction. Additionally, the General Plan Planning Area experiences a phenomenon called aseismic creep as described below.[17]

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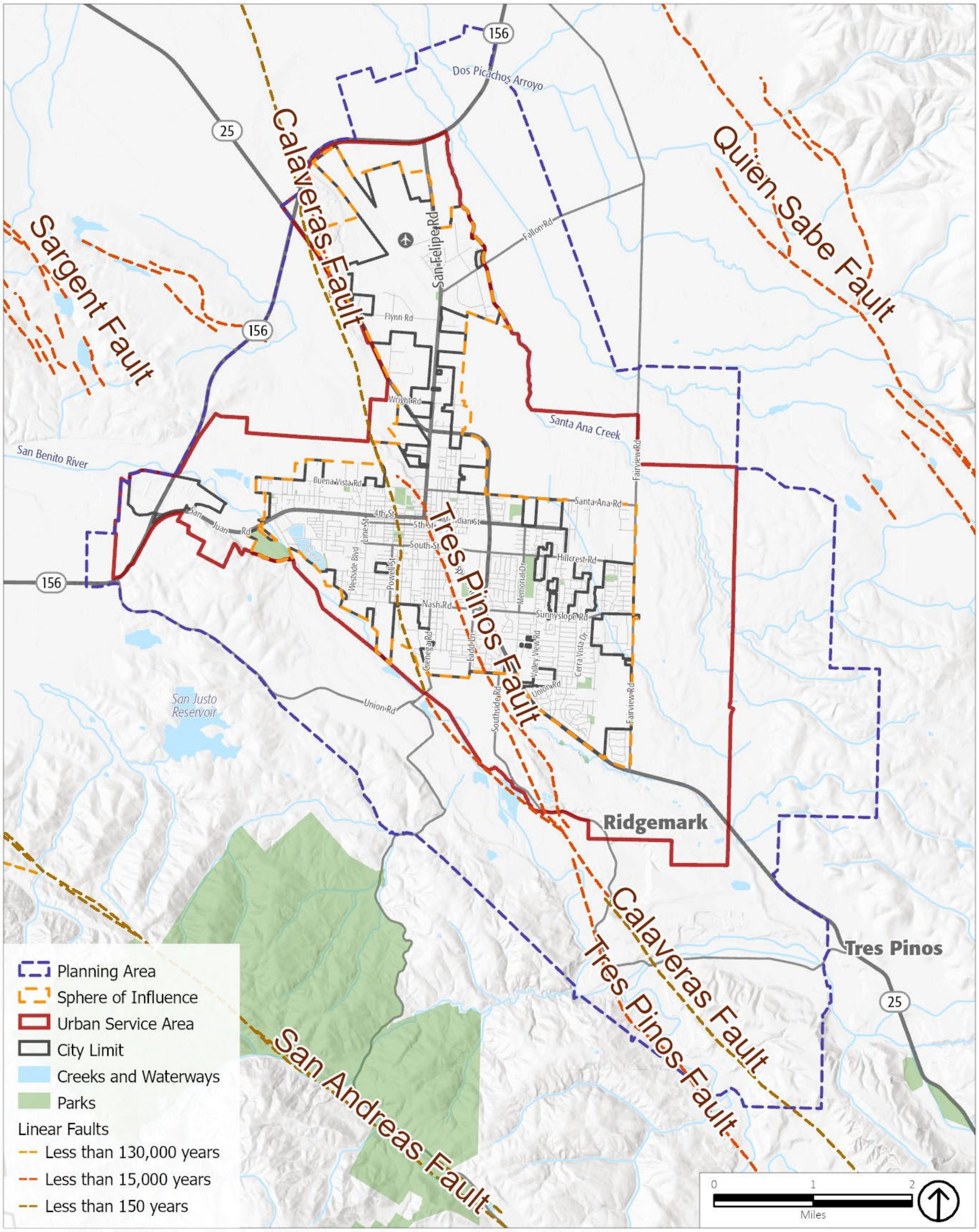
[16] County of San Benito, March 2015, 2035 San Benito County General Plan Update, State Clearinghouse No. 2011111016, page 10-7.

[17] City of Hollister, 2005, General Plan Final Program EIR, page 4.9-1. Some of the text in this section comes directly from the EIR with little alteration.

Figure 8-3 Fault Map



Source: ESRI, 2020; PlaceWorks, 2020; San Benito County, 2020; USGS, 2019

8.2.3.1 Ground Shaking and Rupture

The most common hazard from a seismic event is ground shaking. While ground shaking due to an earthquake may be experienced many miles from the source of an earthquake, ground rupture is frequent in the immediate vicinity of any fault line which experiences a significant seismic event.[18] Because the Calaveras Fault lies beneath Hollister's downtown, this area has the potential to experience ground rupture in the event of a strong seismic event.

8.2.3.2 Liquefaction

Liquefaction is a hazard which occurs during prolonged periods of ground shaking in areas with alluvial or granular soils which are less compacted than soil types such as clay. Liquefaction is a result of prolonged ground shaking from a seismic event, which causes a sudden rise of an underground water table. When a water table rises in areas with alluvial and granular soils, the water infiltrates the soil bed and compromises the strength and stability of the soil, which can therefore compromise structures in such areas. As discussed in Section 8.2.2, Soils, the General Plan Planning Area is largely located atop alluvial soils. These alluvial soils, in addition to a perched water table, mean that there is a high risk of liquefaction in the General Plan Planning Area, particularly within the flood plain on either side of the San Benito River as shown in Figure 8-4. However, there is insufficient evidence to definitively link structural damage with liquefaction events triggered by an earthquake.[19]

8.2.3.3 Aseismic Creep

Aseismic creep is the steady and ongoing movement of fault lines, generally without any associated earthquake. Faults which cause aseismic creep are unusual in that they slowly move for long periods of time, usually producing small earthquakes rather than large ones.[20] In cities that experience aseismic creep, it is common to see roadways, curbs, or buildings which appear offset or cracked. The Calaveras Fault, which runs through the General Plan Planning Area, moves an estimated four to twelve millimeters per year due to aseismic creep.[21] Although not considered a significant hazard, aseismic creep can result in significant structural damage in areas where structures are built on top of an active fault line.[22]

[18] City of Hollister, 2005, General Plan Final Program EIR, page 4.9-1.

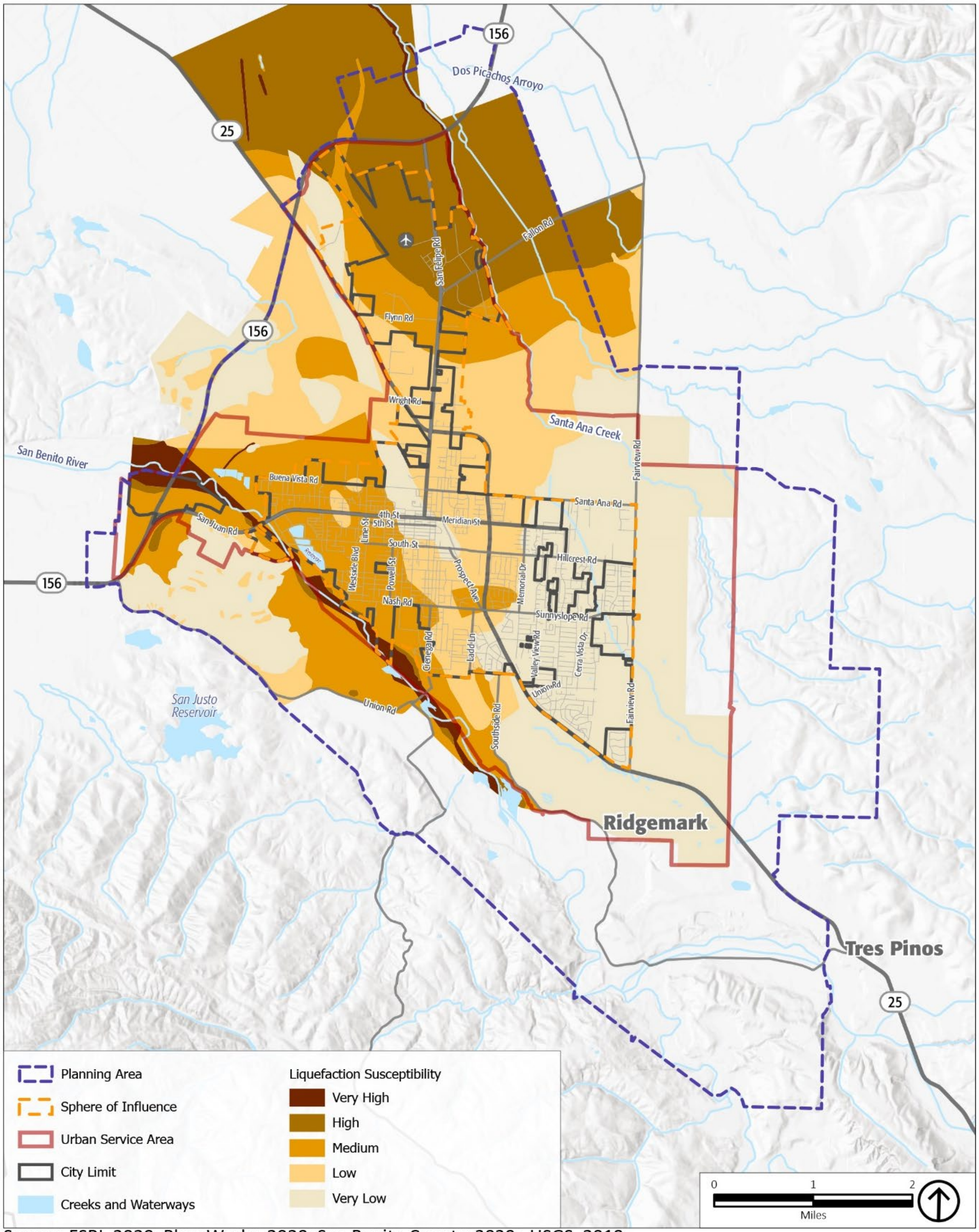
[19] City of Hollister, 2005, General Plan Final Program EIR, page 4.9-2. The last sentence of the text in this section comes directly from the EIR with little alteration.

[20] U.S. Geological Survey, Earthquake Hazards, Creep Evidence of Active Faulting, https://www.usgs.gov/natural-hazards/earthquake-hazards/science/creep-evidence-active-faulting?qt-science_center_objects=0#qt-science_center_objects, accessed on April 29, 2020.

[21] City of Hollister, September 2015, Phase I Fault Rupture Hazard Assessment, City of Hollister Downtown Area, Project No. 2015.0062, http://hollister.ca.gov/wp-content/uploads/2016/03/Phase-I-City-of-Hollister-Downtown-Fault-Rupture-Hazard-Assessment-FINAL.pdf, accessed on April 29, 2020.

[22] American Geophysical Union, April 2017, Reviews of Geophysics, Creeping Faults: Good News, Bad News?, https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017RG000565, accessed on April 29, 2020.

Figure 8-4 Liquefaction Map



Source: ESRI, 2020; PlaceWorks, 2020; San Benito County, 2020; USGS, 2019

8.2.4 LANDSLIDES

Due to the flat terrain in the General Plan Planning Area, landslides are not an environmental concern. In the event of a severe earthquake, a landslide could possibly be triggered on the west side of Park Hill, however the soil profile is not made up of materials which would likely contribute to large landslides or mudflows.[23]

8.2.5 EROSION

Erosion occurs when the upper layers of soil are displaced by erosive agents such as water, ice, snow, air, plants, animals, or anthropogenic forces. Sandy soils on moderate slopes, or clayey soils on steep slopes are susceptible to erosion when exposed to these forces. Erosion can become more frequent when established vegetation is disturbed or removed due to grading, wildfires, or other factors.

As described in Section 8.2.1, Geology, the valley floors of the General Plan Planning Area are largely flat, and erosion is not a common occurrence. Erosion can occur around agricultural lands, however soils associated with Prime Farmland are classified as having only a slight or moderate erosion potential.[24] The areas most subject to erosion are Park Hill and the outer banks of the San Benito River where sand and gravel have been mined.[25]

8.2.6 LAND SUBSIDENCE

Land subsidence is a human-induced hazard in which the over-extraction of groundwater causes the depression and caving in of soil deposits. Land subsidence is particularly common in areas with fine-grained sediments, such as silt and clay, in which water molecules are partly responsible for the strength of the soil. The over-extraction of groundwater thus causes these soils to shrink which results in sinkholes that may compromise building foundations, pavement, and infrastructure.[26]

Land subsidence has not been well documented within San Benito County, although valley deposits within the County are at risk of subsidence if groundwater over-extraction occurs. However, no cases of groundwater over-extraction have been documented in the General Plan Planning Area or the greater San Benito County.[27] The Gilroy-Hollister groundwater basin has been ranked as medium priority by the 2014 Sustainable Groundwater Management Act from the State of California. Medium priority basins are those which have statewide importance but that have not been critically over-extracted.[28]

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[23] City of Hollister, March 2016, Draft Environmental Impact Report North Street Subdivision, State Clearinghouse No. 2014121066, page 3-104 and 3-117.

[24] City of Hollister, 2005, General Plan Final Program EIR, page 4.11-1.

[25] City of Hollister, 2005, General Plan Final Program EIR, page 4.10-24.

[26] U.S. Geological Survey, Land Subsidence, https://www.usgs.gov/special-topic/water-science-school/science/land-subsidence?qt-science_center_objects=0#qt-science_center_objects, accessed on April 30, 2020.

[27] County of San Benito, March 2015, 2035 San Benito County General Plan Update, State Clearinghouse No. 2011111016, page 10-13 and 10-35.

[28] City of Hollister, October 2017, Chappell Road Project Final Environmental Impact Report Appendix B, State Clearinghouse No. 2016101044, page 3.6-4.

8.2.7 EXPANSIVE SOILS

Soils classified as expansive are those which change dramatically in volume depending on moisture content. When wet, these soils expand; conversely, when dry, these soils contract. Sources of moisture that trigger an expansion include rainfall, landscape irrigation, utility leakage, and perched groundwater. Expansive soils are typically very fine-grained with a high to very high percentage of clay, typically montmorillonite, smectite, or bentonite clay. Soil tests are often used to identify expansive soils, wherein a soil samples volume and length changes in response to reduced moisture content.[29] A change of 3 percent or greater indicates a moderate to high shrink-swell potential. Such soils are known to cause damage to concrete slabs, structure foundations, and pavement. Areas which have expansive soils must often implement special building and structure design which can withstand such a fluctuation in soil.

There are clay deposits in the northern portion of the General Plan Planning Area, which are known to swell and contract during moisture events.[30] However, as described in Section 8.2.2, Soils, soils in the General Plan Planning Area are predominantly well-draining soils that are not known to be expansive in nature.

8.2.8 PALEONTOLOGICAL RESOURCES

As discussed in Section 8.2.1, Geology, the Hollister Valley is underlain with the San Benito Formation, a thick layer of alluvial sediments which are drained from other locations in the surrounding region and deposited into low-lying lands. The alluvial deposits in the Hollister Valley have been recorded to contain several megafauna vertebrate fossils, extracted from the upper portion of the San Benito Formation. The fossils have been located specifically in areas where tectonic plate movement forces the San Benito Formation into pressure ridges, which occurs when lateral tectonic movements force sub-surface sediment to rupture to the surface. Discoveries specifically from the upper San Benito Formation include an elephant scapula, a Mammoth tooth, Columbian mammoth (*Mammuthus columbi*), ancient bison (*Bison antiquus*), camel (*Camelops hesternus*), and western horse (*Equus occidentalis*), along with various invertebrate fossils such as teeth and large vertebrate bones. Recent fault investigations have uncovered additional megafauna vertebrate fossils such as gastropod fossils (clams), and vertebrate bones from various mammals including the giant ground sloth (*Megalonyx jeffersonii).* These fossil discoveries suggest that the upper layers of the San Benito Formation were formed in the Middle to Late Pleistocene, generally characterized as between 240,000 and 11,000 years before present.[31] It is anticipated that due to the rich geologic past within the Hollister Valley, there may be significant paleontological resources in alluvial clay deposits which have not been unearthed.

[29] Army Corps of Engineers Field Manual TM 5-818-7, 1985, https://www.wbdg.org/FFC/ARMYCOE/COETM/ARCHIVES/tm_5_818_7.pdf, accessed on April 30, 2020.
[30] City of Hollister, 2005, General Plan Final Program EIR, page 4.9-6.
[31] City of Hollister, July 2017, Design Level Geologic and Geotechnical Evaluation of the Allendale Residential Subdivision North of North Street, page 16.

8.3 IMPLICATIONS FOR THE GENERAL PLAN UPDATE

Based on the information contained in this chapter, the General Plan Update process should consider addressing the following issues:

- Monitor compliance with the necessary setbacks from active faults, including the San Andreas, the Quien Sabe, and the Calaveras Faults. The setbacks, set by the Alquist Priolo Earthquaky Fault Zone Act, prohibit construction from occurring within 50 feet of an active fault.
- Require the reinforcement of URM buildings.
- Require geotechnical reports on all sites, particularly sites located in downtown Hollister located within 50 feet of the Calaveras Fault line, and sites located in high liquefaction zones on either side of the San Benito River.
- Examine planning best practices regarding infrastructure instability and damage due to aseismic creep.

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