3.10 Geology and Soils

This section describes the geologic and seismic setting of the Project Site, including regional and local geology, soils, and groundwater, as well as the regulatory framework relevant to the Willow Village Master Plan Project (Proposed Project). The potential environmental effects of the Proposed Project related to geology and soils are also described. The impacts examined include risks related to geologic hazards, such as earthquakes, landslides, liquefaction, and expansive soils, as well as impacts on the environment related to erosion and sedimentation. This section identifies project-level and cumulative environmental impacts and explains how compliance with existing applicable regulations and General Plan and M-2 Area Zoning Update (ConnectMenlo) Environmental Impact Report (EIR) mitigation measures would reduce or avoid the identified impacts. Two geotechnical feasibility investigations were prepared for the Project Site.[1,2] The information and conclusions from these documents are incorporated into this section. Additional information was obtained from government agency websites and publications.

No Project-specific issues were identified in response to the Notice of Preparation (Appendix 1).

Existing Conditions

Environmental Setting

Regional Setting

Geology

The Project Site is situated on the San Francisco Peninsula, which separates San Francisco Bay (Bay) from the Pacific Ocean. The San Francisco Peninsula is a ridge of rocks and sediments in the Santa Cruz Mountains portion of the Coast Ranges geomorphic province,[3] which forms a rugged barrier between the Pacific Coast and inland California.[4] The relatively flat-lying plain is bounded by the Santa Cruz Mountains to the west and the Bay to the east.

The Coast Ranges geomorphic province stretches from the Oregon border to nearly Point Conception in California. In the San Francisco Bay Area, most of the Coast Ranges developed on a basement of tectonically mixed Cretaceous- and Jurassic-age (i.e., 70- to 200-million-year-old) rocks of the Franciscan Complex. Locally, younger sedimentary and volcanic units cap these basement rocks. Still younger surficial deposits that reflect geologic conditions from the last million years or so cover most of the Coast Ranges.

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1 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California.* (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

2 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California.* (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

3 Geomorphic provinces are naturally defined geologic regions that display a distinct landscape or landform.

4 California Geological Survey. 2002. *California Geomorphic Provinces*. California Department of Conservation. (California Geological Survey Note 36.) Available: https://www.conservation.ca.gov/cgs/Documents/Publications/CGS-Notes/CGS-Note-36.pdf. Accessed: March 19, 2021.

Movement on the many splays of the San Andreas fault system has produced the dominant northwest-oriented structural and topographic trend seen throughout the Coast Ranges today. This trend reflects the boundary between two of Earth's major tectonic plates, the North American plate to the east and the Pacific plate to the west. The San Andreas fault system, as well as its associated major branches, is about 40 miles wide in the Bay Area, extending from the San Gregorio fault near the coast to the Coast Ranges-Central Valley blind thrust at the western edge of the Great Central Valley. The San Andreas fault is the dominant structure in the system, spanning nearly the length of California and capable of producing high-magnitude earthquakes. Many subparallel or branch faults within the San Andreas system are equally active and nearly as capable of generating large earthquakes. Right-lateral movement dominates the activity on these faults, but an increasingly large amount of thrust faulting resulting from compression across the system is now being identified as well.

Faults and Earthquake Magnitude

The faults that are considered capable of generating significant earthquakes are generally associated with well-defined areas of crustal movement, which trend northwesterly. Table 3.10-1 presents the large regional faults near the Project Site (see also Figure 3.10-1, Active Faults in the Project Area) as well as their maximum credible earthquake magnitude, expressed in moment magnitude (MM) (described in more detail below under *Earthquake Magnitude*).

Table 3.10-1. Regional Faults within 15 Miles of the Project Site, Distance from Project Site, and Maximum Credible Earthquake Magnitude

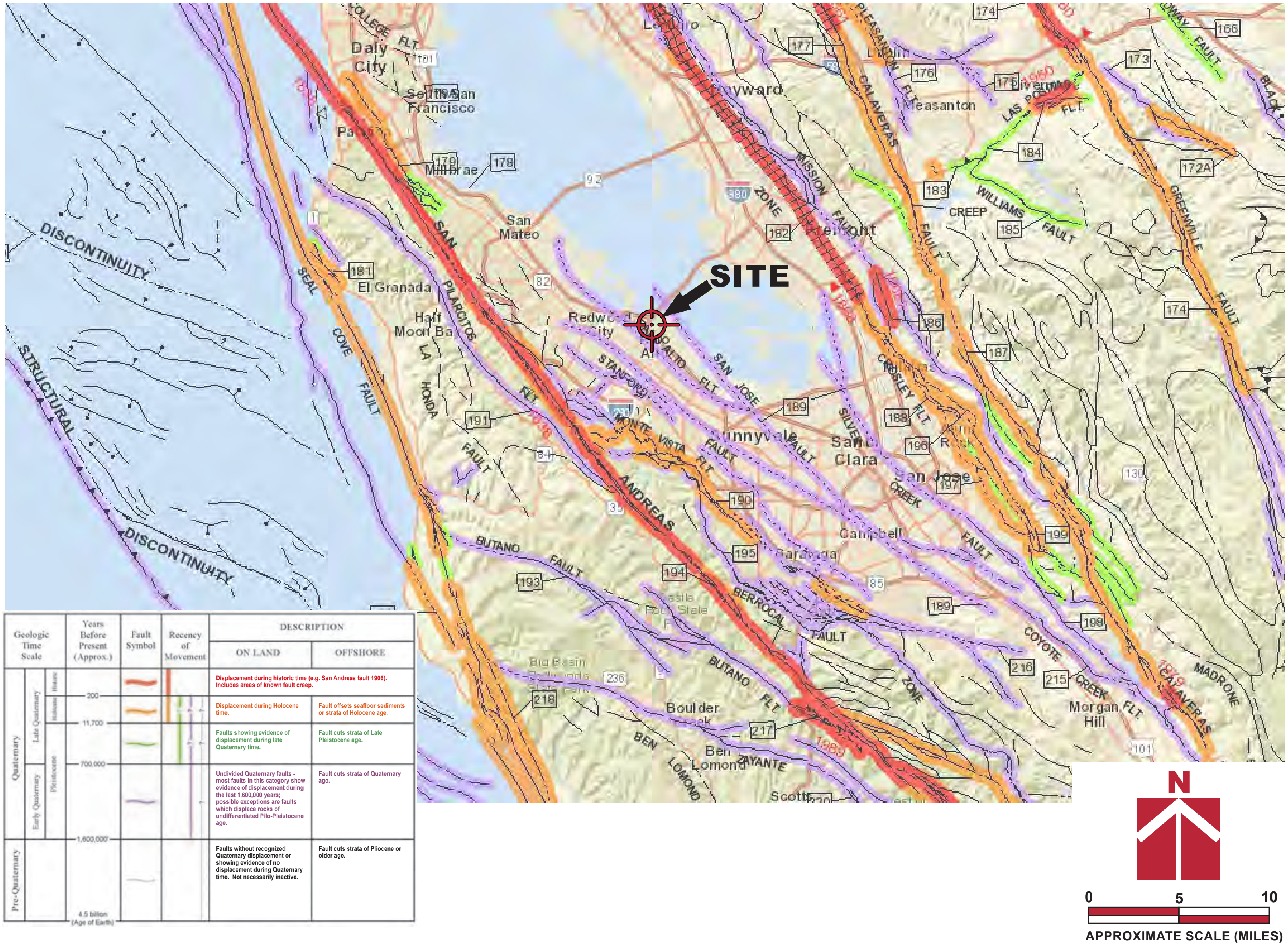
Fault[a]	Distance (miles)[a]	Maximum Credible Earthquake Magnitude (MM)
Monte Vista-Shannon	6.1	6.2[b]
San Andreas (1906)	7.3	7.0–7.9[b]
Hayward (total length)	11.5	7.2[b, c]
Hayward (southeast extension)	13.9	Not available

Sources:
[a.] Cornerstone Earth Group, 2020
[b.] Mualchin, 1996
[c.] Anderson et al., 1982

Seismicity

The San Francisco Bay Area region is one of the most seismically active areas in the country. Although seismologists cannot predict earthquake events, the U.S. Geological Survey's Working Group on California Earthquake Probabilities[5] assesses the likelihood of earthquakes occurring in various regions of California. The estimated frequency of earthquakes around magnitude 6.7 is approximately one per 6.3 years within California and approximately one per 29 years within the Bay Area region. The likelihood that California will experience a magnitude 8 earthquake or larger in the next 30 years is about 7 percent. The likelihood that the San Francisco Bay Area will experience a magnitude 8 earthquake or larger in the next 30 years is about 4 percent.

[5] Working Group on California Earthquake Probabilities. 2015. *UCERF3: A New Earthquake Forecast for California's Complex Fault System.* U.S. Geological Survey, Southern California Earthquake Center, California Geological Survey, California Earthquake Authority. (USGS fs2015-3009.) Available: https://pubs.usgs.gov/fs/2015/3009/pdf/fs2015-3009.pdf. Accessed: March 19, 2021.



Base by California Geological Survey - 2010 Fault Activity Map of California (Jennings and Bryant, 2010)

ICF Graphics ... 00040.18 (4-8-2021) JC

ICF

Figure 3.10-1
Active Faults in the Project Area

Earthquake Magnitude

The classification of earthquakes is based on the amount of energy released, as measured by the Richter scale and the MM scale. Each whole magnitude number on these logarithmic scales represents a tenfold increase in the wave amplitude (earthquake size) generated by an earthquake as well as a 3.16-fold increase in energy released. Therefore, a magnitude 6.3 earthquake is 10 times larger than a magnitude 5.3 earthquake and releases 3.16 times more energy. The Working Group on California Earthquake Probabilities estimates that there is an 72 percent probability for one more MM 6.7 earthquakes or greater occurring in the Bay Area between 2015 and 2045.

Earthquake Intensity and Ground Shaking

The intensity of seismic shaking (ground shaking) or strong ground motion during an earthquake depends on the distance and direction between a particular area and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the area. The Modified Mercalli Intensity scale is used to describe the intensity of an earthquake.[6] The scale relates an earthquake to its effects on humans, nature, and human-made structures using a scale of I through XII, with I denoting a weak earthquake and XII an earthquake that causes almost complete destruction. Table 3.10-2 provides abbreviated definitions for the scale ratings. This scale is not employed by engineers when designing seismically resistant structures. The safety standards to which structures must be designed are set forth in the California Building Standards Code and take into account numerous factors and criteria. However, the Modified Mercalli Intensity scale is useful in describing earthquake effects for the general public and can serve to interpret earthquake magnitude qualitatively.

Earthquakes occurring on faults that traverse Menlo Park and adjacent jurisdictions would probably generate the strongest ground motions. An earthquake along the entire San Andreas fault (closest approach to the Project Site is 7.3 miles) is considered capable of generating an MM 7.8 earthquake (similar to the 1906 San Francisco earthquake). An earthquake of this magnitude would generate strong to very strong ground shaking (Modified Mercalli Intensity VIII or IX) at the Project Site.[7] Ground shaking of this intensity could result in damage to buildings and trigger ground failures, such as liquefaction, potentially resulting in foundation damage, disruption of utilities, and roadway damage. The Association of Bay Area Governments (ABAG) projects that the overall ground shaking expected in Menlo Park from earthquake faults in the Bay Area region would be strong to very strong (Modified Mercalli Intensity VIII or IX).[8]

Hydrogeology

The Project Site is near the boundary between major units of two alluvial deposits, as defined by the California Department of Water Resources: the San Francisquito Cone and the Niles Cone. San Francisquito Cone deposits are derived from the Santa Cruz Mountains to the southwest; Niles Cone

[6] U.S. Geological Survey. 1989. *The Severity of an Earthquake*. Available: https://pubs.usgs.gov/gip/earthq4/severitygip.html. Accessed: March 19, 2021. Last Revised: November 30, 2016.

[7] Metropolitan Transportation Commission and Association of Bay Area Governments. n.d. *MTC/ABAG Hazard Viewer Map.* Earthquake Shaking Scenario: San Andreas Fault (all northern segments). Last updated: 2012.Available: https://mtc.maps.arcgis.com/apps/webappviewer/index.html?id=4a6f3f1259df42eab29b35dfcd086fc8. Accessed: March 19, 2021.

[8] Association of Bay Area Governments. 2021. *Probabilistic Seismic Hazard Assessment*. March 31, 2021. Available: https://mtc.maps.arcgis.com/apps/webappviewer/index.html?id=4a6f3f1259df42eab29b35dfcd086fc8. Accessed: September 16, 2021.

Table 3.10-2. Modified Mercalli Intensity Scale

Scale Rating	Description
I	Not felt, except by very few under especially favorable conditions.
II	Felt by persons at rest, especially on upper floors. Delicately suspended objects may swing.
III	Felt quite noticeably by persons while indoors, especially on the upper floors of buildings. Many people do not recognize the event as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck.
IV	Felt indoors by many; felt outdoors by few during the day. At night, some are awakened. Dishes, windows, doors disturbed; walls make cracking sounds. Sensation like that of a heavy truck striking a building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many are awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, with many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate damage in well-built ordinary structures. Considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary buildings, with partial collapse. Damage great in poorly built structures. Chimneys, factory stacks, columns, monuments, walls may fall. Heavy furniture is overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed along with foundations. Rails bent.
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: U.S. Geological Survey, 1989

deposits are derived from the Diablo Range along the northeast boundary of the Bay.[9] The unconsolidated materials in both units consist of four hydrogeologic zones: shallow aquifer, aquitard, deep aquifer, and the sediments below the deep aquifer. The shallow aquifer zone ranges in depth from 5 to approximately 100 feet below the ground surface (bgs). The shallow aquifer zone consists of silt and clay with low permeability that has interbedded with high-permeability, coarse-grained channel deposits.

The Project Site lies within the San Mateo Plain Groundwater Basin[10]—specifically, in the South San Mateo Plain Groundwater Subbasin.[11] The upper aquifer is encountered at depths of approximately 120 feet bgs, and the deep aquifer is encountered at 200 to 400 feet bgs.

[9] Regional Water Quality Control Board, San Francisco Bay Region. 2003. *A Comprehensive Groundwater Protection Evaluation for the South San Francisco Bay Basins.* Available: https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/groundwater/southbayreport.pdf. Accessed: March 19, 2021.

[10] County of San Mateo Office of Sustainability. 2021. *Groundwater*. Available: https://www.smcsustainability.org/energy-water/groundwater/. Accessed: September 16, 2021.

[11] Regional Water Quality Control Board, San Francisco Bay Region. 2003. *A Comprehensive Groundwater Protection Evaluation for the South San Francisco Bay Basins.* Available: https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/groundwater/southbayreport.pdf. Accessed: March 19, 2021.

Project Site

Site Geology

The main Project Site,[12] Hamilton Avenue Parcels North and South,[13] and Willow Road Tunnel[14] are in an area adjacent to the Bay where Holocene-age (11,000 years or less before present [BP]) alluvial fan deposits account for the majority of Quaternary sediment deposited in this area (see Figure 3.10-2, Geologic Units Present at the Project Site). According to mapping, the main Project Site is underlain by fine-grained alluvium of Holocene age (Qaf).[15] This alluvial sediment was shed from the northwest-trending Santa Cruz Mountains. Hamilton Avenue Parcels North and South are underlain by fine-grained Quaternary alluvium of Holocene age— specifically, alluvial fan deposits, fine facies (Qhff).[16] Willow Road Tunnel is underlain by artificial fill, most likely associated with construction of State Route 84 and Willow Road. The artificial fill is underlain by Holocene-age basin deposits and Bay Mud, according to geologic mapping.[17] However, exploration to 120 feet bgs did not encounter Bay Mud.[18]

Site Surface and Subsurface Conditions

Pavement at the main Project Site generally consists of 3 to 12 inches of asphalt concrete over 4 to 12 inches of aggregate base.[19] Below the pavement, some subsurface explorations encountered undocumented fill, consisting of very stiff, sandy fat clays; very stiff to hard sandy lean clays; and loose to medium-dense clayey sands. Variable amounts of gravel were also encountered within the fill, extending to depths of about 11.5 feet below the existing grades. Stiff to hard surficial clays were generally encountered within the western portion of the main Project Site; these highly to very highly expansive clays extended to depths of 3 to 8 feet. The surficial soils in the eastern portion generally consisted of stiff to very stiff lean clays with variable amounts of sand.

Surface conditions at Hamilton Avenue Parcels North and South generally obscure soils because the parcels are extensively developed.[20] Based on site reconnaissance, artificial fills at the parcels are assumed to be non-engineered and can contain imported, man-made materials such as gravel, landscaping

[12] Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

[13] Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

[14] ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

[15] Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California.* (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

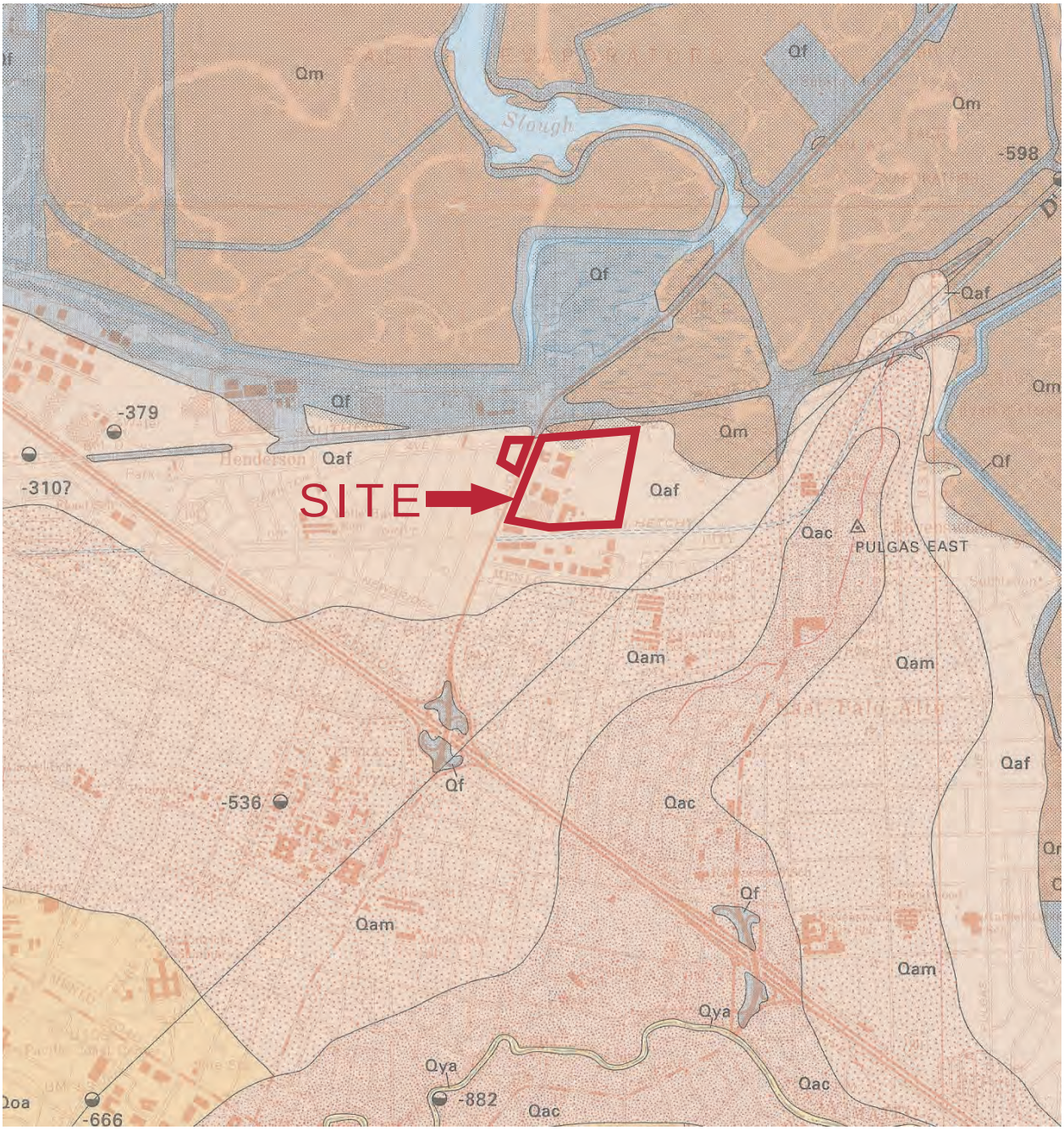
[16] Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

[17] ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

[18] Ibid.

[19] Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California.* (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

[20] Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.



Geologic Units

Qf	Artificial Fill (Holocene)
Qaf	Fine-grained Alluvium (Holocene)
Qam	Medium-grained alluvium (Holocene)
Qac	Coarse-grained alluvium (Holocene)
Qm	Bay Mud

Base by Earl H. Pampeyan, dated 1993, Palo Alto and Part of Redwood Point 7½′ Quadrangles.

Explanation

Contact- dashed where approximate, dotted where concealed

N

0 2000 4000

APPROXIMATE SCALE (FEET)

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ICF

Figure 3.10-2
Geologic Units Present at the Project Site

bark, and other materials. The thickness of the artificial fill is unknown but, based on observations of ground conditions around the site, probably less than 4 feet. Subsurface boring investigations at the Meta Platforms, Inc. (Meta), Campus, located approximately 300 feet north of Hamilton Avenue Parcel North, indicate that the subsurface profile beneath the surficial fill very likely consists of a layer of fat clays underlain by lean clays and interbedded sands. The fat clays at Hamilton Avenue Parcels North and South are expected to be in a stiff to hard and highly plastic.

Surface conditions at the Willow Road Tunnel site include 3 to 3.5 inches of asphalt over 8 to 12 inches of aggregate base material at the parking lot.[21] The northern end of the proposed tunnel alignment is currently occupied by a landscaped area. Field exploration indicates that the site is underlain by artificial fill, gravels, sands, silts and clays, and highly organic soils.[22] According to the boring logs, artificial fill occurs at 5 to 15 feet bgs.

Site Topography

The main Project Site is nearly flat, with grades ranging from about 6 to 11 feet North American Vertical Datum 1988 (NAVD 88).[23] Likewise, Hamilton Avenue Parcels North and South are nearly flat, with grades ranging from about 6 to 12 feet NAVD 88.[24,25,26] The Willow Road Tunnel site is also nearly flat.

Surface Fault Rupture

No known surface expression of fault traces cross the main Project Site,[27] Hamilton Avenue Parcels North and South,[28] or the Willow Road Tunnel site.[29] None of the sites lies in an Alquist-Priolo Earthquake Fault Zone, nor is either adjacent to any known active fault.

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21 ENGEO. 2021. *Geotechnical Data Report Addendum, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) December 16. Prepared for Meta, Menlo Park, CA. San José, CA.

22 ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

23 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California.* (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

24 Cornerstone Earth Group. 2019. *Phase I Environmental Site Assessment, Belle Haven Retail Center, 871–899 Hamilton Avenue, Menlo Park, California*. (Project Number 254-11-21.) June 10. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

25 Cornerstone Earth Group. 2018. *Phase I Environmental Site Assessment, 1401 Willow Road, Menlo Park, California*. (Project Number 254-11-15.) April 23. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

26 Cornerstone Earth Group. 2020. *Phase I Environmental Site Assessment, 1399 Willow Road, Menlo Park, California*. (Project Number 254-45-1.) October 13. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

27 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

28 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California.* (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

29 ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

Ground Shaking

Moderate to severe (i.e., design-level) earthquakes could cause strong ground shaking at the main Project Site, Hamilton Avenue Parcels North and South, and Willow Road Tunnel site.[30] A peak ground acceleration (PGA) of 0.537g[31] was estimated for the main Project Site,[32] which corresponds to severe intensity (i.e., Modified Mercalli Intensity VIII).[33] Strong ground shaking can be anticipated at Hamilton Avenue Parcels North and South and the Willow Road Tunnel site as well.[34,35]

Liquefaction

Liquefaction occurs when saturated soils lose cohesion, strength, and stiffness with applied shaking, such as that from an earthquake. The lack of cohesion causes solid soil to behave like a liquid, resulting in ground failure. When a load such as a structure is placed on ground that is subject to liquefaction, seismically related ground failure can result in the structure sinking and soil being displaced. Seismically related ground failure can take on many forms, including flow failures, lateral spreading, lowering of the ground surface, ground settlement, loss of bearing strength, ground fissures, and sand boils. Liquefaction within subsurface layers, which can occur during ground shaking associated with an earthquake, can also result in ground settlement.

The main Project Site, Hamilton Avenue Parcels North and South, and Willow Road Tunnel site are within a state-designated liquefaction zone.[36,37] Site-specific investigation supported this conclusion; several layers could experience liquefaction, resulting in 0.25 to 2 inches of post-liquefaction settlement at the main Project Site.[38] Conditions are anticipated to be similar at Hamilton Avenue Parcels North and South and the Willow Road Tunnel site because of proximity to the main Project Site.

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30 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

31 "g" is the standard acceleration due to Earth's gravity. Peak ground acceleration is expressed in fractions of g as a decimal or percentage.

32 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California.* (Project Number 254-11-7.) May 27.

33 U.S. Geological Survey. n.d. *ShakeMap Scientific Background*. Available: https://earthquake.usgs.gov/data/shakemap/background.php. Accessed: March 19, 2021.

34 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

35 ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

36 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

37 California Geological Survey. 2006. *Earthquake Zones of Required Investigation*. Palo Alto Quadrangle. Available: https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/. Accessed: March 19, 2021.

38 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

Ground Rupture

Ground rupture can result from seismically induced liquefaction. Ground rupture occurs during seismic movement when the cap of non-liquefiable material overlying the liquefiable material is not adequate. Seismic ground shaking causes the liquefied sediments to break through the overlying non-liquefiable layer.[39] Significant ground deformation and settlement can result.

Site-specific investigation at the main Project Site identified several areas where the overlying non-liquefiable cap may be inadequate with respect to preventing liquefaction-induced ground rupture.[40] There is also potential for liquefaction-induced ground rupture at Hamilton Avenue Parcels North and South and the Willow Road Tunnel site because the sites are also subject to liquefaction.[41]

Lateral Spreading

Lateral spreading or lurching typically occurs as a form of horizontal displacement of relatively flat-lying material toward an open face such as an excavation, channel, or body of water. Generally, this movement is due to a failure along a weak plane and often associated with liquefaction. At the main Project Site, Hamilton Avenue Parcels North and South, and Willow Road Tunnel site, the liquefaction risk is high (see *Liquefaction*, above). However, because there are no significant steep open faces within 200 feet of the sites, the potential for lateral spreading to affect the sites is low.[42,43]

Landslide

Landslides occur when the stability of a slope changes from a stable to an unstable condition. The stability of a slope is affected by slope inclination, material type, moisture content, orientation of layering, and vegetative cover. In general, steeper slopes are less stable and therefore more susceptible to landslides than more gently inclined ones.

As discussed above under *Site Topography*, the main Project Site, Hamilton Avenue Parcels North and South, and the Willow Road Tunnel site are in an area that is nearly flat. Furthermore, the sites are not in an area that has been designated by the State of California as being subject to landslide.[44] Therefore, the risk of landslide at the Project Site is low.

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39 Ibid.

40 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

41 California Geological Survey. 2006. *Earthquake Zones of Required Investigation*. Palo Alto Quadrangle. Available: https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/. Accessed: March 19, 2021.

42 Ibid.

43 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

44 California Geological Survey. 2006. *Earthquake Zones of Required Investigation. Palo Alto Quadrangle*. Available: https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/. Accessed: March 19, 2021.

Soils at the Project Site

Soils at the Project Site are Urban Land, Urban Land-Orthents, cut-and-fill complex, 0 to 5 percent slopes, and Urban Land-Orthents, reclaimed complex, 0 to 2 percent slopes.[45] No native soils are present at the ground surface on the Project Site. Artificial fill was up to 11.5 feet in depth at the main Project Site, approximately 4 feet in depth at Hamilton Avenue Parcels North and South, and 5 to 15 feet in depth at the Willow Road Tunnel site.[46,47,48]

Compressible Surface Soils and Fills Leading to Settlement

Near-surface, compressible saturated clays are present locally and may be present at the main Project Site and Hamilton Avenue Parcels North and South.[49,50] Both short-term immediate compression settlement and long-term consolidation settlement could occur at the Project Site. The site-specific investigation for the main Project Site found that it would be feasible to support the proposed structures using either shallow foundations (e.g., spread footings, reinforced concrete mats, foundations over ground improvements) or deep foundations (e.g., driven or auger-cast piles).[51] No information is available regarding this issue at the Willow Road Tunnel site; however, because of its proximity to the other sites, the same conditions can be assumed.

Expansive Soils

Soils that contain a high clay content may shrink or expand under varying moisture conditions, resulting in structural damage to roads, foundations, and infrastructure. The main Project Site, Hamilton Avenue Parcels North and South, and Willow Road Tunnel Site are underlain by artificial fill and soils that are moderately to very highly expansive.[52,53]

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45 Natural Resources Conservation Service. 2021. *Web Soil Survey*. Custom Soil Report. Available: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed: April 8, 2021.

46 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

47 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California.* (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

48 ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

49 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

50 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California.* (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

51 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

52 Ibid.

53 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California.* (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

Groundwater

Groundwater was encountered during boring at depths ranging from about 8 to 16 feet bgs at the main Project Site, corresponding to elevations of 2 to -6 feet NAVD 88;[54] between 8 and 10 feet bgs at Hamilton Avenue Parcels North and South; and between 7 and 14 feet bgs at the Willow Tunnel site (2.5 to -3.4 feet NAVD 88).[55,56,57] High groundwater depths were estimated to be 5 feet bgs at the main Project Site,[58] 10 feet bgs at Hamilton Avenue Parcels North and South,[59] and 7 feet bgs at the Willow Road Tunnel site, based on maps of historic groundwater depths.[60] Fluctuations in groundwater levels may be due to variations in rainfall, irrigation practices, and other factors.

Paleontological Resources

Paleontological sensitivity is an indicator of the likelihood of a geologic unit to yield fossils, as defined and discussed below under *Methods for Analysis*. Unlike archaeological sites, which are narrowly defined, paleontological sites are defined by the entire extent (both areal and stratigraphic) of a geologic unit or formation. Once a unit is identified as containing vertebrate fossils, or other rare fossils, the entire unit is a paleontological site.[61] For this reason, the paleontological sensitivity of geologic units is described and analyzed broadly (referenced herein as the "study area") and not limited to jurisdictional boundaries.

The paleontological sensitivity of the geologic units exposed at the ground surface at the Project Site or underlying the Project Site is listed in Table 3.10-3 and shown in Figure 3.10-2. Following the table is a description of the geologic units exposed at the ground surface in the study area with the potential to contain fossils. Paleontological sensitivity is described further below.

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54 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

55 Cornerstone Earth Group. 2019. *Phase I Environmental Site Assessment, Belle Haven Retail Center, 871–899 Hamilton Avenue, Menlo Park, California.* (Project Number 254-11-21.) June 10. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

56 Cornerstone Earth Group. 2018. *Phase I Environmental Site Assessment, 1401 Willow Road, Menlo Park, California*. (Project Number 254-11-15.) April 23. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

57 ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

58 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

59 Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

60 ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

61 Society of Vertebrate Paleontology. 2010. *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources.* Available: https://vertpaleo.org/wp-content/uploads/2021/01/SVP_Impact_Mitigation_Guidelines.pdf. April 8, 2021.

Table 3.10-3. Paleontological Sensitivity of Geological Units at or Underlying the Main Project Site, Hamilton Avenue Parcels North and South, and Willow Road Tunnel Site

Symbol	Geologic Unit	Epoch	Paleontological Sensitivity	Notes
Af	Artificial fill	Historic	None	
Qaf	Fine-grained alluvium	Holocene (and potentially Pleistocene)[a]	High[a]	In most areas, unit is most likely too young to yield fossils.[b] However, recent research suggests that the Quaternary alluvium of the adjacent Santa Clara Valley, generally mapped as Holocene age, may be more paleontologically sensitive than previously recognized.[a] Furthermore, this geologic unit is most likely underlain by older Pleistocene-aged alluvium (Qoa), which has the potential to contain significant fossils.
Qhff	Alluvial fan deposits, fine facies	Holocene (and potentially Pleistocene)[a]	High[a]	In most areas, unit is most likely too young to yield fossils.[b] However, recent research suggests that the Quaternary alluvium of the adjacent Santa Clara Valley, generally mapped as Holocene age, may be more paleontologically sensitive than previously recognized.[a] Furthermore, this geologic unit is most likely underlain by older Pleistocene-aged alluvium (Qoa), which has the potential to contain significant fossils.
Qhbm	Bay mud	Holocene	Low	This unit is too young to yield fossils.
Qhfp	Floodplain deposits	Holocene	High[a]	In most areas, this unit is most likely too young to yield fossils.[b] However, recent research suggests that the Quaternary alluvium of the adjacent Santa Clara Valley, generally mapped as Holocene age, may be more paleontologically sensitive than previously recognized.[a] Furthermore, this geologic unit is most likely underlain by older Pleistocene-aged alluvium (Qoa), which has the potential to contain significant fossils.
Qoa	Older alluvium	Pleistocene	High[c]	Not exposed at the ground surface at the main Project Site, Hamilton Avenue Parcels North and South, or Willow Road Tunnel site.

Sources: Society of Vertebrate Paleontology 2010; Cornerstone Earth Group 2020a, 2020b, Maguire and Holroyd 2016.
Notes:
[a] Maguire and Holroyd, 2016.
[b] Geologic units younger than 5,000 years old are generally not considered old enough to contain fossils (Wagner et al., 1991).
[c] UCMP, 2021.

Quaternary Fine-Grained Alluvium (Qaf), Alluvial Fan Deposits, Fine Facies (Qhff), and Floodplain Deposits (Qhfp)

Quaternary fine-grained alluvium (Qaf) consists of unconsolidated, poorly sorted, plastic organic clay and silty clay in poorly drained interfluvial basins, usually at the margins of tidal marshlands.[62] This geologic unit contains modern vertebrate fossils.

Quaternary alluvial fan deposits, fine facies (Qhff), and floodplain deposits (Qhfp) consist of clay and silt depots with interbedded lobes of coarser alluvium.[63] These fine-grained alluvial fan and floodplain overbank deposits lie on very gently sloping portions of the alluvial fan or valley floor. Although these Holocene-aged deposits are generally considered too young to yield significant fossils, Pleistocene vertebrate fossils have been found from multiple localities across the adjacent Santa Clara Valley, including Palo Alto,[64] and farther north in San Mateo County. All of these fossil localities occur in units that have been mapped as surficial alluvial Holocene deposits. Radiocarbon dating of the mapped Holocene sediments where the Pleistocene remains were found shows Pleistocene age for two of these finds (11 and 30 feet below the modern ground surface); for the others, no dating was performed. Some of these finds may have washed down from the mountains and been deposited in Holocene waterways, but the two radiocarbon-dated finds most likely originated where they were found. These occurrences demonstrate that older sediments and fossils (greater than 10,000 years BP) occur at or very near the surface in these areas, particularly because the amount, association, and orientation of the fossils from these localities indicate that the sediments in which they occur have not been reworked through geologic or artificial processes. Accordingly, Pleistocene alluvium may be more widespread and shallower in the Santa Clara Valley and San Mateo County than was previously thought, and Pleistocene fossil resources are very likely present in this area in units mapped as Holocene alluvium. Documented vertebrate fossils include extinct species of mammoth, bear, horse, bison, and camel.

Because of the fossil discoveries in mapped Holocene sediments in adjacent Santa Clara County, Quaternary fine-grained alluvium (Qaf), alluvial fan deposits, fine facies (Qhff), and floodplain deposits (Qhfp) of Holocene age are considered to have high paleontological sensitivity.

Pleistocene Older Alluvium (Qoa)

Holocene-era geologic units at the main Project Site, Hamilton Avenue Parcels North and South, and Willow Road Tunnel site are very likely underlain by older late Pleistocene-aged alluvium (Qoa).[65] This older Pleistocene-aged alluvium is not exposed at the ground surface at the main Project Site,[66]

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62 Pampeyan, E.H. 1993. *Geologic Map of the Palo Alto and Part of the Redwood Point 7.5-minute Quadrangles, San Mateo and Santa Clara Counties, California.* (IMAP 2371.) U.S. Geological Survey. Available: https://pubs.er.usgs.gov/publication/i2371. Accessed: May 7, 2021.

63 Witter, R.C., K.L. Knudsen, J.M. Sowers, C.M. Wentworth, R.D. Koehler, and C.E., Randolph. 2006. *Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California* and *Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California, Part 3: Description of Mapping and Liquefaction Interpretation.* U.S. Geological Survey in cooperation with the California Geological Survey. (Open-File Report 2006-1037.) Available: https://pubs.usgs.gov/of/2006/1037/. Accessed: May 7, 2021.

64 Maguire, K.C., and P.A. Holroyd. 2016. Pleistocene Vertebrates of Silicon Valley (Santa Clara County, California). In *PaleoBios* 33:1–14, July 22, 2016. Available: https://escholarship.org/uc/item/3k43832x. Accessed: April 8, 2021.

65 Pampeyan, E.H. 1993. *Geologic Map of the Palo Alto and Part of the Redwood Point 7.5-minute Quadrangles, San Mateo and Santa Clara Counties, California*. (IMAP 2371.) U.S. Geological Survey. Available: https://pubs.er.usgs.gov/publication/i2371. Accessed: May 7, 2021.

66 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California.* (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

Hamilton Avenue Parcels North and South (Figure 3.10-2) or at the Willow Road Tunnel site.[67] The geologic unit consists of weathered, unconsolidated to moderately consolidated gravel, sand, and silt.[68] This unit consists largely of alluvial fan deposits. Vertebrate fossils have been retrieved from Pleistocene-aged sediments in San Mateo County.[69] These include fossils from the genus *Camelops* (camel) and *Equus* (horse).

Quaternary older alluvium (Qoa) of Pleistocene age is considered to have high paleontological sensitivity.

Regulatory Setting

Federal

National Earthquake Hazards Reduction Program

Federal laws codified in the United States Code Title 42, Chapter 86, were enacted to reduce risks to life and property from earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program. Implementation of these requirements is regulated, monitored, and enforced at the state and local level. Key regulations and standards are summarized below.

State

Alquist-Priolo Earthquake Fault Zoning Act

California's Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) (Public Resources Code [PRC] Section 2621 et seq.), originally enacted in 1972 as the Alquist-Priolo Special Studies Zones Act and renamed in 1994, is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the location of most types of structures intended for human occupancy[70] across the traces of active faults and strictly regulates construction in corridors along active faults (earthquake fault zones). It also establishes criteria for identifying active faults, giving legal weight to terms such as *active*, and establishes a process for reviewing building proposals for areas in and adjacent to earthquake fault zones.

Under the Alquist-Priolo Act, faults are zoned and construction along or across them is strictly regulated if they are "sufficiently active" and "well defined." A fault is considered sufficiently active if one or more of its segments or strands shows evidence of surface displacement during Holocene time (defined for

[67] Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

[68] Pampeyan, E.H. 1993. *Geologic Map of the Palo Alto and Part of the Redwood Point 7.5-minute Quadrangles, San Mateo and Santa Clara Counties, California*. (IMAP 2371.) U.S. Geological Survey. Available: https://pubs.er.usgs.gov/publication/i2371. Accessed: May 7, 2021.

[69] University of California Museum of Paleontology. 2021. *Advanced Specimen Search: San Mateo County*. Available: https://ucmpdb.berkeley.edu/advanced.html. Accessed: May 5, 2021.

[70] Under the Alquist-Priolo Act, a structure for human occupancy is defined as one used for or intended to support or shelter any use or occupancy that is expected to have a human occupancy rate of more than 2,000 person-hours per year (California Code of Regulations, Title 14, Division 2, Section 3601[e]).

the purposes of this act as approximately the last 11,000 years). A fault is considered well defined if its trace can be clearly identified by a trained geologist as a physical feature at the ground surface or in the shallow subsurface.[71]

Seismic Hazards Mapping Act

Similar to the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (PRC Sections 2690–2699.6) is intended to reduce damage resulting from earthquakes. Although the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake hazards, including strong ground shaking, liquefaction, and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act. The state is charged with identifying and mapping areas that are at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and cities and counties are required to regulate development within mapped seismic hazard zones.

A primary purpose of the Seismic Hazards Mapping Act is to assist cities and counties in preparing the safety elements of their general plans and encourage land use management policies and regulations that reduce seismic hazards. The intent of this act is to protect the public from the effects of strong ground shaking, liquefaction, landslides, ground failure, or other hazards caused by earthquakes. Under the Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites within seismic hazard zones until appropriate site-specific geologic or geotechnical investigations have been carried out and measures to reduce potential damage have been incorporated into development plans. In addition, California Geologic Survey *Special Publication 117A*, Guidelines for Evaluating and Mitigating Seismic Hazards in California, provides guidance for evaluating earthquake-related hazards in designated zones and for recommending mitigation measures, as required by PRC Section 2695(a).[72] Maps of liquefaction hazards have been prepared for much of the San Francisco Bay Area, including the Menlo Park area.

California Building Standards Code

California Code of Regulations (CCR) Title 24, Part 2, the California Building Standards Code, provides minimum standards for building designs in the state. The current 2019 California Building Standards Code, effective January 1, 2020, is based on the 2018 International Building Code.

Each jurisdiction in California may adopt its own building code, based on the 2019 California Building Standards Code. Local codes are permitted to be more stringent than the 2019 California Building Standards Code but, at a minimum, are required to meet all state standards and enforce the regulations of the 2019 California Building Standards Code, beginning January 1, 2020. The City of Menlo Park (City) has adopted the 2019 California Building Standards Code and local amendments.

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[71] California Geological Survey. 2018. Earthquake Fault Zones: A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California. In *Special Publication 42*. Available: https://www.conservation.ca.gov/cgs/Documents/Publications/Special-Publications/SP_042.pdf. Accessed: March 8, 2021.

[72] California Geological Survey. 2008. *Guidelines for Evaluating and Mitigating Seismic Hazards in California.* (Special Publication 17A.) Available: https://www.conservation.ca.gov/cgs/Documents/Publications/Special-Publications/SP_117a.pdf. Accessed: March 8, 2021.

National Pollutant Discharge Elimination System Construction General Permit

Under the Authority of the federal Clean Water Action, Section 402 (National Pollutant Discharge Elimination System [NPDES]), the State Water Resources Control Board (State Water Board) permits all regulated activities under Order No. 2009-0009-DWQ, as amended by 2010-0014-DWQ and 2012-0006-DWQ (adopted September 2, 2009), which requires, prior to beginning any construction activities, the permit applicant to obtain coverage under the Construction General Permit by preparing and submitting a Notice of Intent to the State Water Board and preparing and implementing a Stormwater Pollution Prevention Plan (SWPPP), in accordance with Construction General Permit requirements, for all construction activities that disturb 1 acre of land or more. Construction activities that are subject to the Construction General Permit include clearing, grading, and disturbances to the ground, such as stockpiling or excavation, that result in soil disturbances of at least 1 acre of the total land area. The SWPPP has two major objectives, (1) to help identify the sources of sediment and other pollutants that affect the quality of stormwater discharges and (2) to describe and ensure the implementation of best management practices (BMPs) to reduce or eliminate sediment and other pollutants in stormwater as well as non-stormwater discharges (refer to Section 3.11, *Hydrology and Water Quality*, for additional information on the Construction General Permit and the SWPPP).

California Department of Transportation

Caltrans Encroachment Permits: Guidelines and Specifications for Trenchless Technology Projects specifies guidelines for tunnel construction, including California Division of Occupational Safety and Health (Cal/OSHA) requirements; excavation; dewatering; the construction and placement of pits and shafts; grouting; and the use of materials for both structural and substructural designs and calculations.[73] The guidelines outline the project owner's responsibilities and the contractor's responsibilities. The project owner is responsible for providing a third-party, full-time inspector, if required by the California Department of Transportation (Caltrans); a full-time safety engineer; and a full-time safety representative. The contractor is responsible for submitting information prior to issuance of the Caltrans permit, including proof of experience; tunnel support-system plans, calculations, materials, methods of construction, and related technical specifications; a working schedule; contingency plan; soil stability reports; and dewatering plans.

California Code of Regulations 14, Section 15064.5

California Code of Regulations 14, Section 15064.5, sets forth criteria for determining whether a project would change the significance of a historical resource, including a resource that "has yielded, or may be likely to yield, information important in prehistory," including paleontological resources. This section also describes what constitutes an impact on historical resources, including "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings" such that its historical significance is materially impaired. If a significant adverse change in the significance of a resource would result from project implementation, the lead agency must identify and implement feasible mitigation to mitigate or avoid that significant adverse change.

[73] California Department of Transportation. 2018. *Caltrans Encroachment Permits: Guidelines and Specifications for Trenchless Technology Projects.* August. Available: https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/trenchless-booklet-a11y.pdf. Accessed: September 16, 2021.

Local

San Mateo Countywide Water Pollution Prevention Program's C.3 Stormwater Technical Guidance

The purpose of the *C.3 Stormwater Technical Guidance* is to ensure that projects include post-construction stormwater controls to meet local municipal requirements as well as requirements in the Municipal Regional Stormwater Permit.[74] The guidance offers instructions regarding how to incorporate stormwater control/low-impact development designs into planning permit and building permit application submittals, stormwater treatment measures, requirements for hydromodification management measures, operation and maintenance requirements, and the alternative compliance provision of the Municipal Regional Stormwater Permit, which allows projects to contribute to offsite alternative compliance projects.

Menlo Park Municipal Code

The City has adopted the 2019 California Building Standards Code (Section 12.04.010[2], Menlo Park Municipal Code).

Menlo Park General Plan

The City General Plan consists of the Open Space/Conservation, Noise, and Safety Elements, adopted May 21, 2013; the 2014–2023 Housing Element, adopted by the City on April 1, 2014; and the Circulation and Land Use Elements, adopted November 29, 2016. The Land Use Element contains the following policy related to geologic hazards and the Proposed Project:[75]

> **Policy LU-7.7: Hazards**. Avoid development in areas with seismic, flood, fire, and other hazards to life or property when potential impacts cannot be mitigated.

The Safety Element contains the following policies related to geologic, seismic, and soil hazards.[76]

> **Policy S1.2: Location of Public Improvements**. Avoid locating public improvements and utilities in areas with identified flood, geologic, and/or soil hazards to avoid any extraordinary maintenance and operating expenses. When the location of public improvements and utilities in such areas cannot be avoided, ensure that effective mitigation measures will be implemented.
>
> **Policy S1.3: Hazard Data and Standards**. Integrate hazard data (geotechnical, flood, fire, etc.) and risk evaluations into the development review process and maintain, develop, and adopt up-to-date standards to reduce the level of risk from natural and human-caused hazards for all land uses.
>
> **Policy S1.5: New Habitable Structures**. Require that all new habitable structures incorporate adequate hazard mitigation measures to reduce identified risks from natural and human-caused hazards.

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[74] San Mateo Countywide Water Pollution Prevention Program. 2014. *C.3 Stormwater Technical Guidance.* October. Version 4.1. Available: https://www.menlopark.org/DocumentCenter/View/10102/C3-Technical-guidance-handbook?bidId=. Accessed: September 16, 2021.

[75] City of Menlo Park. 2016. *ConnectMenlo General Plan Land Use Element*. (Adopted November 29, 2016.) Available: https://www.menlopark.org/DocumentCenter/View/15014/Land-Use-Element_adopted-112916_final_figures?bidId=. Accessed: March 8, 2021.

[76] City of Menlo Park. 2013. *City of Menlo Park General Plan Open Space/Conservation, Noise, and Safety Elements*. (Adopted May 21, 2013.) Available: https://www.menlopark.org/DocumentCenter/View/234/Open-Space-and-Conservation-Noise-and-Safety-Elements?bidId=. Accessed: March 19, 2021.

Policy S1.6: Design and Location of Utilities. Monitor appropriate location, design, construction, maintenance, and inspection standards for utility systems traversing hazard areas within the city limits. This would include evaluating and upgrading outdated systems and infrastructure, coordinating with the California Public Utilities Commission, and locating new utility systems away from potential hazard areas.

Policy S1.7: Hazard Reduction. Continue to require new development to reduce the seismic vulnerability of buildings, as well as their susceptibility to other hazards, through enforcement of the California Building Standards Code and other programs.

Policy S1.13: Geotechnical Studies. Continue to require site-specific geologic and geotechnical studies for land development or construction in areas of potential land instability, as shown on the state and/or local geologic hazard maps or identified through other means.

Policy S1.14: Potential Land Instability. Prohibit development in areas of potential land instability, as identified on state and/or local geologic hazard maps or identified through other means, unless a geologic investigation demonstrates that hazards can be mitigated to an acceptable level, as defined by the State of California.

The Open Space and Conservation Element of the City General Plan contains two policies related to paleontological resources.[77]

Policy OSC3.3: Archaeological or Paleontological Resources Protection. Protect prehistoric or historic cultural resources, either onsite or through appropriate documentation, as a condition of removal. When a development project has sufficient flexibility, require avoidance or preservation of the resources as the primary form of mitigation, unless the City identifies superior mitigation. If resources are documented, undertake coordination with descendants and/or stakeholder groups, as warranted.

Policy OSC3.4: Prehistoric or Historic Cultural Resources Found during Construction. If cultural resources, including archaeological or paleontological resources, are uncovered during grading or other onsite excavation, require construction to stop until appropriate mitigation is implemented.

City of Menlo Park Engineering Division Grading and Drainage Control Guidelines

The City published guidelines for commercial, multi-family, and subdivision grading and drainage.[78] All projects that create and/or replace 10,000 square feet or more of impervious surfaces, including roof areas and pavement, must adhere to the guidelines. The purpose of the guidelines is to limit post-development stormwater discharges to pre-development discharge levels, or less; control pollutants from stormwater runoff using San Mateo County's *C.3 Stormwater Technical Guidance* criteria; ensure that projects meet the requirements of NPDES Municipal Regional Stormwater Permit CAS612008; and ensure that the drainage design prevents erosion and vectors.

[77] Ibid.

[78] City of Menlo Park. n.d. *Commercial, Multi-Family, and Subdivision Grading and Drainage Guidelines*. Available: https://www.menlopark.org/DocumentCenter/View/10104/Commercial-Drainage-Guidelines?bidId=. Accessed: September 16, 2021.

Environmental Impacts

This section describes the impact analysis related to geology and soils for the Proposed Project. It describes the methods used to determine the impacts of the Proposed Project and lists the thresholds used to conclude whether an impact would be significant. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant impacts accompany each impact discussion, as necessary.

Thresholds of Significance

In accordance with Appendix G of the CEQA Guidelines, the Project would have a significant effect if it would result in any of the conditions listed below.

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving (1) 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; (2) strong seismic ground shaking; (3) seismically related ground failure, including liquefaction; or (4) landslides.
- Result in substantial soil erosion or the loss of topsoil.
- Be located on a geologic unit or soil that is unstable, or would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse.
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.
- Have soils that would be incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Methods for Analysis

Geology, Soils, and Seismicity

The preliminary geotechnical investigation for the main Project Site, the geotechnical consultation for Hamilton Avenue Parcels North and South, and the geotechnical data report for the Willow Road Tunnel site describe and evaluate geologic and geotechnical conditions at the sites to support preliminary planning and conceptual-level design during the initial phases of Project planning. The geotechnical investigations prepared for the Project Site provide a summary and compilation of the available geotechnical information that was used as part of the analysis of geologic, seismic, and geotechnical issues for the EIR.

Two geotechnical feasibility investigations were conducted for the Proposed Project.[79,80] The preliminary geotechnical investigation for the main Project Site included field and laboratory programs for evaluating surficial and subsurface soils, a summary of previously completed borings and cone penetration tests, and

[79] Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27.

[80] ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

a new exploratory program with borings.[81] The borings for the previously completed subsurface investigation were drilled to a depth of approximately 50 feet bgs. Cone penetration tests were advanced to depths of 50 to 120 feet bgs. Borings for the new exploratory program were drilled to a depth of approximately 15 feet bgs. In addition, borings were advanced to a depth of approximately 10 feet bgs; cone penetration tests were advanced to a depth of approximately 120 feet bgs at the Willow Road Tunnel site.[82]

The geotechnical consultation completed for Hamilton Avenue Parcels North and South included site reconnaissance, which provided a report on subsurface conditions at the nearby Meta Campus; a description of seismic, geologic, and soil hazards at the main Project Site; and preliminary identification of seismic, geologic, and soil impacts and mitigation measures.[83]

Design-level geotechnical studies would be completed during development of construction plans, in accordance with the 2019 California Building Standards Code and City building permit requirements.

Paleontological Resources

The standard procedures[84] of the Society of Vertebrate Paleontology (SVP) include guidelines for the investigation, collection, preservation, and cataloging of fossil-bearing sites, including the designation of paleontological sensitivity. The standard procedures are widely accepted among paleontologists and followed by most investigators. The procedures identify the two key phases of paleontological resource protection: (1) assessment and (2) implementation. Assessment involves identifying the potential for a project site or area to contain significant nonrenewable paleontological resources that could be damaged or destroyed by excavation or construction. Implementation involves formulating and applying measures to reduce such adverse effects.

For the assessment phase, SVP defines the level of potential as one of four sensitivity categories for sedimentary rocks: High, Undetermined, Low, or No Potential.[85]

- **High Potential.** Assigned to geologic units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered and sedimentary rock units that are suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstones; fine-grained marine sandstones). Paleontological potential concerns the potential for yielding abundant fossils, a few significant fossils, or recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data.
- **Undetermined Potential.** Assigned to geologic units for which little information is available concerning their paleontological content, geologic age, and depositional environment. In cases where no subsurface data already exist, paleontological potential can sometimes be assessed by subsurface site investigations.

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81 Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27.

82 ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

83 California Geological Survey. 2006. *Earthquake Zones of Required Investigation*. Palo Alto Quadrangle. Available: https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/. Accessed: March 19, 2021.

84 Society of Vertebrate Paleontology. 2010. *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources.* Available: https://vertpaleo.org/wp-content/uploads/2021/01/SVP_Impact_Mitigation_Guidelines.pdf. April 8, 2021.

85 Ibid.

- **Low Potential.** Field surveys or paleontological research may determine that a geologic unit has low potential with respect to yielding significant fossils (e.g., basalt flows). Mitigation is generally not required.
- **No Potential.** Some geologic units have no potential with respect to containing significant paleontological resources, such as high-grade metamorphic rocks (e.g., gneisses and schists) and plutonic igneous rocks (e.g., granites and diorites). Mitigation is not required.

The methods used to analyze potential impacts on paleontological resources and develop mitigation for identified impacts followed the SVP's standard procedures.

- Assessment
    - Identify the geologic units that would be affected by a project, based on the project's depth of excavation—either at the ground surface or below the ground surface, defined as at least 5 feet bgs.
    - Evaluate the potential of the identified geologic units to contain significant fossils (paleontological sensitivity).
    - Identify impacts on paleontologically sensitive geologic units as a result of near-term and long-term construction and operations that involve ground disturbance.
    - Evaluate impact significance.
- Implementation
    - According to the identified degree of sensitivity, formulate and implement measures to mitigate potential impacts.

The potential of the Proposed Project to affect paleontological resources relates to ground disturbance. Geologic units at the Project Site were identified through California Geological Survey regional mapping.[86] The determination regarding the presence of paleontological resources in the units was based on procedures established by the SVP[87] and fossil finds discussed in the scientific literature.[88] After the records search, the paleontological sensitivity of the units was assessed according to the SVP standard procedures.[89]

For purposes of this analysis, an impact on unique paleontological resources and unique geologic features is considered significant. The impact would therefore require mitigation if the Proposed Project would directly or indirectly destroy a unique paleontological resource or site or a unique geologic feature.

[86] Wagner, D.L., E.J. Bortugno, and R.D. McJunkin. 1991. *Geologic Map of the San Francisco-San José Quadrangle, California, 1:250,000.* (Regional Geologic Map Series, Map No. 5A [Geology].)

[87] Society of Vertebrate Paleontology. 2010. *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources.* Available: https://vertpaleo.org/wp-content/uploads/2021/01/SVP_Impact_Mitigation_Guidelines.pdf. April 8, 2021.

[88] Maguire, K.C., and P.A. Holroyd. 2016. Pleistocene Vertebrates of Silicon Valley (Santa Clara County, California). In *PaleoBios* 33:1–14, July 22, 2016. Available: https://escholarship.org/uc/item/3k43832x. Accessed: April 8, 2021.

[89] Society of Vertebrate Paleontology. 2010. *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources*. Available: https://vertpaleo.org/wp-content/uploads/2021/01/SVP_Impact_Mitigation_Guidelines.pdf. April 8, 2021.

Summary of Analysis in the ConnectMenlo EIR

Geology, Soils, and Seismicity

The ConnectMenlo EIR analyzed the impacts listed below that would result from implementing the updates to the Land Use and Circulation Elements and the M-2 Area Zoning Update.[90]

- Impacts related to strong seismic ground shaking, seismically related ground failure, and landslide were analyzed in the ConnectMenlo EIR as Impact GEO-1 (pages 4.5-9 to 4.5-11). It was determined that the impacts would be less than significant because future development, as part of the City's project approval process, would be required to comply with existing regulations, including General Plan policies to minimize impacts related to strong seismic ground shaking; seismically related ground failure, including liquefaction; or landslide and because the City would implement General Plan programs that would require ongoing review, identification, and the maintenance of maps and regulations related to geologic and seismic hazards. No mitigation was required.
- Impacts as a result of substantial soil erosion or loss of topsoil were analyzed in the ConnectMenlo EIR as Impact GEO-2 (page 4.5-11). It was determined that the impacts would be less than significant because future development, as part of the City's project approval process, would be required to comply with existing regulatory requirements, such as those specified in the City of Menlo Park Engineering Division Grading and Drainage Control Guidelines, which would reduce impacts from erosion and the loss of topsoil to the extent practicable. No mitigation was required.
- Impacts as a result of a location on a geologic unit or soil that is unstable or could become unstable with project implementation were analyzed in the ConnectMenlo EIR as Impact GEO-3 (pages 4.5-12 to 4.5-13). It was determined that the impacts would be less than significant because future development, as part of the City's project approval process, would be required to comply with existing regulations, including General Plan policies prepared to minimized impacts related to development on unstable geologic units and soils where lateral spreading, subsidence, liquefaction, or collapse could occur in the study area. In addition, the City would implement General Plan programs that would require ongoing review, identification, and the maintenance of maps and regulations related to geologic and seismic hazards. No mitigation was required.
- Impacts as a result of a location on expansive soils were analyzed in the ConnectMenlo EIR as Impact GEO-4 (page 4.5-13). It was determined that the impacts would be less than significant because future development, as part of the City's project approval process, would be required to comply with existing regulations, including General Plan policies prepared to minimized impacts related to development on expansive soil in the study area. In addition, the City would implement the General Plan programs that would require ongoing review, identification, and the maintenance of maps and regulations related to geologic and seismic hazards. No mitigation was required.
- Impacts as a result of a location on soils that would be incapable of adequately supporting the use of septic tanks or alternative wastewater systems were analyzed in the ConnectMenlo EIR as Impact GEO-5 (pages 4.5-13 to 4.5-14). It was determined that the impacts would be less than significant because development within the study area is not expected to require the use of septic tanks or alternative wastewater disposal systems. No mitigation was required.

[90] City of Menlo Park. 2016. *ConnectMenlo: General Plan Land Use and Circulation Elements and M-2 Zoning Update for the City of Menlo Park*. (June 1.) Prepared by Placeworks, Berkeley, CA. Menlo Park, CA. Available: https://www.menlopark.org/1013/Environmental-Impact-Report. Accessed: March 19, 2021.

Paleontological Resources

The ConnectMenlo EIR analyzed the following impacts that would result from implementation of the updates to the Land Use and Circulation Elements and the M-2 Area Zoning Update:[91]

- Impacts on unique paleontological resources or geologic features were analyzed in the ConnectMenlo EIR as Impact CULT-3 (pages 4.4-18 to 4.4-20). It was determined that the impacts would be less than significant with mitigation incorporated. Although the impacts could be potentially significant because geological formations underlying Menlo Park could contain paleontological resources, and ground-disturbing construction associated with future development allowed under the General Plan could reach depths below the ground surface at which paleontological resources could occur, implementation of ConnectMenlo Mitigation Measure CULT-3 would reduce the impact to less than significant. In the event that fossils or fossil-bearing deposits are discovered during ground-disturbing activities, Mitigation Measure CULT-3 would require excavations within a 50-foot radius of the find to be temporarily halted or diverted until a City-approved paleontologist can assess the significance of the find under the criteria set forth in CEQA Guidelines Section 15064.5. If the find meets the criteria set forth in CEQA Guidelines Section 15064.5 and avoidance is not feasible, the paleontologist would prepare an excavation plan to mitigate the effect of construction activities on the discovery.

Impacts Not Evaluated In Detail

As explained below, the Proposed Project would result in ***no impact*** related to surface fault rupture, landslides, loss of topsoil, lateral spreading, unique geologic features, or impacts on septic systems. Therefore, these impacts are not discussed further.

Surface Fault Rupture. No faults cross the main Project Site, Hamilton Avenue Parcels North and South, or the Willow Road Tunnel site, nor are the sites within an Alquist-Priolo Earthquake Fault Zone. The risk of surface fault rupture is negligible.

Landslides. The main Project Site, Hamilton Avenue Parcels North and South, and the Willow Road Tunnel site are nearly level. The sites are not adjacent to any hillsides where seismically induced landslides or other downslope movements of rock or soil material could pose a hazard. In addition, the Proposed Project would not cause or exacerbate landslide hazards.

Loss of Topsoil. Soils at the Project Site are Urban Land, Urban Land-Orthents, cut-and-fill complex, and Urban Land-Orthents, reclaimed complex, meaning that they are not native topsoil. Removing them for construction would not result in a loss of topsoil.

Lateral Spreading. Because there are no open faces or bodies of water adjacent to the main Project Site, Hamilton Avenue Parcels North and South, or the Willow Road Tunnel site that would be conducive to lateral spreading, there would be no risk of lateral spreading.

Unique Geologic Features. Because there are no unique geologic features at the main Project Site, Hamilton Avenue Parcels North and South, or the Willow Road Tunnel site, the Proposed Project would not affect a unique geologic feature.

Impacts on Septic Systems. The Proposed Project would not include septic tanks or leach field systems. Wastewater generated at the main Project Site would be disposed of through the existing sanitary sewer system. Although wastewater would be generated at the car wash and other commercial uses at Hamilton Avenue Parcels North and South, septic tanks or alternative wastewater disposal systems would not be

[91] Ibid.

used. No wastewater would be generated at the Willow Road Tunnel site. The Proposed Project would not require soils that would be capable of supporting septic systems.

Impacts and Mitigation Measures

Impact GS-1: Strong Seismic Ground Shaking and Seismically Related Ground Failure. The Proposed Project would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving (1) strong seismic ground shaking and (2) seismically related ground failure, including liquefaction. (LTS)

The Proposed Project would be located in a seismically active region. A list of faults of regional significance is provided in Table 3.10-1. Seismically induced ground shaking at the Project Site would depend on a number of factors, as follows:

- Size of the earthquake (magnitude),
- Distance from the Project Site to the fault rupture source,
- Directivity (focusing earthquake energy along a fault in the direction of a rupture), and
- Subsurface conditions.

Given the Project Site's proximity to the San Andreas fault (approximately 7.3 miles away), the Hayward fault (11.5 miles away), and other regional faults that are capable of producing a large earthquake, the potential exists for a large earthquake to induce strong to very strong ground shaking at the Project Site during the life of the Proposed Project. In addition, the Project Site is within a state-designated liquefaction zone.

As evidenced by the level of development throughout the Bay Area, successful building construction is possible in a seismically active zone and can be readily accomplished, even where seismic hazards are known to exist. The risks to public safety from seismic hazards can be mitigated to the extent required by law through proper designs and construction methods. The City monitors design and construction methods and enforces applicable laws through the building permit process. In addition, the City, along with other Bay Area jurisdictions, participates in a coordinated planning and emergency response program and has its own Emergency Operation Plan to respond to natural disasters.

The Proposed Project would be designed and constructed to meet standards set forth by the California Building Standards Code, in accordance with the Menlo Park Municipal Code. These standards are intended to reduce major structural damage and loss of life in the event of an earthquake. The seismic performance goals generally expect some property damage to be incurred in a moderate to large earthquake, but the damage would be reparable and not life threatening. In addition, adherence to Caltrans requirements would ensure that the Willow Road Tunnel would have the maximum practicable protection from seismic stresses. Furthermore, Policy S1.13 of the Safety Element requires site-specific geologic or geotechnical studies for construction in areas with potential land instability; Program S-1D requires potential geologic, seismic, and soil problems to be thoroughly investigated during the earliest stages of the design process; and Program S-1H requires a seismic risk analysis and adequate construction standards to be enforced.

The Proposed Project would be required to adhere to policies that would address and/or minimize geologic hazards in accordance with the specifications of California Geological Survey *Special Publication 117*, Guidelines for Evaluating and Mitigating Seismic Hazards, and the requirements of the Seismic Hazards Mapping Act. Therefore, the Proposed Project would have a ***less-than-significant*** impact

with regard to the exposure of people or structures to seismic ground shaking or liquefaction-related hazards, consistent with the ConnectMenlo EIR. No mitigation is required.

Impact GS-2: Substantial Soil Erosion. The Proposed Project would not result in substantial soil erosion. (LTS)

Construction. As discussed above, the Project Site is nearly level, and development on hillsides would not be required. Therefore, there would be no long-term topographic changes that would affect erosion potential. However, the Proposed Project would include demolition, excavation, grading, trenching for utility installations, and construction of the Willow Road Tunnel, which could result in accelerated erosion. Excavation would generate up to approximately 407,000 cubic yards (cy) of excavated soil, of which approximately 171,000 cy of would be disposed of offsite. In addition, approximately 123,000 cy of demolition waste would be disposed of offsite at a landfill. Removal of the concrete and asphalt currently onsite would expose previously sheltered soils to the elements as well as construction activities on the site, which could accelerate erosion rates. However, as described in Section 3.11, *Hydrology and Water Quality*, all construction activities would comply with the existing NPDES Construction General Permit, which contains standards that ensure that water quality would not be degraded.

As required by the Construction General Permit requirements, standard erosion control measures and BMPs would be identified in the SWPPP and implemented during construction to reduce sedimentation in waterways and any loss of topsoil. The BMPs would also minimize erosion and runoff during construction. BMPs could include, but would not be limited to, using drainage swales or lined ditches to control stormwater flows and protecting storm drain inlets with gravel bags or catch basin inserts. The impact related to erosion during Project construction would be ***less than significant***, consistent with the ConnectMenlo EIR. No mitigation is required.

Operation. After construction, the Project Site would be developed with buildings, parking areas, roadways, bicycle and pedestrian paths, open space areas, landscaping, and hardscape. Project Site runoff would be managed by a combination of low-impact development strategies, which could include bioretention areas, flow-through planters, permeable paving, rain gardens, and/or vegetated swales. As part of an integrated approach to stormwater management, consistent with City and County of San Mateo requirements, streetscapes, parks, and open spaces would employ BMPs to treat runoff. In addition, the amount of pervious landscaped area would increase significantly compared with existing conditions. Therefore, more water would be kept onsite, thereby allowing percolation to groundwater reserves. This would result in ***less-than-significant*** impacts related to erosion during Project operation, consistent with the ConnectMenlo EIR. No mitigation is required.

Impact GS-3: Unstable Soils or Geologic Units. The Proposed Project would not be located on a geologic unit or soil that is unstable or would become unstable as a result of the Proposed Project and potentially result in subsidence, liquefaction, or collapse. (LTS)

The site-specific investigation estimated that differential settlement resulting from seismically induced liquefaction may occur, perhaps on the order of 0.25 to 2 inches. If Project structures are improperly designed and constructed, differential settlement could undermine structural foundations, potentially exposing people onsite, including both inhabitants and construction workers, to increased safety risks.

Construction activities, such as excavation, could result in soil instability and cause cut slopes to collapse. Soil collapse is also associated with subterranean voids, such as tunnels or mine shafts, or excessive loading. Soil collapse could result if utilities, pipes, or tanks that are currently extant at the Project Site are abandoned in place and not appropriately backfilled, capped, or retrenched. Furthermore, artificial fill

and intertidal deposits that underlie the Project Site are regarded as potentially weak soils that may be compressible or may exhibit other characteristics that would make them unstable (e.g., differential compaction). The site-specific investigation for the main Project Site found that it would be feasible to support the proposed structures using either shallow foundations (e.g., spread footings, reinforced concrete mats, or foundations over ground improvements) or deep foundations (e.g., driven or auger-cast piles). As discussed below, these construction techniques would ensure that the Proposed Project's structures and foundations would have the maximum practicable protection from soil failure.

Excavation would occur to a depth of approximately 20 feet bgs for utilities, 30 feet bgs for the Willow Road Tunnel, and 25 feet bgs for basement excavations. During site-specific investigation, groundwater was encountered at depths ranging from about 8 to 15 feet bgs. The presence of shallow groundwater could affect grading and underground construction and result in a wet and unstable pavement subgrade, difficult compactions, and difficult utility installations. Excavations of less than 8 feet deep below the existing grades that are backfilled the same day are likely to remain relatively dry. Dewatering and the shoring of utility trenches may be required for deeper work, such as utility installations, construction of the Willow Road Tunnel, and basement excavations. However, standard engineering practices could be used to reduce potential hazards associated with soils at the Project Site.

Preliminary geotechnical investigations concluded that development at the Project Site (i.e., both the main Project Site and Hamilton Avenue Parcels North and South) is feasible from a geotechnical perspective.[92,93] The geotechnical investigation for the Willow Road Tunnel site described conditions at the site but did not address feasibility.[94,95]

As part of the construction permitting process, the City requires completed reports from registered soil professionals to identify potentially unsuitable soil conditions. The reports must (a) identify potentially unsuitable soil conditions and (b) contain appropriate recommendations for the foundation type and design criteria, conforming to the analysis and implementation criteria in the 2019 California Building Standards Code to eliminate inappropriate soil conditions. Adherence to the soil and foundation support parameters of the 2019 California Building Standards Code, as required by City and state law, would ensure that structures and their associated trenches and foundations would have the maximum practicable protection from soil failure available under static or dynamic conditions. In addition, adherence to Caltrans requirements would ensure that the Willow Road Tunnel would have the maximum practicable protection from soil failure available under static or dynamic conditions. The Project Sponsor would be required by law to incorporate the applicable standards into the design for the Proposed Project. In view of the requirements, impacts related to unstable geologic or soil units at the Project Site are considered ***less than significant***, consistent with the ConnectMenlo EIR. No mitigation is required.

[92] Cornerstone Earth Group. 2020. *Preliminary Geotechnical Investigation Update, Willow Village, Willow Road, Hamilton Avenue, and Hamilton Court, Menlo Park, California*. (Project Number 254-11-7.) May 27. Prepared for Peninsula Innovation Partners, LLC, Menlo Park, CA. Sunnyvale, CA.

[93] Cornerstone Earth Group. 2020. *Geotechnical Consultation, Willow Village Expansion Feasibility Study, Hamilton Avenue and Willow Road, Menlo Park, California*. (Project Number 254-45-2.) October 15. Prepared for Facebook, Inc., Menlo Park, CA. Sunnyvale, CA.

[94] ENGEO. 2021. *Geotechnical Data Report, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) September 30. Prepared for Facebook, Menlo Park, CA. San José, CA.

[95] ENGEO. 2021. *Geotechnical Data Report Addendum, Willow Tunnel, Menlo Park, California*. (Project Number 17215.000.000.) December 16. Prepared for Meta, Menlo Park, CA. San José, CA.

Impact GS-4: Expansive Soils. The Proposed Project would not be located on expansive soils, creating substantial direct or indirect risks to life or property. (LTS)

Moderately to very highly expansive soils occur at the Project Site. Structures and utilities supported on expansive soil could experience cyclic seasonal heave and settlement as the soil expands and contracts through wetting and drying cycles. If structures and utilities are not properly designed, cyclic expansion and contraction could affect structural stability. Structural damage, warping, and cracking in parking areas and along roads, driveways, and sidewalks, as well as damage to the Willow Road Tunnel and utility lines, may occur if potential effects from expansive soils and imported fill are not considered during design and construction of the Proposed Project.

To reduce impacts from expansive soils, the Proposed Project would be designed and constructed to meet or exceed local standards as well as the current California Building Standards Code. Adherence to the soil and foundation support parameters of the California Building Standards Code, as required by City and state law, would ensure that structures and their associated trenches and foundations would have the maximum practicable protection from soil failure available under static or dynamic conditions. In addition, adherence to Caltrans requirements would ensure that the Willow Road Tunnel would have the maximum practicable protection from soil failure available under static or dynamic conditions. Furthermore, Safety Element Policy S1.13 requires site-specific geologic or geotechnical studies for construction in areas with potential land instability and to provide recommendations to address soil instability such as expansive soils; Program S-1D requires potential geologic, seismic, and soil problems to be thoroughly investigated during the earliest stages of the design process; and Program S-1H requires a seismic risk analysis and adequate construction standards to be enforced. The Proposed Project would adhere to all recommendations in these technical investigations. The impacts related to expansive soil units at the Project Site would be ***less than significant***, consistent with the ConnectMenlo EIR. No mitigation is required.

Impact GS-5: Paleontological Resources. The Proposed Project could destroy a unique paleontological resource or site. (LTS/M)

No known fossils, unique paleontological resources, or unique geologic features are present in the study area. However, geological formations underlying the Project Site have the potential to contain paleontological resources. Excavation would occur to a depth of approximately 20 feet bgs for utilities, 30 feet bgs for the Willow Road Tunnel, and 25 feet bgs for basement excavations. Geologic units with high paleontological sensitivity occur at these depths below the Project Site (see Table 3.10-3). Therefore, the Proposed Project has the potential to directly or indirectly destroy a unique paleontological resource or site. However, impacts on paleontological resources would depend on the depth, extent, and type of soil-disturbing activities that would occur as a result of construction as well as the paleontological sensitivity of the materials underlying the site.

Site preparation would involve earthwork, such as excavation, grading, trenching, cut-and-cover work, and potentially the installation of foundation piles, all of which would encounter artificial fill and could encounter native deposits, as described in Table 3.10-3. Activities at ground surface that disturb Quaternary fine-grained alluvium (Qaf), Quaternary alluvial fan deposits, fine facies (Qhff), and Quaternary floodplain deposits (Qhfp), as well as activities below the ground surface that disturb these geologic units and Quaternary older alluvium, could expose undisturbed deposits that contain fossils. These activities could damage or destroy fossils. This is considered a ***potentially significant*** impact.

MITIGATION MEASURE. Mitigation Measure CULT-3 from the ConnectMenlo EIR would ensure that construction personnel would follow proper notification procedures in the event that paleontological resources are uncovered during construction. In addition, Mitigation Measure PALEO-1 would ensure that construction personnel would recognize fossil materials. Implementation of ConnectMenlo Mitigation Measure CULT-3, reproduced below, and PALEO-1 would reduce potentially significant impacts on paleontological resources to ***less than significant with mitigation***, consistent with the ConnectMenlo EIR.

CULT-3: Conduct Protocol and Procedures for Encountering Paleontological Resources.

In the event that fossils or fossil-bearing deposits are discovered during ground-disturbing activities, anywhere in the City, excavations within a 50-foot radius of the find shall be temporarily halted or diverted. Ground disturbance work shall cease until a City-approved, qualified paleontologist determines whether the resource requires further study. The paleontologist shall document the discovery as needed (in accordance with Society of Vertebrate Paleontology standards [Society of Vertebrate Paleontology 1995]), evaluate the potential resource, and assess the significance of the find under the criteria set forth in CEQA Guidelines Section 15064.5. The paleontologist shall notify the appropriate agencies to determine the procedures that would be followed before construction activities would be allowed to resume at the location of the find. If avoidance is not feasible, the paleontologist shall prepare an excavation plan for mitigating the effect of construction activities on the discovery. The excavation plan shall be submitted to the City of Menlo Park for review and approval prior to implementation, and all construction activity shall adhere to the recommendations in the excavation plan.

PALEO-1: Conduct Worker Awareness Training

Before the start of any excavation or grading activities, the construction contractor will retain a qualified paleontologist, as defined by the SVP, who is experienced in teaching non-specialists. The qualified paleontologist will train all construction personnel who are involved with earthmoving activities, including the site superintendent, regarding the possibility of encountering fossils, the appearance and types of fossils that are likely to be seen during construction, and proper notification procedures should fossils be encountered. Procedures to be conveyed to workers include halting construction within 50 feet of any potential fossil find and notifying a qualified paleontologist, who will evaluate the significance.

The qualified paleontologist will also make periodic visits during earthmoving in high-sensitivity sites to verify that workers are following the established procedures.

Cumulative Impacts

Impact C-GS-1: Cumulative Geologic and Soil Impacts. Cumulative development would result in a less-than-significant cumulative impact on geology, soils, and seismicity, and thus the Proposed Project would not be a cumulatively considerable contributor to any significant cumulative impact on geology, soils and seismicity. Cumulative development would result in a less-than-significant cumulative impact with mitigation on paleontological resources, and the Proposed Project would not be a cumulatively considerable contributor to any significant cumulative impact. (LTS, LTS/M)

Summary of Analysis in the ConnectMenlo EIR

As stated in Section 4.4, *Cultural Resources*, and Section 4.5, *Geology, Soils, and Seismicity*, of the ConnectMenlo EIR, the geographic context for cumulative impacts related to seismic shaking, seismically induced landslides, liquefaction, expansive soils, and paleontological resources considered growth projected by ConnectMenlo within the study area in combination with impacts from projected regional growth in the immediate vicinity.

Development of past, current, and future projects within the study area and immediate vicinity have the potential to result in development-related impacts pertaining to seismic shaking, seismically induced landslides, liquefaction, expansive soils, and paleontological resources. However, new development in the area would be subject to the California Building Standards Code as well as existing general plan polices, which would, to the maximum extent practicable, reduce cumulative development-related impacts associated with seismic shaking, seismically induced landslides, liquefaction, and expansive soils.

The ConnectMenlo EIR determined that cumulative impacts on geology, soils, and seismicity would be less than significant and that implementation of ConnectMenlo would not significantly contribute to cumulative impacts related to geology, soils, and seismicity. Therefore, the ConnectMenlo EIR determined that impacts related to geology, soils, and seismicity under ConnectMenlo would be ***less than significant.***

With respect to paleontological resources, new development would be required to comply with existing federal, state, and local laws and regulations enacted to protect paleontological resources. In addition, development within the ConnectMenlo study area would be subject to general plan policies adopted to protect unrecorded paleontological resources. Mitigation Measure CULT-3 would require avoidance of paleontological resources or, if avoidance is not possible, preparation of an excavation plan to protect the resources. Impacts on paleontological resources would be ***less than significant with mitigation***.

Cumulative Impacts with the Proposed Project

Consistent with the Menlo Park EIR, the geographic context for cumulative impacts associated with geology, soils, seismicity, and paleontological resources under the Proposed Project includes development in the ConnectMenlo study area in combination with impacts from projected regional growth in the immediate vicinity.

As noted in Chapter 3, *Environmental Impact Analysis*, of this EIR, in addition to the buildout projections considered in the ConnectMenlo EIR, the cumulative scenario for this EIR also includes the 123 Independence Drive and East Palo Alto projects.

As with the Proposed Project, the 123 Independence Drive and East Palo Alto projects, as well as other projects in the vicinity, would be required to comply with state and local building codes. With respect to paleontological resources, these additional projects would be required to comply with state and local laws and regulations, as well as existing general plan polices, that protect paleontological resources. In addition, the Proposed Project and the 123 Independence Drive project would be required to comply with ConnectMenlo EIR Mitigation Measure CULT-3, which serves to further protect paleontological resources. The Proposed Project would also comply with Mitigation Measure PALEO-1. Therefore, these additional projects would not alter the cumulative impact determination stated in the ConnectMenlo EIR, and the cumulative impact with respect to geology, soils, seismicity, and paleontological resources would remain ***less than significant***.

The Proposed Project would not result in a substantial change in the ConnectMenlo project and therefore would not be a cumulatively considerable contributor to any significant cumulative impact on geology, soils, and seismicity and would not cause new or substantially more severe significant impacts related to geology, soils, seismicity, or paleontological resources than those analyzed in the ConnectMenlo EIR. Therefore, consistent with the conclusions in the ConnectMenlo EIR, the Proposed Project would result in a ***less-than-significant cumulative impact*** with respect to geology, soils, and seismicity. The impact with respect to paleontological resources would be ***less than significant with mitigation***. No additional mitigation measures would be required.