This section of the Draft Environmental Impact Report (Draft EIR; DEIR) describes the geology and soils of the Pinole General Plan Update (GPU) Planning Area and analyzes issues such as potential exposure of people and property to geologic hazards, landform alteration, and erosion. In addition, potential seismic/geologic hazards such as earthquakes and ground failure, slope instability, and landslides are discussed.

4.8.1 EXISTING SETTING

TOPOGRAPHY & LOCAL GEOLOGY

Planning Area Setting

The City of Pinole GPU Planning Area encompasses approximately 13.3 square miles, which includes 5.45 square miles of land and 7.85 square miles of water. The water portions of the city include the San Pablo Bay tidal marshes and bay waters.

The Planning Area is located within the Coast Ranges geomorphic province, which is characterized by nearly parallel northwest-trending ridges interspersed with alluvium-filled valleys. Terraces and alluvial fans border the ridges of the Coast Ranges before they hit the San Francisco, San Pablo, and Suisun bays and merge into tidal flats along the bay margins. The Coast Ranges were structurally formed by faulting and folding of the Farallon and North American plates, recorded by rocks of the Franciscan Complex of Cretaceous and Jurassic age (100 to 65 million years old). Subsequent shearing between the North American and Pacific plates has been recorded in the rocks of the Tertiary Complex of sedimentary and volcanic rocks of the Berkeley and Oakland Hills. Surface elevations within the Coast Ranges generally range from several feet below mean sea level to more than 3,849 feet above sea level at its highest peak at Mount Diablo, located in central Contra Costa County.

The topography of the City of Pinole is characterized by upland terrain of the East Bay Hills in the eastern portions of the city and lowland terrain with subdivisions of valley lands and bay lands in the western portions of the city. The East Bay Hills are a segment of the Coast Ranges with northwesterly-trending, moderate to steeply sloping hillsides and surface elevations ranging from 0 to 75 percent slopes. The ground surface elevation in the vicinity of the Planning Area, as shown on a collection of United States Geological Survey USGS Topographic Map quadrangles, ranges from approximately mean sea level (msl) to 790 feet above msl.

GEOTECHNICAL CONDITIONS

Soils

The geologic units of the GPU Planning Area primarily consist of existing fill, landslide deposits, colluviums, younger alluvial fan deposits, bay mud, older alluvial fan deposits consisting of clays and clay loams, and undifferentiated bedrock.

According to the U.S. Department of Agriculture *Soil Survey of Contra Costa County*, the GPU Planning Area contains 24 separate soil types (**Table 4.8-1**). The primary native soils in the vicinity of the Planning Area are older alluvial fan deposits derived from granite rock. Additional native soils consist of younger alluvial fan deposits consisting of Clear Lake Clay (0 to 2 percent slopes), Cropley Clay (2 to 5 percent slopes), and Diablo Clay (15 to 30 percent slopes). Non-native soils, which comprise a large percentage of the total land of the GPU Planning Area, consist of existing cut and fill materials, which are classified as well drained. The non-native materials

consist of cut and fill material of Los Osos complex (9 to 30 percent slopes), Millsholm complex (9 to 30 percent slopes), and Diablo complex (9 to 30 percent slopes). The alluvial-derived soil material that comprises a large portion of the Planning Area is considered to have low to moderately low drainage capacity. The non-native cut and fill material is considered to have well to moderately well drainage capacity. **Figure 4.8-1** describes the locations of the specific soil types found in the Planning Area.

These base geological conditions can lend to structural failures and property damage from low subsoil strength and geologic hazards such as landslides, creeping, slaking (breakdown upon exposure to air or water), or exposure to expansive soils (shrinking and swelling of soil). Properly designed foundations, buildings, and roads can help to prevent potential damage to structures and foundations from geological hazards present in the Planning Area.

TABLE 4.8-1
PLANNING AREA SOIL TYPES

Soil Name	Approximate Percentage of Land in Planning Area*
Altamont-Fontana Complex, 30 to 50 percent slopes	0.6
Botella Clay Loam, 2 to 9 percent slopes	4.7
Clear Lake Clay	6.5
Conejo Clay Loam, 0 to 2 percent slopes	0.4
Conejo Clay Loam, 2 to 5 percent slopes	1.8
Cropley Clay, 2 to 5 percent slopes	3.3
Cut and Fill Land – Diablo Complex, 9 to 30 percent slopes	5.5
Cut and Fill Land – Los Osos Complex, 9 to 30 percent slopes	7.6
Cut and Fill Land – Millsholm Complex, 9 to 30 percent slopes	9.7
Cut and Fill Land – Millsholm Complex, 30 to 50 percent slopes	6.7
Diablo Clay, 15 to 30 percent slopes	2.6
Diablo Clay, 30 to 50 percent slopes	1.0
Joice Muck	0.7
Lodo Clay Loam, 9 to 30 percent slopes	0.2
Lodo Clay Loam, 30 to 50 percent slopes	4.8
Los Gatos Loam, 15 to 30 percent slopes	0.4
Los Gatos Loam, 30 to 50 percent slopes	1.9
Los Osos Clay Loam, 15 to 30 percent slopes	7.4
Los Osos Clay Loam, 30 to 50 percent slopes	14.1
Los Osos – Los Gatos Complex	1.2
Millsholm Loam, 15 to 30 percent slopes	2.7
Millsholm Loam, 30 to 50 percent slopes	14.1
Tierra Loam, 2 to 9 percent slopes	0.9
Tierra Loam, 9 to 15 percent slopes	0.1
Waterways	1.1

Source: Natural Resource Conservation Service, 2010
**Excludes submerged areas of the Planning Area*

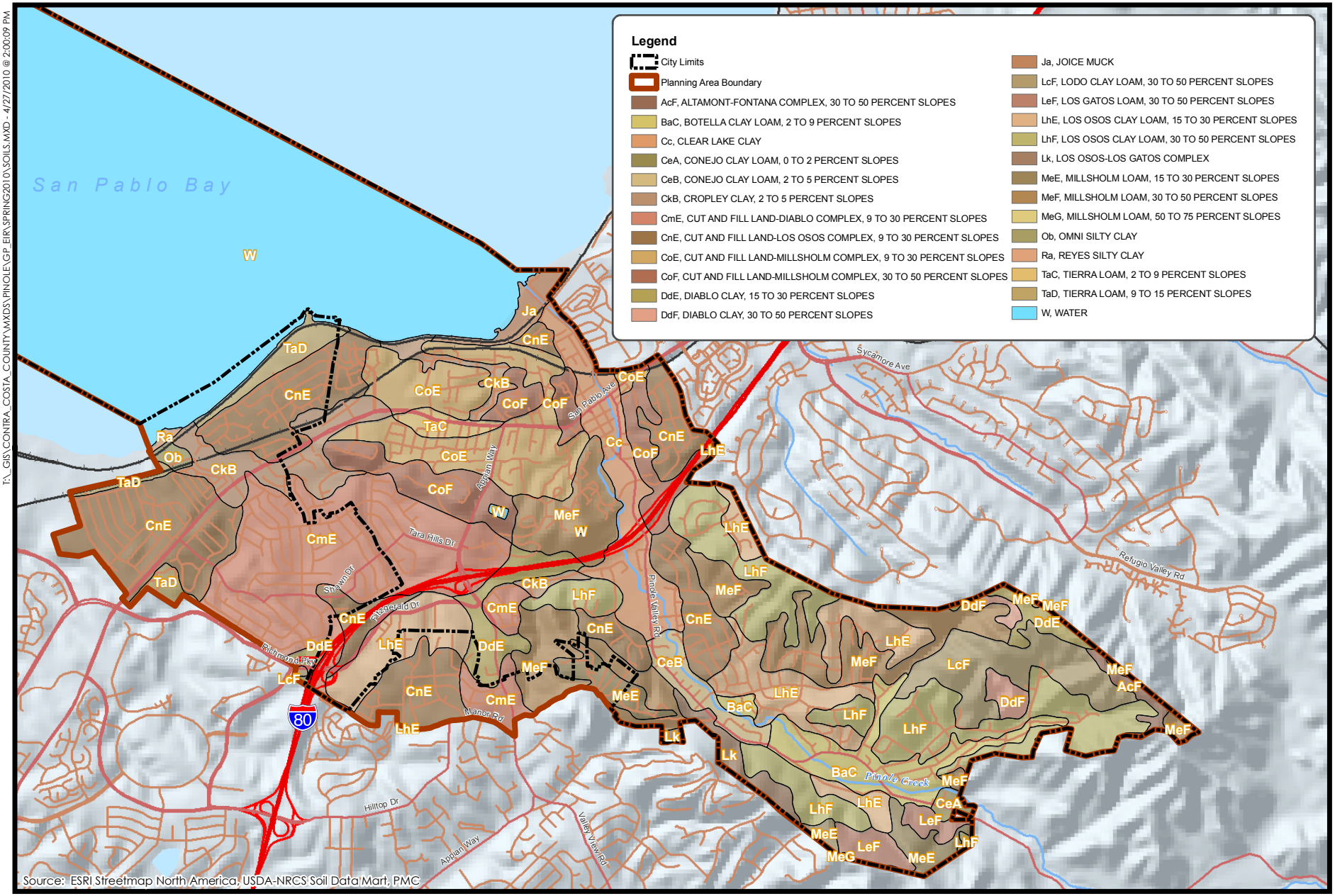

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Figure 4.8-1
Soils Map

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Potential Soils Hazards

Expansive Soils

Expansive soils are soils that shrink or swell depending on the level of moisture they absorb. These swelling soils typically contain clay minerals, as the amount and kind of clay affects the fertility and physical condition of soil and the ability of the soil to adsorb and retain moisture. As the soils get wet, the clay minerals absorb water molecules and expand; conversely, as they dry they shrink, leaving large voids in the soil. When structures are located on expansive soils, foundations have the tendency to rise during the wet season and sink during the dry season. Unless accommodated by design, this movement can create new stresses on various sections of the foundation and connected utilities and can lead to structural failure and damage to infrastructure.

The lowland areas of the Planning Area containing alluvium and bay mud that consist of rich clay soils have a moderate potential for expansion under changing conditions. However, the city's biggest threat comes from large and erratic settlements in areas where fill material overlays soft, compressible bay mud.

Landslides and Slope Instability

Landslides may be triggered by both natural and human-induced changes in the environment that result in slope instability. The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors:

- Erosion by rivers, glaciers, or ocean waves create over steepened slopes;
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains;
- Earthquakes create stresses that make weak slopes fail;
- Earthquakes of magnitude 4.0 and greater have been known to trigger landslides;
- Volcanic eruptions produce loose ash deposits, heavy rain, and debris flows; and
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from man-made structures may stress weak slopes to failure and other structures.

Slope material that becomes saturated with water may develop a debris or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, blocking bridges and tributaries and causing flooding along its path (California Geological Survey, 2002a).

Human activities such as mining, construction, and changes to surface drainage areas can also affect landslide potential in an area. Landslides often accompany other natural hazard events such as floods, wildfires, or earthquakes. Landslides can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, and forested areas and can cause injuries and death.

There is a high potential in the Planning Area for seismically induced landslides and slope instability hazards. Seismically induced landslides are likely to occur along the steep to intermediate hillside areas of the GPU Planning Area. These areas can occur along the East Bay

Hills, areas where previous land sliding or soil creeping has occurred, areas where non-engineered grading and uncontrolled drainage on slopes has occurred, and areas with deep colluvial deposits. Slope stability hazards can result in loose debris flows and landslides. In April 2006, the city experienced a large landslide induced by heavy rainfall on Interstate 80 (I-80) between Pinole Valley Road and Appian Way that closed westbound State Route (SR) 4 (City of Pinole, 2009b).

Erosion/Accelerated Erosion

The Natural Resource Conservation Service (NRCS) classifies soils based on the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. NRCS erosion factor K indicates the susceptibility of a soil to erode by water. This estimate is based primarily on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (NRCS, 2010). Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to the eroding effects of water flow. The soils of the Planning Area generally fall within a K range of 0.2 to 0.32 (NRCS, 2010), which represents a moderate to moderately severe susceptibility to erosion.

The NRCS wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion. The Millsholm Loam complex possesses the highest susceptibility to wind erosion of all soil types in the Planning Area (NRCS, 2010). The Millsholm Loam complex consists of approximately 18 percent of soils located in the GPU Planning Area.

Tsunamis

Tsunamis are significant sea waves resulting from the vertical displacement of the ocean floor due to a large earthquake. The potential for a significant tsunami event to occur within the GPU Planning Area and cause any significant damage is considered low. Tsunami hazards within the GPU Planning Area could include temporary high water levels, possible loss of property or property damage, erosion, and possible loss of life or injury. The GPU Planning Area is located along the shores of the San Pablo Bay, which is subject to the possible effects of a tsunami. However, the San Francisco Bay significantly attenuates tsunamis that might reach Pinole, which lies on its northern extension of San Pablo Bay.

Geologic Hazards Faults and Seismicity

Earthquakes

Earthquakes are the product of the buildup and sudden release of strain along a fault or zone of weakness in the earth's crust. Stored energy may be released as soon as it is generated or it may be accumulated and stored for long periods of time. Individual releases may be so small that they are detected only by sensitive instruments or they may be violent enough to cause destruction over vast areas. Strong ground shaking associated with earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks such as water, power, gas, communication, and transportation lines. Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, seiches, liquefaction, and dam failure.

Earthquakes are generally expressed in terms of *intensity* and *magnitude*. Intensity is based on the observed effects of ground shaking on people, buildings, and natural features. An earthquake's intensity varies from region to region, depending on the location of the observer with respect to the earthquake epicenter. By comparison, an earthquake's magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake. Magnitude is based on the amplitude of the earthquake waves recorded on instruments, which have a common calibration. The magnitude or strength of earth movement associated with seismic activity is typically quantified using the Richter scale. This scale is a measure of the strength of an earthquake or strain energy released by it, as determined by seismographic observations. This is a logarithmic value originally defined by Charles Richter in 1935. An increase of one unit of magnitude (for example, from 4.6 to 5.6) represents a tenfold increase in wave amplitude on a seismogram, or approximately a 30-fold increase in the energy released. In other words, a magnitude 6.7 earthquake releases over 900 times (30 times 30) the energy of a 4.7 earthquake.

The Modified Mercalli (MM) Intensity Scale is used in the United States to evaluate earthquake movement. The MM scale is composed of 12 increasing levels of intensity designated by Roman numerals. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and, finally, total destruction. The levels range from imperceptible shaking to catastrophic destruction. The MM scale does not have a mathematical basis; instead, it is an arbitrary ranking based on observed effects. The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. **Table 4.8-2** provides a description and a comparison of intensity and magnitude and describes the typical effects observed at locations near the epicenter of earthquakes of different magnitudes.

TABLE 4.8-2
MAGNITUDE AND INTENSITY

Magnitude	Intensity	Typical Maximum Modified Mercalli Intensity and Typical Effects of Earthquake Activity*
1.0 – 3.0	I	I. Not felt except by a very few under especially favorable conditions.
3.0 – 3.9	II – III	II. Felt only by a few persons at rest, especially on upper floors of buildings. III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0 – 4.9	IV – V	IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 – 5.9	VI – VII	VI. Felt by all, 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 in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 – 6.9	VIII – IX	VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse.

Magnitude	Intensity	Typical Maximum Modified Mercalli Intensity and Typical Effects of Earthquake Activity*
		Buildings shifted off foundations.
7.0 and higher	VIII or higher	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed 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: California Geological Survey, 2002a

*Notes: *Abbreviated Modified Mercalli Intensity Scale*

The California Geological Survey (CGS) identifies low, medium, and high severity zones within the state of California. The Planning Area is located within Seismic Zone 4. A Seismic Zone 4 is an area that can expect to experience ground motion of high severity. Based on seismologic and geologic conditions, the maximum level of ground motion potentially experienced in the Planning Area would occur as a result of a 7.25 magnitude earthquake on the Hayward fault zone or of an 8.5 magnitude along the San Andreas Fault.

In accordance with the severity zones, the CGS also defines the following:

- *Fault* – A fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side.

- *Fault Zone* – A zone of related faults, which commonly are braided, and sub parallel, but may be branching and divergent. A fault zone has a significant width (with respect to the scale at which the fault is being considered, portrayed, or investigated), ranging from a few feet to several miles.

- *Potentially Active Fault* – A fault that showed evidence of surface displacement during Quaternary time (last 1.6 million years). The purpose of this designation indicates the evaluation of possible zonation.

- *Sufficiently Active Fault* – A fault that has evidence of Holocene (10,000 years) surface displacement along one or more of its segments or branches.

- *Well-Defined Fault* – A fault whose trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The geologist should be able to locate the fault in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

Sufficiently active faults and well defined faults are the two criteria used by the State of California in order to determine whether a fault should be zoned under the Alquist-Priolo Act, further discussed in subsection 4.8.2, Regulatory Framework. The City of Pinole Planning Area is not located within an Alquist-Priolo earthquake hazard zone (formerly known as special study zones), although several active faults are identified in the vicinity of the Planning Area. **Table 4.8-3** identifies known primary faults in the vicinity of the Planning Area, their activity, the approximate distance from the Planning Area, and the maximum magnitude associated with each fault. **Figure 4.8-2** shows the location of the faults within the Planning Area.

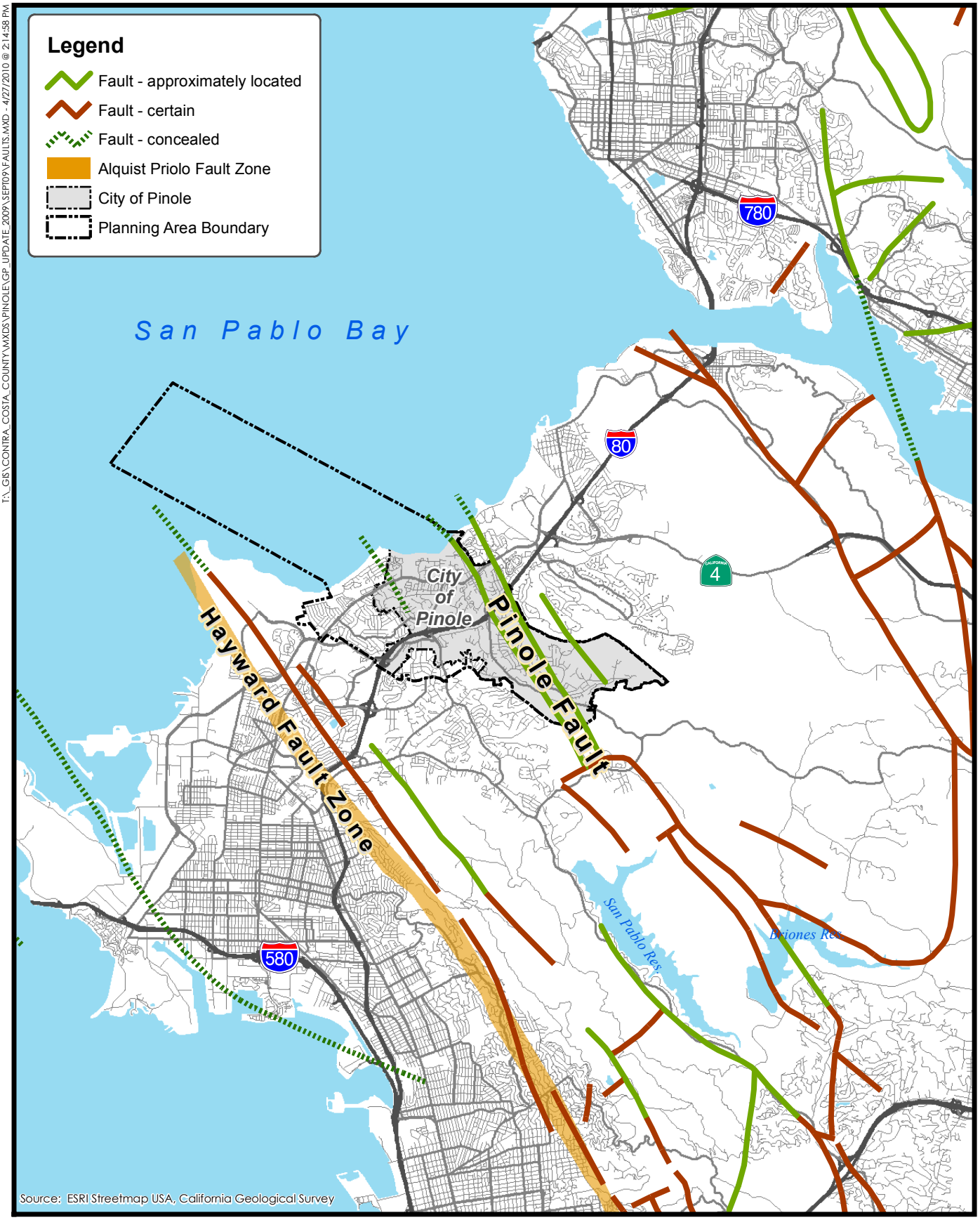

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Figure 4.8-2
Faults Hazard Map

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TABLE 4.8-3
FAULTS IN THE VICINITY OF THE GPU PLANNING AREA

Name	Approximate Distance from GPU Planning Area (in miles)	Activity	Maximum Magnitude (MW)
Antioch Fault	26	Portions active within the past 200 years	6.5
Calaveras Fault	22	Portions active within the past 200 years	7.25
Clayton Fault	18	Portions active within the past 200 years	6.25
Concord Fault	12	Portions active within the past 200 years	6.5
Green Valley Fault	12	Active	5.5
Greenville Fault	40	Portions active within the past 200 years	5.5
Hayward Fault	1.5–3.9	Portions active within the past 200 years	7.25
Marsh Creek Fault	32	Not reported	6.9
Mt. Diablo Thrust Fault	18	10,000 years	6.6
Pinole fault	0	10,000 years	6.8
Rodgers Creek Fault	23	Portions active within the past 200 years	7.0
San Andreas	18–20	Portions active within the past 200 years	8.5
San Gregorio	30	Portions active within the past 200 years	7.9
West Napa	15	Active	6.5

Source: Contra Costa County, 2005

The Hayward and San Andreas fault zones are considered the faults of greatest concern to Contra Costa County and throughout the Bay Area due to their location and size. Subsurface data indicate that there has been appreciable movement on the San Andreas Fault and Hayward Fault in the last 200 years. Recent historic surface faulting along these faults were creep and surface rupture earthquakes. The San Andreas Fault was the cause of the Loma Prieta earthquake of 1989 and the 1906 San Francisco earthquake, both of which caused widespread damage throughout the Bay Area. Additionally, earthquakes occurred on the Hayward Fault in the years 1836 and 1868. The Working Group of California Earthquake Probabilities (WGO2) evaluated the likelihood of one or more earthquakes of magnitude 6.7 or higher occurring in the San Francisco Bay Area. The results concluded that the San Andreas Fault has a 21 percent chance and the Hayward Fault has a 27 percent chance of experiencing a 6.7 magnitude earthquake or higher within the next 30 years. Due to the Planning Area's proximity to the Hayward Fault, this fault poses the greatest threat to the City of Pinole.

The Pinole Fault bisects the GPU Planning Area. The Pinole Fault is the southeastern-most, onshore continuation of the Rodgers Creek Fault. The Pinole Fault branches northerly through the GPU Planning Area, forming a "Y." The trunk and eastern leg of the "Y" essentially follow the Pinole Creek drainage, and the western leg extends from Pinole Creek northwesterly to the bay margin just west of Wilson Point. The Pinole Fault was believed to be inactive (no activity within the last 10,000 years); however, recent research has shown that the Pinole Fault has undergone activity within the last 10,000 years and should be considered as an active fault (Fenton, 1997). Age dating of sediment in San Pablo Bay shows that the Pinole Fault has a recurrence interval of approximately every 900 years, with repeated movement over the last 10,000 years. Additionally,

the Pinole Fault may be a potentially linking structure between the Rogers Creek Fault and the Hayward Fault, thereby significantly increasing the potential rupture length and the maximum earthquake which may be generated by these faults.

Ground Shaking

The City of Pinole is not located within an Alquist-Priolo Study Zone. However, the GPU Planning Area is bisected by the Pinole Fault, an active fault, and it is located relatively close to an Alquist-Priolo Study Zone along the Hayward Fault and to several active faults.

In populated areas, the greatest potential for loss of life and property damage is a result of ground shaking from a nearby earthquake. The degree of damage depends on many interrelated factors. Among these factors are the Richter magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surficial deposits or bedrock, degree of consolidation of surficial deposits, presence of high ground water, topography, and design, type, and quality of building construction. A critical factor affecting the intensity of ground shaking is the geologic material underneath a site. Deep, loose soils will amplify and prolong the shaking. Ground shaking can be several times greater on sites underlain by weak sediments like bay mud, rather than on bedrock such as granite.

Losses from shaking can occur where tall structures are built on thick, soft sediments. The amount of damage from shaking is also influenced by the structural integrity of buildings before an earthquake. Damage to buildings and utilities in Pinole is likely to be greatest on those sites underlain by deep, loose, compressible deposits of bay mud, non-engineered fill, and marginally stable hillside areas. Areas within the GPU Planning Area that are highly susceptible to damages resulting from ground shaking are located between San Pablo Avenue and the San Pablo Bay shoreline, in the western portions of the city, especially in the Tara Hills Mobile Home Park.

Liquefaction

Liquefaction is the loss of soil strength due to seismic forces generating various types of ground failure. The potential for liquefaction must account for soil types and density, the groundwater table, and the duration and intensity of ground shaking.

Based upon known soil, groundwater, and ground shaking conditions within the GPU Planning Area, the potential for liquefaction beneath the GPU Planning Area is considered low. Areas potentially susceptible to liquefaction are located along the San Pablo Bay shoreline, the locations in the western portions of the GPU Planning Area discussed above, and in areas located underneath deposits of active/recently active stream channels. Additionally, the potential for ground lurching, differential settlement, or lateral spreading occurring during or after seismic events is also considered to be low except for the locations discussed above.

4.8.2 REGULATORY FRAMEWORK

STATE

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. A direct result of the 1971 San Fernando earthquake and the extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures, the Alquist-Priolo Earthquake Fault Zoning Act's main

purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The Seismic Hazards Mapping Act (discussed below) addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.

The law requires the State Geologist to establish regulatory zones (known as Earthquake Fault Zones) around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. The law requires that before a project can be permitted, cities and counties must require a geologic investigation to demonstrate that proposed buildings will not be constructed across active faults. An evaluation and written report of a specific site must be prepared by a licensed geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (generally 50 feet) (DOC, 2009). According to the State Department of Conservation, the City of Pinole itself is not listed as a city which is affected by earthquake fault zones and, by extension, is not subject to the Alquist-Priolo Earthquake Fault Zoning Act. However, Contra Costa County, which encompasses the city, is listed as a county which is affected by earthquake fault zones and subject to the requirements of the Alquist-Priolo Earthquake Fault Zoning Act. While Pinole is not located within an Alquist-Priolo earthquake hazard zone, the unincorporated portions of the GPU Planning Area are in Contra Costa County and are considered to be in an earthquake hazard zone.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (SHMA) of 1990 (Public Resources Code, Chapter 7.8, Sections 2690–2699.6), passed by the legislature following the 1989 Loma Prieta earthquake, directs the Department of Conservation, California Geological Survey to identify and map areas prone to liquefaction, earthquake-induced landslides, and amplified ground shaking. The purpose of the SHMA is to minimize loss of life and property through the identification, evaluation, and mitigation of seismic hazards.

Staff geologists in the Seismic Hazard Zonation Program gather existing geological, geophysical, and geotechnical data from numerous sources to produce the Seismic Hazard Zone Maps. They integrate and interpret these data regionally in order to evaluate the severity of the seismic hazards and designate as Zones of Required Investigation (ZORI) those areas prone to liquefaction and earthquake-induced landslides. Cities and counties are then required to use the Seismic Hazard Zone Maps in their land use planning and building permit processes. The Seismic Hazards Mapping Act requires that site-specific geotechnical investigations be conducted within the Zones of Required Investigation to identify and evaluate seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy (DOC, 2009).

California Building Code

In addition to the requirements of the Uniform Building Code, California Code of Regulations, Title 24, also known as the California Building Standard Code or the California Building Code (CBC), establishes further guidance for foundation design, shear wall strength, and other structurally related concerns. The purpose of the CBC is to provide minimum standards to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. The provisions of the CBC apply to the construction,

alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout the State of California (CBSC, 2008). The CBC modified UBC regulations for specific conditions found in California and included a large number of more detailed and/or more restrictive regulations. For example, the CBC includes common engineering practices requiring special design and construction methods that reduce or eliminate potential expansive soil related impacts. The CBC requires structures to be built to withstand ground shaking in areas of high earthquake hazards, and the placement of strong motion instruments in larger buildings to monitor and record the response of the structure and the site of seismic activity. Compliance with CBC regulations ensures the adequate design and construction of building foundations to resist soil movement. In addition, the CBC also contains drainage requirements in order to control surface drainage and to reduce seasonal fluctuations in soil moisture content.

Published by the International Conference of Building Officials, the International Building Code is a widely adopted model building code in the United States. The CBC incorporates by reference the International Building Code (IBC) with necessary California amendments. These amendments include significant building design criteria that have been tailored for California earthquake conditions. Design criteria for seismic loading and other geologic hazards are included in the design standards in the CBC. The CBC provides design criteria for geologically induced loading that govern sizing of structural members and provides calculation methods to assist in the design process.

LOCAL

Association of Bay Area Governments

The Association of Bay Area Governments (ABAG) has adopted a Manual of Standards for Erosion and Sediment Control Measures (May 1995), a comprehensive field guide for controlling soil erosion in the area.

City of Pinole Erosion and Sediment Control Plan Ordinance

The City's Erosion and Sediment Control Plan Ordinance (Title 15, Chapter 15.36.190 of the City Code) establishes that erosion and sediment control plans, prepared by a registered civil engineer, shall be submitted to the City for review for any building or construction activities. This ordinance applies to project sites over 0.25 acre or when more than 150 cubic yards of excavation or fill will take place, if there is a slope of greater than 15 percent, or if the project grading would pose a threat to adjacent or downstream property or obstruct a drainage channel. Erosion control plans must effectively minimize soil erosion and sedimentation from the project site and must also provide for the control of runoff from the site.

The Erosion and Sediment Control Plan Ordinance establishes administrative procedures, minimum standards of review, and implementation and enforcement procedures for controlling erosion, sedimentation, and other pollutant runoff, including construction debris and hazardous substances used on construction sites. The plan also establishes interim erosion control and sedimentation plans for rainy seasons that must be approved by the Public Works Director. The intent of the ordinance is to minimize damage to surrounding properties and public rights-of-way, the degradation of the water quality of water courses, and the disruption of natural or City-authorized drainage flows caused by construction activities.

4.8.3 IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

The impact analysis in this section is based, in part, on the following State CEQA Guidelines Appendix G thresholds of significance.

The CEQA Guidelines (Appendix G) indicate that a proposed project may have potentially significant geologic impacts if it results in any of the following:

1) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death, involving:

    a. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;

    b. Strong seismic ground shaking;

    c. Seismic-related ground failure, including liquefaction;

    d. Landslides.

2) Result in substantial soil erosion of the loss of topsoil.

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

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

5) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

Since geologic conditions in the Planning Area do not include ultramafic rock conditions that could support naturally occurring asbestos, no public health exposure impacts to naturally occurring asbestos are expected to occur.

METHODOLOGY

The evaluation of geology and related soils located within the proposed Planning Area was based on a review of regional reports prepared by Contra Costa County, the State of California, and various consultants. The proposed General Plan land uses were compared to existing geologic conditions in order to identify impacts to the Planning Area resulting from implementation of the proposed project.

PROJECT IMPACTS AND MITIGATION MEASURES

Seismic Hazards (Standard of Significance 1)

Impact 4.8.1 Implementation of the proposed project (General Plan Update, Three Corridors Specific Plan, and Zoning Code Update) would result in the construction of projects over a seismically hazardous area. This is considered **less than significant** impact.

General Plan Update

The Planning Area is located in a fault zone that is expected to experience ground motion of high severity. The maximum level of ground motion potentially experienced in the Planning Area would occur as a result of a 7.25 magnitude earthquake on the Hayward fault zone or of an 8.5 magnitude along the San Andreas Fault. While the City of Pinole is not located within an Alquist-Priolo earthquake hazard zone, the unincorporated portions of the GPU Planning Area are in Contra Costa County and are considered to be in an earthquake hazard zone. Due to the proximity to the Hayward Fault to the GPU Planning Area, this fault poses the greatest threat to Pinole.

The Pinole Fault has a recurrence interval of approximately every 900 years, with repeated movement over the last 10,000 years. Additionally, the Pinole Fault may be a potentially linking structure between the Rogers Creek Fault and the Hayward Fault, thereby significantly increasing the potential rupture length and the maximum earthquake which may be generated by these faults.

Damage to buildings and utilities in Pinole is likely to be greatest on those sites underlain by deep, loose, compressible deposits of bay mud, non-engineered fill, and marginally stable hillside areas. Areas within the GPU Planning Area that are highly susceptible to damages resulting from ground shaking are located between San Pablo Avenue and the San Pablo Bay shoreline, in the western portions of the city, especially in the Tara Hills Mobile Home Park. However, the City has adopted the CBC into their building standards for all development within the city limits. CBC standards address foundation design, shear wall strength, and other structural-related conditions. All development projects associated with the proposed General Plan Update are subject to the CBC, which requires a seismic evaluation and particular seismic design criteria to reduce ground shaking effects. Compliance with CBC regulations ensures the adequate design and construction of building foundations to resist soil movement. Therefore, this impact is **less than significant**.

Three Corridors Specific Plan

Implementation of the proposed Three Corridors Specific Plan would consist of the revitalization of the San Pablo Avenue, Pinole Valley Road, and Appian Way corridors, which could include new development and/or redevelopment of various urban uses. The updated General Plan and the Three Corridors Specific Plan direct the majority of the city's future growth to sites designated for mixed and multiple-family use in the San Pablo Avenue, Pinole Valley Road, and Appian Way corridors. The Three Corridors Specific Plan also identifies opportunity sites for infill mixed-use development along the city's commercial corridors in close proximity to transit and other amenities. Areas within the GPU Planning Area that are highly susceptible to damages resulting from ground shaking are located between San Pablo Avenue and the San Pablo Bay shoreline, in the western portions of the city, especially in the Tara Hills Mobile Home Park. However it should be noted that the City has adopted the CBC into their building standards which would

require all new development projects to conduct a seismic evaluation and to incorporate particular seismic design criteria to reduce ground shaking effects. Therefore, this impact is **less than significant**.

Zoning Code Update

Adoption of the updated General Plan would require amendments to the Zoning Code for consistency with the General Plan land use designations and various General Plan policies. The City plans to update its Zoning Code as part of the proposed General Plan Update project. These updates would involve the deletion, addition, and modification of certain zoning districts and development standards in order to make the Zoning Code consistent with the updated General Plan (see Section 3.0, Project Description, for more details). These updates would not result in any development activities beyond those analyzed for the proposed GPU. Therefore, the Zoning Code Update would have an impact similar to that for the General Plan Update as discussed above.

Proposed General Plan Policies and Action Items that Address Seismic Hazards

The General Plan Update contains the following policies and actions that are specific, enforceable requirements and/or restrictions and corresponding performance standards that assist in mitigating potential seismic hazards impacts.

Policy HS.3.1 Require geotechnical studies for development proposals. Such studies should determine the actual extent of geotechnical hazards, optimum location for structures, the advisability of special structural requirements, and the feasibility and desirability of a proposed facility in a specified location.

Action HS.3.1.1 Continually update the geologic hazard map with new information provided by geotechnical studies.

Policy HS.3.2 Require soils and geologic review of development proposals in accordance with City procedures to assess potential seismic hazards, liquefaction, land sliding, mud sliding, erosion, sedimentation, hydromodification and settlement in order to determine whether these hazards can be adequately mitigated.

Policy HS.3.3 Require that all geologic hazards be adequately addressed and mitigated through project development. Development proposed in areas of potential geological hazards should not be endangered by, nor contribute to, the hazardous conditions on the site or on adjoining properties.

Policy HS.3.4 Assure existing and new structures are designed to protect people and property from seismic hazards. Evaluate new development on sites which may have involved hazardous materials prior to development approvals.

Action HS.3.4.1 Update the Building Code and other codes as necessary to address earthquake, fire and other hazards, and support programs for the identification, abatement or mitigation of existing hazardous structures.

Action HS.3.4.2 Implement actions to address safety issues related to unreinforced masonry buildings in coordination with historic preservation policies and programs.

As mentioned above, the City has adopted the CBC into their building standards for all development within the city limits. All development projects associated with the proposed General Plan Update are subject to the CBC, compliance with which would ensure adequate design and construction of building foundations to resist soil movement. In addition, implementation of the above General Plan policies and action items would also reduce impacts associated with seismic hazards. Therefore, seismic hazard impacts associated with implementation of the proposed project would be reduced to a **less than significant** level.

Mitigation Measures

None required.

Soil Erosion or Loss of Topsoil (Standard of Significance 2)

Impact 4.8.2 Implementation of the proposed project (General Plan Update, Three Corridors Specific Plan, and Zoning Code Update) would result in increased soil, wind, and water erosion and loss of topsoil, due to grading activities within the Planning Area. This is considered a **less than significant** impact.

General Plan Update

Implementation of the proposed General Plan Update would provide for the intensification of urbanization, including residential and commercial development, from excavation and grading activities in areas that have been previously undeveloped or are changing to more intense land uses. Although no specific development is proposed as part of the proposed project, the General Plan Update would provide for improvements to existing roadways, substantial infrastructure, and varying densities of commercial, residential, and industrial development.

The grading and site preparation for future development would remove topsoil, disturbing and potentially exposing the underlying soils to erosion from a variety of sources, including wind and water. In addition, construction activities generally involve the use of water, which could further erode the topsoil as the water moves across the ground. Proposed development would also involve paving and other site improvements, substantially increasing the amount of impervious surfaces. These impervious surfaces generate higher levels of urban runoff (i.e., erosion from site preparation, sediment deposition from stormwater runoff, and vehicle fluids). The areas of silty or loamy soils within the Planning Area could be susceptible to erosion by both wind and water.

However, construction activities involving clearing, grading, or excavation that causes soil disturbance on 1 or more acres (or any project involving less than 1 acre that is part of a larger development plan and includes clearing, grading, or excavation) would be subject to coverage under the state's National Pollutant Discharge Elimination System (NPDES) General Construction Storm Water Permit. Project applicants are required to prepare and comply with a stormwater pollution prevention plan (SWPPP) that specifies best management practices (BMPs) to avoid soil erosion and associated pollution of waterways and are also required to report any water pollution and remediate the pollution occurrence (refer to the Regulatory Framework subsection of Section 4.9, Hydrology and Water Quality, for an expanded discussion on SWPPP requirements). In addition, the City's Erosion and Sediment Control Plan Ordinance establishes that erosion and sediment control plans, prepared by a registered civil engineer, shall be submitted to the City for review for any building or construction activities. Therefore these measures, along with the implementation of proposed General Plan policies, would reduce impacts associated with erosion and loss of topsoil to **less than significant**.

Three Corridors Specific Plan

Implementation of the proposed Three Corridors Specific Plan could result in the construction of new infrastructure. Grading, earthmoving, and other site preparation activities associated with the construction of new roadway segments could remove topsoil, disturbing the underlying soils and exposing them to potential erosion from a variety of sources, including wind and water. However, the City's Erosion and Sediment Control Plan Ordinance, the requirements of the NPDES permits, and implementation of proposed General Plan policies would reduce impacts associated with loss of topsoil and erosion to a **less than significant** level. In addition, Chapter 8.20 of the City Municipal Code requires that all construction contractors performing work in the city conform to the requirements of the Association of Bay Area Governments (ABAG) Manual of Standards for Erosion and Sediment Control Measures. The ABAG Manual of Standards for Erosion and Sediment Control Measures was developed by a team of experts and provides the detailed specifications and explanations for erosion control in the Bay Area and northern California jurisdictions. Since its initial publication, ABAG has revised the manual to incorporate advances in technologies and techniques for erosion and sediment control developed over the last decade.

Zoning Code Update

Adoption of the updated General Plan would require amendments to the Zoning Code for consistency with the General Plan land use designations and various General Plan policies. The City plans to update its Zoning Code as part of the proposed General Plan Update project. These updates would involve the deletion, addition, and modification of certain zoning districts and development standards in order to make the Zoning Code consistent with the updated General Plan (see Section 3.0, Project Description, for more details). These updates would not result in any development activities beyond those analyzed for the proposed GPU. Therefore, the Zoning Code Update would have an impact similar to that for the General Plan Update as discussed above.

Proposed General Plan Policies and Action Items that Address Soil Erosion or Loss of Topsoil

The following proposed General Plan update policies and action items address soil erosion through the use of enforceable performance standards.

Policy HS.3.1 Require geotechnical studies for development proposals. Such studies should determine the actual extent of geotechnical hazards, optimum location for structures, the advisability of special structural requirements, and the feasibility and desirability of a proposed facility in a specified location.

Action HS.3.1.1 Continually update the geologic hazard map with new information provided by geotechnical studies.

Policy HS.3.2 Require soils and geologic review of development proposals in accordance with City procedures to assess potential seismic hazards, liquefaction, land sliding, mud sliding, erosion, sedimentation, hydromodification and settlement in order to determine whether these hazards can be adequately mitigated.

Policy HS.3.3 Require that all geologic hazards be adequately addressed and mitigated through project development. Development proposed in areas of potential geological hazards should not be endangered by, nor contribute to, the hazardous conditions on the site or on adjoining properties.

Policy HS.3.7 Limit development and require appropriate control measures in conjunction with proposed development in areas susceptible to erosion.

Action HS.3.7.2 Establish riparian and stream restoration programs that include stormwater treatment, erosion control measures, stream cleanup projects and revegetation plans for denuded areas. These programs may also result in the removal of invasive, non-native vegetation that would be replaced with native plant materials to stabilize slopes and enhance wildlife habitat.

Action HS.7.1.2 Prohibit development in areas that are particularly susceptible to erosion and sediment loss.

In addition, Chapter 7.0, *Private Realm Design Guidelines*, of the proposed Three Corridors Specific Plan encourages the integration of the natural topography into site designs, minimizing grading, and maximizing pervious surfaces and the use of swales to reduce runoff by utilizing onsite infiltration.

Implementation of the above proposed General Plan policies and action items and Specific Plan guidelines, as well as compliance with NPDES requirements and the City's Erosion and Sediment Control Plan Ordinance, would ensure that future development projects would be evaluated for potential soil erosion impacts on a site-by-site basis and that runoff and erosion control measures would be integrated into the construction process and project site design. Therefore, impacts associated with loss of topsoil and erosion resulting from implementation of the proposed project would be reduced to a **less than significant** level.

Mitigation Measures

None required.

Landslide/Slope Instability (Standard of Significance 3)

Impact 4.8.3 Implementation of the proposed project (General Plan Update, Three Corridors Specific Plan, and Zoning Code Update) may result in construction in areas subject to landslide. This impact is **less than significant.**

General Plan Update

As stated in the Existing Setting discussion, there is a high potential in the Planning Area for seismically induced landslides and slope instability hazards. Seismically induced landslides are likely to occur along the steep to intermediate hillside areas of the Planning Area. Additionally, areas within the Planning Area prone to slope instability include areas with pronounced and steeper slopes located along the East Bay Hills, areas where previous land sliding or soil creeping has occurred, areas where non-engineered grading and uncontrolled drainage on slopes has occurred, and areas with deep colluvial deposits. Slope stability hazards can result in loose debris flows and landslides. Therefore, this is a **potentially significant** impact. However, as mentioned under Impact 4.8.3, the City has adopted the CBC into their building standards which would require all new development projects to conduct a seismic evaluation and to incorporate particular seismic design criteria to reduce ground shaking effects.

Three Corridors Specific Plan

Implementation of the proposed Three Corridors Specific Plan would consist of the revitalization of the San Pablo Avenue, Pinole Valley Road, and Appian Way corridors, which could include new development and/or redevelopment of various urban uses. The Three Corridors Specific Plan is intended to establish more housing choices and job opportunities within the city's commercial corridors. The updated General Plan and the Three Corridors Specific Plan direct the majority of the city's future growth to sites designated for mixed and multiple-family use in the San Pablo Avenue, Pinole Valley Road, and Appian Way corridors. The Three Corridors Specific Plan also identifies opportunity sites for infill mixed-use development along the city's commercial corridors in close proximity to transit and other amenities. Implementation of the proposed Three Corridors Specific Plan could result in the construction of new infrastructure in areas of the city that are largely developed. As previously stated, there are areas within the Planning Area prone to slope instability, e.g., the East Bay Hills. However, the Three Corridors Specific Plan area is already developed, and no new exposure to slopes and instable soils would be encountered. Therefore, this is a **less than significant** impact.

Zoning Code Update

Adoption of the updated General Plan would require amendments to the Zoning Code for consistency with the General Plan land use designations and various General Plan policies. The City plans to update its Zoning Code as part of the proposed General Plan Update project. These updates would involve the deletion, addition, and modification of certain zoning districts and development standards in order to make the Zoning Code consistent with the updated General Plan (see Section 3.0, Project Description, for more details). These updates would not result in any development activities beyond those analyzed for the proposed GPU. Therefore, the Zoning Code Update would have an impact similar to that for the General Plan Update as discussed above.

Proposed General Plan Policies and Action Items that Address Landslide or Slope Instability

The following proposed General Plan policies and action items address soil and geologic stability through specific performance-based standards.

Policy HS.3.1 Require geotechnical studies for development proposals. Such studies should determine the actual extent of geotechnical hazards, optimum location for structures, the advisability of special structural requirements, and the feasibility and desirability of a proposed facility in a specified location.

Action HS.3.1.1 Continually update the geologic hazard map with new information provided by geotechnical studies.

Policy HS.3.2 Require soils and geologic review of development proposals in accordance with City procedures to assess potential seismic hazards, liquefaction, land sliding, mud sliding, erosion, sedimentation, hydromodification and settlement in order to determine whether these hazards can be adequately mitigated.

Policy HS.3.3 Require that all geologic hazards be adequately addressed and mitigated through project development. Development proposed in areas of potential geological hazards should not be endangered by, nor contribute to, the hazardous conditions on the site or on adjoining properties.

Action HS.3.7.2 Establish riparian and stream restoration programs that include stormwater treatment, erosion control measures, stream cleanup projects and revegetation plans for denuded areas. These programs may also result in the removal of invasive, non-native vegetation that would be replaced with native plant materials to stabilize slopes and enhance wildlife habitat.

The City has adopted the CBC into their building standards for all development within the city limits. All development projects associated with the proposed General Plan Update are subject to the CBC, which address foundation design, shear wall strength, and other structural-related conditions. Compliance with CBC standards would minimize impacts related to landslides and slope instability. In addition, implementation of the above policies and action items, as well as compliance with applicable state, and local regulations regarding landslides and slope instability, would ensure that slope instability resulting from implementation of the proposed project would be reduced to a **less than significant** level.

Mitigation Measures

None required.

Location on Expansive and Unstable Soils (Standard of Significance 4)

Impact 4.8.4 Implementation of the proposed (General Plan Update, Three Corridors Specific Plan, and Zoning Code Update) would expose buildings, pavements, and utilities to significant damage as a result of underlying expansive or unstable soil properties. This is considered a **less than significant** impact.

General Plan Update

Implementation of the proposed General Plan Update could result in construction activities overlying expansive or unstable soils. Newly constructed buildings, pavements, and utilities could be damaged by differential settlement due to soil expansion and contraction. When structures are located on expansive soils, foundations have the tendency to rise during the wet season and shrink during the dry season. Movements can vary under the structures, which in turn create new stresses on various sections of the foundation and connected utilities. These variations in ground settlement can lead to structural failure and damage to infrastructure.

The lowland areas of the Planning Area containing alluvium and bay mud that consist of rich clay soils have a moderate potential for expansion under changing conditions. However, the city's biggest threat comes from large and erratic settlements in areas where fill material overlays soft, compressible bay mud. The clayey soils are considered to be slightly to highly expansive. Therefore, new development allowed by the project may expose structures to potential damage from expansive soils. This impact is **potentially significant**.

Three Corridors Specific Plan

Implementation of the proposed Three Corridors Specific Plan would consist of the revitalization of the San Pablo Avenue, Pinole Valley Road, and Appian Way corridors, which could include new development and/or redevelopment of various urban uses. The Three Corridors Specific Plan is intended to establish more housing choices and job opportunities within the city's commercial corridors. Due to the city's small supply of developable land, the updated General Plan and the Three Corridors Specific Plan direct the majority of the city's future growth to sites designated for mixed and multiple-family use in the San Pablo Avenue, Pinole Valley Road, and

Appian Way corridors. The Three Corridors Specific Plan also identifies opportunity sites for infill mixed-use development along the city's commercial corridors in close proximity to transit and other amenities. Implementation of the proposed Three Corridors Specific Plan could result in the construction of new infrastructure. As previously stated, there are expansive soils within the Planning Area. Therefore, this is a **potentially significant** impact.

Zoning Code Update

Adoption of the updated General Plan would require amendments to the Zoning Code for consistency with the General Plan land use designations and various General Plan policies. The City plans to update its Zoning Code as part of the proposed General Plan Update project. These updates would involve the deletion, addition, and modification of certain zoning districts and development standards in order to make the Zoning Code consistent with the updated General Plan (see Section 3.0, Project Description, for more details). These updates would not result in any development activities beyond those analyzed for the proposed GPU. Therefore, the Zoning Code Update would have an impact similar to that for the General Plan Update as discussed above.

Proposed General Plan Policies and Action Items that Address Location on Expansive or Unstable Soils

The following proposed General Plan update policies and action items address impacts related to unstable and expansive soils through the use of enforceable performance standards.

Policy HS.3.1 Require geotechnical studies for development proposals. Such studies should determine the actual extent of geotechnical hazards, optimum location for structures, the advisability of special structural requirements, and the feasibility and desirability of a proposed facility in a specified location.

Action HS.3.1.1 Continually update the geologic hazard map with new information provided by geotechnical studies.

Policy HS.3.2 Require soils and geologic review of development proposals in accordance with City procedures to assess potential seismic hazards, liquefaction, land sliding, mud sliding, erosion, sedimentation, hydromodification and settlement in order to determine whether these hazards can be adequately mitigated.

Policy HS.3.3 Require that all geologic hazards be adequately addressed and mitigated through project development. Development proposed in areas of potential geological hazards should not be endangered by, nor contribute to, the hazardous conditions on the site or on adjoining properties.

Action HS.3.7.2 Establish riparian and stream restoration programs that include stormwater treatment, erosion control measures, stream cleanup projects and revegetation plans for denuded areas. These programs may also result in the removal of invasive, non-native vegetation that would be replaced with native plant materials to stabilize slopes and enhance wildlife habitat.

Implementation of the above policies and action items, as well as compliance with applicable state, and local regulations regarding expansive and unstable soils, would reduce impacts to expansive and unstable soils to **less than significant** levels.

Mitigation Measures

None required.

4.8.4 CUMULATIVE SETTING, IMPACTS, AND MITIGATION MEASURES

CUMULATIVE SETTING

The setting for this cumulative analysis includes existing, proposed, approved, and planned projects in the GPU Planning Area and surrounding portions of unincorporated Contra Costa County. Development in the region identified in Section 4.0 would change the intensity of land uses in the region. However, impacts associated with geology, soils, and seismicity are generally site-specific rather than cumulative in nature as geologic properties can vary by site. Individual development projects would be subject to, at a minimum, uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent in the region.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

Cumulative Geologic, Soils, and Seismic Impacts

Impact 4.8.5 Implementation of the proposed project (General Plan Update, Three Corridors Specific Plan, and Zoning Code Update), in combination with existing, planned, proposed, and reasonably foreseeable development, would not contribute to cumulative geologic, seismic, and soil impacts, as the impacts would be site-specific and not additive in character. Thus, this impact would be **less than cumulatively considerable**.

Geology and soil-related impacts are generally site-specific and are determined by a particular site's soil characteristics, topography, and proposed land uses. Development projects are analyzed on an individual basis and must comply with established requirements of the City as they pertain to protection against known geologic hazards and potential geologic and soil-related impacts. Standards may include over-excavation, modification to foundations, additional bracing, or drainage to reduce or eliminate impacts associated with geology. As such, the proposed project's contribution to cumulative geology-related impacts is considered **less than cumulatively considerable.**

Proposed General Plan Policies and Action Items that Address Cumulative Geologic, Soils, and Seismic Impacts

The proposed General Plan Update contains several policies and action items that would assist in reducing the cumulative geology and soils impact. The following list contains those policies and action items that contain specific, enforceable requirements and/or restrictions and corresponding performance standards that assist in reducing this impact. Since these policies and action items have been described in detail in prior impact discussions for this section, the following is limited to only listing the policy and action item numbers.

Health and Safety Element

Policy HS.3.1, Action HS.3.1.1, Policy HS.3.2, Policy HS.3.3, Policy HS.3.4, Action HS.3.4.1, Action HS.3.4.2, Policy HS.3.7, Action HS.3.7.2, Action HS.7.1.2.

Adherence to all state, and local requirements, in addition to implementation of the above General Plan policies, would further minimize the City of Pinole's contribution to cumulative geology, soils, and seismicity impacts. Therefore, the General Plan's contribution to cumulative geology, soils, and seismicity impacts would be **less than cumulatively considerable**.

Mitigation Measures

None required.

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