4.8 GEOLOGY, SOILS, AND SEISMICITY

4.8.1 Introduction

This section describes geology, soils, and seismicity conditions in the vicinity of the Proposed Project sites and assesses the extent to which the project could expose people or structures to potential seismic, liquefaction, landslide, and expansive soil impacts, and the extent to which the project could result in substantial soil erosion or loss of topsoil. The impact section evaluates construction and operational impacts, and mitigation measures are presented as necessary. The section is based on a preliminary geotechnical report prepared for this EIR by Ninyo & Moore, which is included in **Appendix K**, and review of other relevant studies and reports. A discussion of cumulative impacts is provided at the end of the section.

Public and agency comments received during the public scoping period in response to the Notice of Preparation are summarized in **Appendix A, Scoping Report**. No comments were received related to geology, soils, and seismicity.

4.8.2 Environmental Setting

The geologic and soils study area extends from the northern Marina area southwest to the Pacific Grove area in the Monterey Peninsula, and as far inland as Salinas. The Proposed Project components are located in three general areas that have relatively distinct geologic and topographic characteristics. The northeastern area includes a large area of low-lying agricultural fields in the floodplain of the Salinas River. Proposed Project components in northern Marina are located within approximately 2 miles of the coast, and project components in Salinas are located within approximately 10 miles of the coast. The central portion of the project area includes rolling hills extending inland from the coast comprised of windblown eolian deposits. This area includes the urbanized developments of Seaside and Marina, as well as the former Fort Ord military base. The southwestern portion of the project area includes rolling hills extending inland and generally west of Canyon Del Rey into the Monterey Peninsula.

4.8.2.1 Regional Geologic Setting

Geologic Setting

The project area is located within the Coast Ranges physiographic province which is characterized by a series of northwest-trending mountain ranges and valleys that are generally fault controlled. The Coast Ranges are chiefly composed of thick Mesozoic- and Cenozoic-age sedimentary strata. The northern and southern parts of the ranges are separated by a depression containing the San Francisco Bay. Faults juxtapose blocks of different origins. The majority of the Monterey area is underlain by the Salinian block, which is generally bounded by the San Andreas fault zone to the northeast and the San Gregorio fault zone to the southwest (Rosenberg, 2001h referenced in Ninyo & Moore, 2014). The Salinian block is comprised of Mesozoic granitic rock and Paleozoic to Mesozoic meta-sedimentary rock (Norris & Webb, 1990 as referenced in Ninyo & Moore, 2014). During Quaternary time, the region has been uplifted to its current elevation and a combination of tectonic and geomorphic processes have shaped the present landscape, including the exposure of marine terraces, deposition of eolian sand, alluvial deposition, and landsliding.

The northeastern portion of the project area extends north of the active Salinas River channel and generally consists of a relatively broad low-lying, alluvial floodplain. The central area of the project consists of eolian deposits that form a zone of moderately elevated, rolling hills extending several miles inland from the coastline and south from the Salinas River channel to Canyon del Rey. The southwestern area of the project extends generally west along the coastline from the Canyon del Rey into elevated terrain of the Monterey Peninsula, which is the coastal expression of a northwesterly trending mountain range uplifted by faulting. The uplifted peninsula includes a variety of geologic units that includes a core of Cretaceous-age granitic rocks, Tertiary-age sedimentary rocks, Pleistocene-age terrace deposits, landslides and alluvial sediments.

Geologic Units

Based on geologic literature review, the geologic units anticipated within the project study area include fill, alluvium, eolian deposits, terrace deposits, Tertiary-age Monterey Formation, and Cretaceous-age poryphyritic granodiorite of Monterey. The distribution of the various geologic units is shown on the regional geology map in **Figure 4.8-1A, Regional Geology Map** along with the existing wastewater conveyance pipelines and Proposed Project components. The regional geology map symbols are described on **Figure 4.8-1B, Explanation of Regional Geology**. A brief summary of these geologic units and characteristics are presented below.

Alluvium

Alluvial materials are generally mapped in the northeast and southwest portions of the project study area. Alluvium is generally comprised of unconsolidated sediments deposited in alluvial fans, along active stream and river channels, and in floodplains. Project components in the northeastern area are mapped as being underlain by Holocene-age flood-plain deposits, Holocene basin deposits, Holocene alluvial deposits, and Holocene stream channel deposits (Rosenberg, 2001a as referenced in Ninyo & Moore, 2014). The alluvium in the northeastern portion of the project area is anticipated to generally consist of interbedded silts, clays, sands, and gravels. The northeastern area is largely agricultural and relatively flat, with relatively poor drainage features. Groundwater is anticipated to be within 10 feet of the ground surface (and shallower) in the low-lying areas.

Portions of the project components in the southwestern area are mapped as being underlain by Holocene basin deposits and Holocene alluvial deposits Alluvial materials in the southwestern project area are anticipated to be more variable due to the complex geologic conditions and terrain associated with the Monterey Peninsula and may include moist to wet, loose/soft clays, silts, and sands.

Eolian Deposits

The central portion of the project area between the Salinas River and Canyon del Rey is mapped as being underlain by Pleistocene-age eolian deposits. Some eolian (windblown) deposits are also present in the southwestern portion of the project area (Rosenberg, 2001a as referenced in Ninyo & Moore, 2014). These deposits are described as being weakly to moderately consolidated, moderately to well-sorted silt and fine- to medium-grained sand deposited in an extensive coastal dune field. Shallow groundwater is not anticipated within the elevated eolian deposits, except for localized low-lying areas along the coastline (Rosenberg, 2001d as referenced in Ninyo & Moore, 2014). The soil erosion hazard within the eolian deposits in the central portion of the project area is mapped as moderate, except along the coast where the soil erosion hazard is mapped as high (Rosenberg, 2001f as referenced in Ninyo & Moore, 2014). Eolian deposits may also be collapsible. Collapsible soil is broadly defined as loose and cemented soil with low moisture content that is susceptible to a large and sudden reduction in volume upon wetting, with no increase in vertical stress.

Terrace Deposits

Pleistocene-age coastal terrace deposits are mapped within the southwestern portion of the project area, and are described as semiconsolidated, moderately well-sorted marine sand containing thin, discontinuous gravel-rich layers. These deposits can locally include some terrace surfaces and debris flow deposits resting on terrace surfaces. In general, the soil erosion hazard is mapped as moderate in areas underlain by coastal terraces (Rosenberg 2001f as referenced in Ninyo & Moore, 2014).

Monterey Formation

The Tertiary-age Monterey Formation is mapped in the southwestern portion of the project along the margins of Lake El Estero, and is described as light brown to white, hard, brittle, and platy siliceous mudstone. Bentonite beds are present within the Monterey Formation, which are prone to landsliding in sloped areas.

Poryphyritic Granodiorite of Monterey

The Poryphyritic Granodiorite of Monterey is mapped in the southwestern portion of the project area. This Cretaceous-age granitic rock is light gray to moderate pink, and medium-grained (Clark et al., 1997 as referenced in Ninyo & Moore, 2014).

Fill

Artificial fill materials are mapped along the proposed CalAm Distribution System Pipelines and at the Lake El Estero Source Water Diversion site in the southwest portion of the project study area, and are anticipated to be encountered elsewhere throughout the study area. Fill materials are generally derived from local natural soils, and may also include imported materials or other non-engineered soils or construction debris.

4.8.2.2 Faulting and Seismicity

Regional Faults

The Project area is located in the Coast Ranges geomorphic province of California, an area considered seismically active, as are most areas of California. The Coast Ranges are comprised of a series of parallel, northwest-trending mountain ranges and valleys generally controlled by faults. Faults juxtapose blocks of geologic units of different origins called belts. The Monterey area is located within the Salinian block which is a northwest-trending belt bounded to the east by the San Andreas Fault, and to the west by the San Gregorio (Sur) fault. A regional fault map is presented on **Figure 4.8-2, Regional Fault Map**.

San Andreas Fault

The San Andreas Fault system is the most active fault system in California. In its entirety, it runs 800 miles down the California coastline, including 30 miles in the southeastern portion of Monterey County. To the north and south of the County, the fault appears to be currently locked with no detectable movement. Between these locked sections, within the County, the San Andreas Fault creeps. From San Juan Bautista to Parkfield, the creeping section produces numerous small to moderate (mostly magnitude 6.0 and smaller) earthquakes but no large ones. The stretch of the fault between Parkfield and Gold Hill defines a transition zone between the creeping and locked behavior of the fault.

Historically, most of the earthquakes that have occurred in Monterey County have originated from movement along the San Andreas Fault system, which runs through the southeastern portion of the county. It is the source of the area's earliest recorded great earthquake event, which occurred in June 1838 with an estimated magnitude 7.0 to 7.4. The next large earthquake in Monterey County occurred almost 20 years later on January 9, 1857 on the southern segment of the San Andreas Fault, northwest of the unincorporated community of Parkfield with an estimated magnitude of 8.3. The San Francisco earthquake on April 18, 1906 had a magnitude of 7.7–7.9. In Monterey, Hotel Del Monte was nearly destroyed, and four or five people were killed. Available data suggest that between five to ten small earthquakes have been felt each year in Monterey County and one moderate earthquake has been felt along the San Andreas Fault near Parkfield every 22 years (1857, 1881, 1901, 1922, 1934, 1966, and 2004) over the past 150 years. However, the next large earthquake did not occur for over 80 years, from 1906 until 1989. On October 17, 1989, the Loma Prieta earthquake occurred in neighboring Santa Cruz County with a magnitude 6.9 to 7.1. In Moss Landing, liquefaction destroyed the marine laboratory and seriously damaged a power plant.

Geologic studies show that over the past 1,400 to 1,500 years large earthquakes have occurred at about 150-year intervals on the southern segment of the San Andreas Fault (south of Parkfield). As the last large earthquake on the southern San Andreas Fault segment occurred in 1857, that section of the fault is considered a likely location for an earthquake within the next few decades. The northern segment of the fault (north of San Juan Bautista) has a slightly lower potential for a great earthquake. However, as noted above, Monterey County experiences several small detectable earthquakes every year. Also, moderate-sized, potentially damaging earthquakes could occur in this area at any time. Recent research by the USGS shows that the San Andreas Fault has a 21% probability and the San Gregorio–Palo Colorado Fault zone has a 10% probability of a magnitude 6.7 or greater earthquake by 2032.

San Gregorio Fault

The San Gregorio Fault Zone is a complex of faults that skirt the coastline north of Big Sur, run northwestward across Monterey Bay, briefly touching the shoreline of the San Mateo County coastline at Point Ano Nuevo and at Seal Cove, just north of Half Moon Bay. This fault is an active fault that has been recently recognized as capable of producing large earthquakes. Recent studies have shown Holocene displacement on the San Gregorio Fault, as recently as 1270 AD to 1400. Additionally, a 1929 earthquake with Richter Magnitude above 6.0, thought to have occurred on the Monterey Fault, may have actually ruptured an offshore segment of the San Gregorio Fault Zone. According to the USGS Working Group on earthquake probabilities, the San Gregorio Fault has a 10% chance of producing one or more magnitude 6.7 earthquakes in the next 30 years.

Local Faults

Several active and potentially active faults have been mapped within or close to the study area. As defined by the California Geological Survey, an "active" fault is one that has exhibited seismic activity or has evidence of fault displacement within Holocene time (roughly during the last 11,000 years). "Potentially active" faults are those which show evidence of displacement during Quaternary time (roughly during the last 1.6 million years), but for which evidence of Holocene movement has not been established. The approximate locations of the major faults in the region and their geographic relationship to the project area are shown on **Figure 4.8-2** and in greater detail on **Figure 4.8-3, Detailed Fault Map**.

Table 4.8-1, Principal Active and Potentially Active Faults lists principal active and potentially active faults near the Proposed Project component sites, the estimated maximum moment magnitude of each fault, and the estimated slip rate for each fault. The distances to each fault are based on estimated distances from the closest Proposed Project component. The distances to each fault are based on estimated distances from the southwestern end of the proposed CalAm Distribution System Pipelines, the Tembladero Slough diversion site, or the Reclamation Ditch diversion site.

Table 4.8-1
Principal Active and Potentially Active Faults

Fault	Fault to Proposed Project Area Distance (Range in Miles)	Maximum Moment Magnitude (M_{max})	Slip Rate (mm/yr)
Monterey Bay – Tularcitos Fault Zone	0-11	7.3	0.5
Rinconada Fault Zone	0-7.5	7.5	1.0
San Andreas (Santa Cruz Mtn Section)	12-26	7.0	17.0
Source: Ninyo & Moore, 2014			

The Reliz fault zone is the northward extension of the Rinconada fault zone which trends to the northwest along the base of the mountains at the southwest side of the Salinas River valley. The northernmost known indication of Quaternary movement along this fault zone is the steeply dipping Paso Robles Formation beds near the Spreckels area. The Reliz fault has been projected northwest from Spreckels crossing through the central portion of the project area in the Marina vicinity; this portion of the fault passes beneath eolian deposits and the location is uncertain. This fault system has displaced materials of late Quaternary age (11,000 to 750,000 years old) and is considered potentially active (Rosenberg, 2001c as referenced in Ninyo & Moore, 2014).

The Monterey Bay-Tularcitos fault zone crosses through the Monterey-Seaside area and extends offshore. The onshore portion in the project vicinity includes the Ord Terrace, Seaside, Chupines, and Navy faults. These faults create an approximately 5 to 9 mile wide zone of short northwest-striking faults that are related. The activity and locations of these faults are not well defined. Geologic data indicates Holocene displacement at some locations and these faults should be considered active for planning purposes.

The northernmost Ord Terrace fault is mapped beneath eolian deposits in the central portion of the project area, and is a steeply southwest-dipping reverse fault. There is evidence for Pleistocene activity in the northward extension of the fault into Monterey Bay, where it cuts Pleistocene strata and off-sets the sea floor (Rosenberg, 2001h as referenced in Ninyo & Moore, 2014). Rosenberg (2001c as referenced in Ninyo & Moore, 2014) shows displacement on the Ord Terrace fault within Quaternary time but prior to the middle Pleistocene.

The Seaside fault is mapped beneath eolian deposits in the central portion of the project area. The Seaside fault is a steeply southwest-dipping reverse fault and well data suggests that its trace connects to a splinter of the Chupines fault near Highway 68. Well logs on either side of the fault show an approximate 275 foot vertical offset of Pleistocene continental deposits, but evidence for Holocene movement is lacking (Rosenberg, 2001h as referenced in Ninyo & Moore, 2014). Rosenberg (2001c) shows displacement along the Seaside fault within Quaternary time but prior to the middle Pleistocene.

The Chupines fault is mapped within the southwestern edge of the central portion of the project area. At locations where the fault orientation is measurable, its dip ranges from 50 degrees southwest to near-vertical. A probable offshore extension of the Chupines fault cuts Holocene deposits and seafloor deposits (Rosenberg, 2001h as referenced in Ninyo & Moore, 2014). Thus the portion of the fault within the project area is considered active.

The Navy fault is mapped through the proposed CalAm Monterey Pipeline alignment within the southwestern portion of the project area. Its northwest-striking alignment is consistent with the Tularcitos fault zone and extends from Carmel Valley to Monterey Bay. The Navy fault dips steeply to the southwest and geomorphic features along its trace such as linear drainages and aligned benches indicate predominantly strike-slip movement. Clark (Clark et al., 1997 as referenced in Ninyo & Moore, 2014) reports Holocene activity on the Navy fault based on Holocene displacements of offshore strata and earthquake epicenter plots near the fault trace. Rosenberg (2001c) however shows displacement within Quaternary time but prior to the middle Pleistocene. The Fault Activity Map of California (Jennings & Bryant, 2010 as referenced in Ninyo & Moore, 2014) indicates that displacement along the onshore portion of the Navy fault within the study area dates to late Quaternary and pre-Holocene time.

Seismic Hazards

Seismic hazards that could potentially affect improvements within the study area include surface fault rupture, ground shaking, soil liquefaction and dynamic settlement, lateral spreading, tsunamis and landsliding.

Fault Rupture

Evaluation of fault rupture hazard is based on the historic activity and recurrence of faulting along existing faults. Faults of known historic activity during the last 200 years, as a class, have a greater probability for future activity than faults classified as Holocene age (last 11,000 years), and a much greater probability of future activity than faults classified as Quaternary age (last 1.6 million years). However, certain faults have recurrent activity measured in tens or hundreds of years whereas other faults may be inactive for thousands of years before being reactivated. The magnitude, sense, and nature of fault rupture also vary for different faults or along different strands of the same fault.

Faults in the vicinity of the project have demonstrated Quaternary movement and can be considered at least potentially active. The Chupines fault and the Navy fault have demonstrated Holocene movement and can be considered active. As such, there is potential for fault rupture within the project area, and these faults cross proposed and existing pipeline alignments. The Reliz, Seaside, Chupines, and Navy faults cross the proposed CalAm Distribution System Monterey Pipeline alignment. The Ord Terrace fault potentially crosses the proposed CalAm Distribution System Monterey Pipeline alignment, and traces are located very near the proposed Injection Well Facilities. The approximate locations of these faults and their geographic relationship to the proposed improvements are shown on **Figure 4.8-3.**

Ground Shaking

Strong ground shaking may occur due to earthquake events along active faults nearby or distant to the study area. Disregarding local variations in ground conditions, the intensity of shaking at different locations within the area can generally be expected to decrease with distance away from an earthquake source. The California Geologic Survey Ground Motion Interpolator (California Geological Survey, 2008 as referenced in Ninyo & Moore, 2014) based on the 2008 Probalistic Seismic Hazard Assessment by the United States Geological Survey (Petersen et al, 2008 as referenced in Ninyo & Moore, 2014), indicates that the peak ground acceleration with a 2% probability of exceedance in 50 years ranges between 0.60g and 0.65g over the study area for an assumed shear wave velocity of 270 meters per second.

Soil Liquefaction and Dynamic Settlement

Liquefaction is a phenomenon in which soil loses its shear strength for short periods of time during an earthquake. Ground shaking of sufficient duration results in the loss of grain-to-grain contact, due to a rapid increase in pore water pressure, causing the soil to behave as a fluid for short periods of time. The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of structure slabs due to sand boiling, and buckling of deep foundations due to liquefaction-induced ground settlement. Dynamic settlement may also occur in loose, dry sands above the water table.

In general, a relatively high potential for liquefaction exists in loose, sandy soils that are within 50 feet of the ground surface and are saturated (below the groundwater table). The

alluvial materials in the southwestern portion of the Project area are mapped as having high liquefaction susceptibility, and the alluvial materials in the northeastern floodplain area of the project are mapped as having moderate to high liquefaction susceptibility (Rosenberg, 2001d as referenced in Ninyo & Moore, 2014). The eolian deposits are generally mapped as having low liquefaction susceptibility, except where shallow groundwater may be present in localized low-lying areas (Rosenberg, 2001d as referenced in Ninyo & Moore, 2014). The liquefaction hazard and landslide seismic hazard are mapped as low in areas underlain by coastal terrace deposits (Rosenberg 2001b and 2001d as referenced in Ninyo & Moore, 2014).

Some locations within the project study area, including the floodplain of the Salinas River, low-lying coastal areas, and alluvial river-bottom areas such as Canyon del Rey (Highway 68) and other drainages within the southwestern portion of the project have a moderate to high liquefaction potential (**Figure 4.8-4, Liquefaction Hazards**). Separate locations of historical liquefaction incidents have been documented within the project area, the majority of which were located within the northeastern project area. There may be a moderate potential for dynamic settlement of dry, loose sands within the elevated dune sand deposits.

Lateral Spreading

Lateral spreading is horizontal earth movement associated with soil liquefaction. Lateral spreading generally occurs in shallow groundwater areas with unsupported embankments including natural creek banks, fill slopes, levees, etc. Areas that have a potential for lateral spreading within the study area are low-lying areas near river channels, sloughs, or other drainages.

Earthquake-Induced Landslides

Relatively shallow surficial sliding may occur throughout the project area where steep slope gradients are present and/or loose soil conditions exist (such as eolian sands, loose topsoil, and fill slopes). The project study area is generally considered to be in an area of low susceptibility to earthquake-induced landsliding (Rosenberg, 2001b as referenced in Ninyo & Moore, 2014).

Tsunami

Tsunamis are open sea tidal waves generated by earthquakes. Tsunami damage is typically confined to low-lying coastal areas. A majority of the coastline along Monterey Bay is mapped within a tsunami inundation area (see **Figure 4.11-8, Tsunami Inundation Areas in the Proposed Project Area**, in **Section 4.11, Hydrology and Water Quality: Surface Water**), which includes the areas in which some project components are located in the southwestern part of the project area (the CalAm Distribution System: Monterey and Transfer Pipeline and the Lake El Estero Diversion sites) and in the northeastern part of the project area in the vicinity of the Salinas River floodplain (the Tembladero Slough and Blanco Drain Diversions sites) (California Geological Survey, 2009a,b,c as referenced in Ninyo & Moore, 2014).

4.8.2.3 Soil Conditions

Expansive Soils

Some clay minerals undergo volume changes upon wetting or drying. Unsaturated soils containing those minerals will shrink/swell with the removal/addition of water. The heaving pressures associated with this expansion can damage structures, flatwork, and pipelines.

Clayey soils may be encountered throughout the project area in fill, alluvial, and formational materials.

Soil Collapse Potential

Collapsible soil is broadly defined as loose and cemented soil with low moisture content that is susceptible to a large and sudden reduction in volume upon wetting, with no increase in vertical stress. The process of soil collapse upon wetting is referred to as hydro-collapse. Another type of collapse can occur in saturated soil bearing soluble minerals when subjected to continuous leaching. Some common soluble soil minerals include calcium chloride, magnesium chloride, sodium chloride, potassium chloride, gypsum, anhydrite, dolomite, and calcium carbonate (Mansour et al., 2008 as referenced in Ninyo & Moore, 2014). The composition of minerals dissolved in leaching water will affect the soil mineral dissolution rate.

The most common types of collapsible soil include alluvial soils, eolian deposits, and residual soils formed by extensive weathering of parent materials such as granitic rock (Mansour et al, 2008 as referenced in Ninyo & Moore, 2014). Within the project area alluvial materials, eolian deposits, and residual soil over granodiorite are present. Settlement may occur where these materials are loose, relatively dry, and subjected to a significant increase in moisture content.

Erosion Potential and Sea Level Rise

Surface soils tend to erode under the wearing action of flowing water, waves, wind, and gravity. Factors influencing erosion include topography, soil type, precipitation and other environmental conditions. In general, granular soils with relatively low cohesion and soils located on relatively steep topography have relatively high erosion potential. Within the project area, coastal areas north of Lake El Estero and the slopes on the southern side of the Salinas River have a high potential for erosion (Rosenberg, 2001f as referenced in Ninyo & Moore, 2014). The coastal terrace and eolian deposits inland from the coastline with less steep topography are considered to have a moderate potential for erosion. The relatively flat areas within the Salinas River valley have a low potential for erosion. The Proposed Project sites are located within areas identified as having a moderate to low erosion hazard; see **Figure 4.8-5, Soil Erosion Hazard Areas**.

The shoreline of south Monterey Bay (from the Salinas River south to Del Monte Beach in the City of Monterey) includes an 11-mile stretch of continuous sandy beach that changes seasonally, with beaches generally being wider and gently sloping in summer and narrower and steeper in winter. Locally severe erosion problems in the south Monterey Bay area has been reported, mainly due to highly erosive windblown sand and particularly in the incorporated and unincorporated areas around Marina, Sand City, Monterey, and Fort Ord. In this area, the coastline is one of low relief, with sand dunes present from the Pajaro River southward to Carmel, and much of the erosion is due to movement of unstable, windblown sand—especially where vegetation has not been established. Much beachfront property is also lost from high surf and wave action that is concentrated during winter storms. This sand may be redistributed along the coast in a process known as long-shore or littoral drift. When sand is depleted or cut off by an obstruction, the result is often severe; with no new sand to reform the beach, a major retreat of the coastline occurs. In the Marina State Beach area, bluffs and dunes retreated at an average rate of 5 to 7 feet per year from 1937 to 1983, and Fort Ord experienced major retreat after a former wastewater/drainage outfall was constructed in 1962, where the beach retreated 175 feet in 21 years (ESA-PWA, 2014).

Coastal shoreline retreat is affected by long-term erosion, sea level rise, and storm events, and is forecast to worsen based on some projections of global warming causing the sea level to rise (ESA-PWA, 2014). Coastal erosion in the southern Monterey Bay, including the project area, is expected to increase with accelerating sea level rise. The only Proposed Project component within the areas considered at risk due to this southern Monterey Bay coastal erosion is the Monterey Pipeline portion of the CalAm Distribution System. All other Proposed Project components are outside the project 100-year coastal retreat boundary. See **Figure 4.8-6, Coastal Erosion Hazard Zones** for a map of the Coastal Erosion Hazard Zones near the Monterey Pipeline component and the Lake El Estero Source Water diversion component. (ESA-PWA, 2014).

4.8.2.4 Geology and Soils Characteristics at Project Sites

As previously indicated, the Proposed Project area consists of three general regions with relatively distinct geologic and topographic characteristics, which are summarized below. Specific geologic, seismic and/or soils characteristics associated with each Proposed Project component site are then presented

The northeastern area includes the following project source water diversion and storage sites: Tembladero Slough, Reclamation Ditch, Salinas Pump Station, Salinas Treatment Facility, and the eastern portion of the Blanco Drain source water diversion site. This area includes the low-lying, relatively flat, alluvial plains of the Salinas River and the relatively narrow flood plains of the Tembladero Slough. Ground surface elevations in the portion of the project area that is within the Salinas River valley generally range from approximately 10 to 45 feet above mean sea level (MSL). Ground surface elevations near the Tembladero Slough source water site range from approximately 4 to 10 feet above MSL.

The central portion of the study area includes the following project sites: the existing Regional Treatment Plant, the western portion of the Blanco Drain source water diversion site, the Product Water Conveyance system, the Injection Well Facilities, and the eastern portion of the proposed CalAm Distribution System Transfer Pipeline. The central area includes gently to moderately rolling dunes with elevations ranging from approximately 10 feet above MSL near the Salinas River to approximately 350 feet above MSL along the southernmost portion of the proposed Product Water Conveyance pipeline alignment. Elevations at the proposed Injection Well Facilities site range from approximately 330 to 425 feet above mean sea level (MSL).

The southwestern portion of the study area includes the Lake El Estero Source Water Diversion site and the western portion of the proposed CalAm Distribution System Monterey Pipeline. The topography in the southwestern area is variable and includes the relatively low-lying coastal area between Canyon del Rey and Lake El Estero, gently sloping terraces beginning several blocks west of Lake El Estero and inland, and undulating coastal bluffs on portions of the coastline. Elevations range from approximately 10 feet above MSL between Canyon Del Rey and Lake El Estero to approximately 220 feet above MSL at the western terminus of the proposed CalAm Distribution System Monterey Pipeline.

Source Water Diversion and Storage Sites

Salinas Pump Station Diversion

The Salinas Pump Station Source Water Diversion site is mapped as being underlain by Holocene basin, including unconsolidated, plastic clay and silty clay containing organic material and locally containing interbedded thin layers of silt and silty sand.

Salinas Treatment Facility, Reclamation Ditch Diversion, Tembladero Slough Diversion, and Blanco Drain (Eastern Portion) Diversions

These sites are mapped as being underlain by Holocene alluvial deposits. The low-lying floodplain areas are underlain by Holocene alluvial deposits. These deposits include unconsolidated layers that generally consist of interbedded silts, clays, sands, and gravels. The alluvial materials in the northeastern floodplain area are mapped as having moderate to high liquefaction susceptibility (Rosenberg, 2001d as referenced in Ninyo & Moore, 2014). Portions of the Salinas River floodplain and the Tembladero Slough source water locations are mapped within a tsunami inundation area.

Lake El Estero Diversion

The proposed Lake El Estero source water location is mapped as being underlain by Holocene basin and alluvial deposits. Within the project area, coastal areas north of Lake El Estero and the slopes on the southern side of the Salinas River have a high potential for erosion (Rosenberg, 2001f as referenced in Ninyo & Moore, 2014). Additionally, the proposed Lake El Estero Source Water Diversion site location is mapped within a tsunami inundation zone. This area of the Proposed Project is one of the closest to areas shown at risk of damage during a major (i.e., 100-year) storm event, considering sea level rise scenarios through 2060; however, the Proposed Project facilities are outside of the risk area (ESA-PWA, 2014).

Blanco Drain Diversion Source Water (Western Portion), Treatment Facilities at the Regional Treatment Facility, Product Water Conveyance Pipelines and Booster Pump Station sites

The central portion of the Proposed Project area between the Salinas River and Canyon del Rey is mapped as being underlain by Pleistocene-age eolian deposits. The eolian deposits are generally mapped as having low liquefaction susceptibility, except where shallow groundwater may be present in localized low-lying areas (Rosenberg, 2001d as referenced in Ninyo & Moore, 2014). Shallow groundwater is not anticipated within the elevated eolian deposits, except for localized low-lying areas along the coastline. The soil erosion hazard within the eolian deposits in the central portion of the project area is mapped as moderate, except along the coast where the soil erosion hazard is mapped as high (Rosenberg, 2001f as referenced in Ninyo & Moore, 2014). Eolian deposits may also be collapsible.

Injection Well Facilities site

The Injection Well Facilities site is east of Seaside, along the eastern side of General Jim Moore Boulevard and south of Eucalyptus Road. This location is underlain by eolian deposits that are anticipated to consist of weakly to moderately consolidated, moderately to well-sorted silt and fine- to medium-grained sand. Groundwater is known to be very deep at approximately 400 feet below ground surface (see **Section 4.10, Hydrology and Water Quality: Groundwater**). The northernmost Ord Terrace fault is mapped beneath eolian deposits in the central portion of the project area approximately ¼ mile south of the proposed Injection Well Facilities (see **Figure 4.8-3, Detailed Fault Map**).

CalAm Distribution System Pipelines

The proposed location for the CalAm Distribution System Monterey Pipeline is underlain by Holocene alluvial deposits where it intersects drainage courses. The alluvial materials in the southwestern area of the project are mapped as having high liquefaction susceptibility

(Rosenberg, 2001d as referenced in Ninyo & Moore, 2014). Artificial fill materials are mapped along the proposed CalAm Monterey and Transfer pipeline alignments in the southwest portion of the project study area.

Pleistocene-age coastal terrace deposits are mapped within the southwestern portion of the proposed CalAm Distribution System Monterey Pipelines from Sand City to the City of Monterey, as are the Tertiary-age Monterey Formation and the Poryphyritic Granodiorite of Monterey (Rosenberg 2001a as referenced in Ninyo & Moore, 2014). The Monterey Formation unit is present at the surface where the Monterey Pipeline crosses Del Monte Avenue at Del Monte Lake in the southeastern corner of Seaside next to Monterey, The granodiorite is present at the surface on the Monterey Peninsula, and this bedrock unit could be encountered during installation of the southwestern portion of the proposed Monterey Pipeline alignment.

In general, the liquefaction hazard and landslide seismic hazard are mapped as low in areas underlain by coastal terrace deposits (Rosenberg 2001b & 2001d as referenced in Ninyo & Moore, 2014); the soil erosion hazard is mapped as moderate in areas underlain by coastal terraces (Rosenberg 2001f as referenced in Ninyo & Moore, 2014). Soils are characterized as having a moderate potential for pipe corrosion.

The on-land portion of the Monterey Bay-Tularcitos fault zone, including the Ord Terrace, Seaside, Chupines, and Navy faults, is mapped through the proposed CalAm Distribution System Monterey Pipeline alignment. There is evidence for recent (less than 11,000 years) displacement on the individual faults of the Monterey Bay-Tularcitos Fault Zone, and therefore, considering the proximity of these active strands to project components, these faults should be considered active for planning purposes (see **Figure 4.8-3**).

A majority of the coastline along Monterey Bay is mapped within a tsunami inundation, which includes portions of the proposed CalAm Monterey Pipeline alignment and the Lake El Estero Source Water Diversion site. Certain areas of CalAm Monterey Pipeline alignment are shown as being at risk of damage during major episodic storm and high wave events and this risk will be exacerbated as sea level rise continues. See **Figure 4.8-6, Coastal Erosion Hazard Zones** for a map of the Coastal Erosion Hazard Zones near these components. (ESA-PWA, 2014).

4.8.3 Regulatory Framework

4.8.3.1 Federal

The Federal Disaster Mitigation Act of 2000 (Public Law 106-390), which was adopted by Congress in October 2000, requires state and local governments to develop hazard mitigation plans in order to apply for federal grant assistance for disaster relief. Monterey County, in coordination with all of its incorporated municipalities, is preparing a comprehensive update to its Multi-Jurisdictional Hazard Mitigation Plan. The plan, which was initially developed and adopted in 2007, is intended to identify local policies and actions to reduce the risk and future losses from natural hazards such as flooding, severe storms, earthquakes, and wildland fires. The plan also serves to meet key federal planning regulations which require local governments to develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance, including funding

for hazard mitigation projects.[1] The County of Monterey and the cities of Carmel-by-the-Sea, Del Rey Oaks, Gonzales, Greenfield, King City, Marina, Monterey, Pacific Grove, Salinas, Sand City, and Soledad have each adopted the plan by resolution. A revised draft Multi-Jurisdictional Hazard Mitigation Plan was prepared in 2014 and is available for review at the County's website at http://www.co.monterey.ca.us/oes/documents/Main_Plan_Body.pdf (Monterey County Office of Emergency Services, 2014).

4.8.3.2 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. In accordance with this act, the State Geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Because many active faults are complex and consist of more than one branch, each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace.

Title 14 of the California Code of Regulations (CCR), Section 3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year. The Proposed Project does not cross an Alquist-Priolo Earthquake Fault Zone and does not include buildings that meet this criterion for human occupancy within the vicinity of any mapped fault trace. Therefore, these provisions of the act do not apply to the Project.

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (Public Resources Code [PRC] Sections 2690 to 2699.6) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong groundshaking, 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 at risk of strong groundshaking, liquefaction, landslides, and other corollary hazards. Cities and counties are required to regulate development within mapped Seismic Hazard Zones.

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 and/or geotechnical investigations have been conducted and measures to reduce potential damage have been incorporated into the development plans. There are no jurisdictions within Monterey County that are included within the State Seismic Hazards Mapping Act.

[1] Monterey County. "Monterey County Hazard Mitigation Plan Update Planning for a Safer Future." Online at: http://www.co.monterey.ca.us/oes/hazard-mitigation.asp.

Building Codes

The California Building Code (CBC), which is codified in CCR Title 24, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all building and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. The 2013 CBC is based on the 2006 International Building Code (IBC) published by the International Code Conference. In addition, the CBC contains necessary California amendments that are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads, as well as other loads (e.g., flood, snow, wind) for inclusion in building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, all of which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

Storm Water Pollution Prevention Plan

Construction activity that disturbs one or more acres of soil, or less than 1 acre but is part of a larger common plan of development that in total disturbs one or more acres, must obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit, 99-08-DWQ). Construction activity subject to this permit includes clearing, grading, and disturbances to the ground such as stockpiling or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of a facility. The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Program (SWPPP). The SWPPP includes construction mitigation measures such as desilting basins, silt fences, hydroseeding of slopes, and monitoring and clean-up requirements.

4.8.3.3 Regional and Local

In addition to the general requirements of CEQA and California laws and regulations, geologic, seismic and soils issues are addressed in General Plans and municipal codes of local jurisdictions within the Proposed Project area. **Table 4.8-2, Applicable State, Regional, and Local Land Use Plans and Policies Relevant to Geology, Soils & Seismicity** summarizes state, regional, and/or local plans, policies and regulations pertaining to geology, soils, and seismicity that are relevant to the Proposed Project and that were adopted for the purpose of avoiding or mitigating an environmental effect. **Table 4.8-2** provides a review of project consistency and/or conflicts with such plans, policies, and regulations. Where the analysis concludes the project would not conflict with the applicable plan, policy, or regulation, the finding and rationale is noted. In some cases, a potential

inconsistency or conflict would be avoided with implementation of mitigation measures included in this EIR, which is explained. In addition to the above policies, the local jurisdictions have adopted grading and erosion control ordinances that mitigate many of the potential geology, soils, and seismicity impacts when projects comply with these ordinances. These ordinances supplement the regulations from the California Building Code, which also addresses standards for all grading during construction of buildings.

Monterey County Plans and Codes

The Monterey County General Plan (Monterey County, 2010) contains policies related to geology, soils, and seismicity in the Safety Element, Chapter 4. Policies are also included in the North County Land Use Plan that is part of the County's certified Local Coastal Program. Policies pertinent to the Proposed Project are summarized in **Table 4.8-2**. The Proposed Project components within unincorporated Monterey County would comply with the following County Code chapters, when applicable, which require the implementation of specific construction-related and site design best management practices to minimize soil erosion and soil loss from construction sites. No construction is proposed on slopes of greater than 30%.

Chapter 16.08 (Grading) of the Monterey County Code sets rules and regulations to control grading, including excavations, earthwork, road construction, fills and embankments; establishes the administration procedure for issuance of permits; and provides for approval of plans and inspections of grading construction. The County Grading Ordinance generally regulates grading activities that involve more than 100 cubic yards of excavation and fill. An excavation which does not exceed 100 cubic yards and which is less than two feet in depth, or which does not create a cut slope greater than five feet in height and steeper is exempt from grading regulations. The Monterey County Grading Ordinance requires a soil engineering and engineering geology report (Section 16.08.110: Permit – Soil Engineering and Engineering Geology Reports [Ordinance 4029, 1999; Ordinance 2534, Section 110, 1979], unless waived by the Building Official because information of record is available showing such data is not needed.

Chapter 16.12 (Erosion Control) of the Monterey County Code sets forth required provisions for project planning, preparation of erosion control plans, runoff control, land clearing, and winter operations; and establishes procedures for administering those provisions. The Code requires that specific design considerations be incorporated into projects to reduce the potential of erosion and that an erosion control plan be approved by the County prior to initiation of grading activities.

City of Marina Codes

The Proposed Project components within the City of Marina would comply with the following Municipal Code chapters, when applicable, which require the implementation of specific construction-related and site design best management practices to minimize soil erosion and soil loss from construction sites (See http://www.ci.marina.ca.us/DocumentCenter/Home/View/4 for full text):

- Chapter 15.46 (Digging And Excavation On The Former Fort Ord)
- Chapter 15.48 (Flood Damage Prevention)

City of Seaside Codes

The Proposed Project components within the City of Seaside would comply with the following Municipal Code chapters, when applicable, which require the implementation of specific construction-related and site design best management practices to minimize soil erosion and soil loss from construction sites (See http://www.codepublishing.com/ca/seaside/#!/seaside15/Seaside1534.html#15.34 for full text):

- Chapter 15.32 (Standards To Control Excavation, Grading, Clearing And Erosion)
- Chapter 15.34 (Digging And Excavation On The Former Fort Ord)

City of Monterey Codes

The Proposed Project components within the City of Monterey would comply with the following Municipal Code chapters, when applicable, which require the implementation of specific construction-related and site design best management practices to minimize soil erosion and soil loss from construction sites (See http://www.codepublishing.com/ca/monterey/ for full text):

- Chapter 9, Article 7 (Flood Damage Prevention)
- Chapter 9, Article 8 (Digging And Excavation On The Former Fort Ord)
- Chapter 31.5 (Storm Water Management)

Plans and Policies Consistency Analysis

Table 4.8-2 describes the state, regional, and local land use plans, policies, and regulations pertaining to geology, soils, and seismicity that are relevant to the Proposed Project and that were adopted for the purpose of avoiding or mitigating an environmental effect. Also included in **Table 4.8-2** is an analysis of project consistency with these plans, policies, and regulations. In some cases, policies contain requirements that are included within enforceable regulations of the relevant jurisdiction. Where the analysis concludes the project would not conflict with the applicable plan, policy, or regulations, the finding and rationale are provided. Where the analysis concludes the project may conflict with the applicable plan, policy, or regulation, the reader is referred to **Section 4.8.4, Environmental Impacts and Mitigation Measures**, for additional discussion, including the relevant impact determination and mitigation measures.

Table 4.8-2
Applicable State, Regional, and Local Land Use Plans and Policies Relevant to Geology, Soils, and Seismicity

Project Planning Region	Applicable Plan	Resource Topic	Project Component(s)	Specific Policy or Program	Project Consistency with Policies and Programs
Monterey County	Monterey County General Plan	Safety	Salinas Treatment Facility Storage and Recovery Reclamation Ditch Diversion Tembladero Slough Diversion Blanco Drain Diversion Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	**Policy S-1.1:** Land uses shall be sited and measures applied to reduce the potential for loss of life, injury, property damage, and economic and social dislocations resulting from ground shaking, liquefaction, landslides, and other geologic hazards in the high and moderate hazard susceptibility areas.	**Consistent:** The Proposed Project has been sited to reduce potential loss of life, injury, or property damage due to geologic and seismic hazards, and no significant impacts have been identified with regard to these issues based on the findings of preliminary geotechnical evaluations.
Monterey County	Monterey County General Plan	Safety	Salinas Treatment Facility Storage and Recovery Reclamation Ditch Diversion Tembladero Slough Diversion Blanco Drain Diversion Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	**Policy S-1.3:** Site-specific geologic studies may be used to verify the presence or absence and extent of the hazard on the property proposed for new development and to identify mitigation measures for any development proposed. An ordinance including permit requirements relative to the siting and design of structures and grading relative to seismic hazards shall be established.	**Consistent:** The Proposed Project has been sited to reduce potential loss of life, injury, or property damage due to geologic and seismic hazards, and no significant impacts have been identified with regard to these issues based on the findings of preliminary geotechnical evaluations.
Monterey County	Monterey County General Plan	Safety	Salinas Treatment Facility Storage and Recovery Reclamation Ditch Diversion Tembladero Slough Diversion Blanco Drain Diversion Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	**Policy S-1.5:** Structures in areas that are at high risk from fault rupture, landslides, or coastal erosion shall not be permitted unless measures recommended by a registered engineering geologist are implemented to reduce the hazard to an acceptable level.	**Consistent:** The Proposed Project has been sited to reduce potential loss of life, injury, or property damage due to potential fault rupture or other geologic or seismic hazards, and no significant impacts have been identified with regard to these issues based on the findings of preliminary geotechnical evaluations.
Monterey County	Monterey County General Plan	Safety	Salinas Treatment Facility Storage and Recovery Reclamation Ditch Diversion Tembladero Slough Diversion Blanco Drain Diversion Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	**Policy S-1.6:** New development shall not be permitted in areas of known geologic or seismic hazards unless measures recommended by a California certified engineering geologist or geotechnical engineer are implemented to reduce the hazard to an acceptable level. Areas of known geologic or seismic hazards include: a. Moderate or high relative landslide susceptibility. b. High relative erosion susceptibility. c. Moderate or high relative liquefaction susceptibility. d. Coastal erosion and sea cliff retreat. e. Tsunami run-up hazards.	**Consistent:** The Proposed Project has been sited to reduce potential loss of life, injury, or property damage due to potential fault rupture or other geologic or seismic hazards, and no significant impacts have been identified with regard to these issues based on the findings of preliminary geotechnical evaluations. There are no areas of mapped landslide potential.
Monterey County	Monterey County General Plan	Safety	Salinas Treatment Facility Storage and Recovery Reclamation Ditch Diversion Tembladero Slough Diversion Blanco Drain Diversion Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	**Policy S-1.7:** Site-specific reports addressing geologic hazard and geotechnical conditions shall be required as part of the planning phase and review of discretionary development entitlements and as part of review of ministerial permits in accordance with the California Building Standards Code as follows: a. Geotechnical reports prepared by State of California licensed Registered Geotechnical Engineers are required during building plan review for all habitable structures and habitable additions over 500 square feet in footprint area. Additions less than 500 square feet and non-habitable buildings may require geotechnical reports as determined by the pre-site inspection. b. A Registered Geotechnical Engineer shall be required to review and approve the foundation conditions prior to plan check approval, and if recommended by the report, shall perform a site inspection to verify the foundation prior to approval to pour the footings. Setbacks shall be identified and verified in the field prior to construction. c. All new development and subdivision applications in State- or County designated Earthquake Fault Zones shall provide a geologic report addressing the potential for surface fault rupture and secondary fracturing adjacent to the fault zone before the application is considered complete. The report shall be prepared by a Registered Geologist or a Certified Engineering Geologist and conform to the State of California's most current guidelines for evaluating the hazard of surface fault rupture. d. Geologic reports and supplemental geotechnical reports for foundation design shall be required in areas with moderate or high landslide or liquefaction susceptibility to evaluate the potential on- and off-site impacts on subdivision layouts, grading, or building structures. e. Where geologic reports with supplemental geotechnical reports determine that potential hazards affecting new development do not lead to an unacceptable level of risk to life and property, development in all Land Use Designations may be permissible, so long as all other applicable General Plan policies are complied with. f. Appropriate site-specific mitigation measures and mitigation monitoring to protect public health and safety, including deed restrictions, shall be required.	**Consistent**: The Proposed Project would comply with the California Building Standard Code and all other county and state requirements for geologic hazards and geotechnical conditions. See Section 4.X, Geology, Soils, and Seismicity for a discussion of seismic hazards and potential mitigation. Also see **Appendix K**, (Preliminary Geotechnical Evaluation Groundwater Replenishment Project EIR, Ninyo and Moore, January 2015)
Monterey County	Monterey County General Plan	Safety	Salinas Treatment Facility Storage and Recovery Reclamation Ditch Diversion	**Policy S-1.8:** As part of the planning phase and review of discretionary development entitlements, and as part of review of ministerial permits in accordance with the California Building Standards Code, new development may be approved only if it can be demonstrated that the site is physically suitable and the development would	**Consistent:** The Proposed Project would comply with the California Building Standard Code and all other county and state requirements for geologic hazards and geotechnical conditions. See **Appendix K**, (Preliminary Geotechnical Report). The

Table 4.8-2
Applicable State, Regional, and Local Land Use Plans and Policies Relevant to Geology, Soils, and Seismicity

Project Planning Region	Applicable Plan	Resource Topic	Project Component(s)	Specific Policy or Program	Project Consistency with Policies and Programs
			Tembladero Slough Diversion Blanco Drain Diversion Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	neither create nor significantly contribute to geologic instability or geologic hazards.	preliminary geotechnical review has been conducted to investigate geologic and seismic hazards, and with compliance with building codes and recommendations of site-specific geotechnical reports, the exposure to seismic hazards related to these Proposed Project components would be minimized.
Monterey County	Monterey County General Plan	Safety	Salinas Treatment Facility Storage and Recovery Reclamation Ditch Diversion Tembladero Slough Diversion Blanco Drain Diversion Treatment Facilities at Regional Treatment Plant RUWAP Alignment Option Coastal Alignment Option	**Policy S-1.9:** A California licensed civil engineer or a California licensed landscape architect can recommend measures to reduce moderate and high erosion hazards in the form of an Erosion Control Plan.	**Consistent:** Best Management Practices and an Erosion Control Plan will be developed in accordance with state and local regulations.
Monterey County	North County Land Use Plan	Geologic Hazards	Tembladero Slough Diversion	**Policy 2.8.3.A1**: All development shall be sited and designed to conform to site topography and to minimize grading and other site preparation activities.	**Consistent:** The Proposed Project components in this planning area (Tembladero Slough Diversion) improvements are sited on relatively flat terrain with minimal grading required.
Monterey County	North County Land Use Plan	Geologic Hazards	Tembladero Slough Diversion	**Policy 2.8.3.A2:** All structures, with the exception of utility lines where no alternative route is feasible, shall be sited a minimum of 50 feet from an active fault or potentially active fault. Greater setbacks may be required where it is warranted by local geologic conditions.	**Consistent:** The Proposed Project (Tembladero Slough Diversion) is not located within 50 feet of an active or potentially active fault.
Monterey County	North County Land Use Plan	Geologic Hazards	Tembladero Slough Diversion	**Policy 2.8.3.A5:** Where soils and geologic reports are required, they should include a description and analysis of the following items: a. geologic conditions, including soil, sediment, and rock types and characteristics in addition to structural features, such as bedding, joints, and faults; b. evidence of past or potential landslide conditions, the implications of such conditions for the proposed development, and the potential effects of the development on landslide activity; c. impact of construction activity on the stability of the site and adjacent area; d. ground and surface water conditions and variations, including hydrologic changes caused by the development (i.e., introduction of sewage effluent and irrigation water to the groundwater system; alterations in surface drainage); e. potential erodibility of site and mitigating measures to be used to minimize erosion problems during and after construction (i.e., landscaping and drainage design). f. potential effects of seismic forces resulting from a maximum credible earthquakes; g. any other factors that might affect slope stability.	**Consistent**: The Proposed Project has been evaluated for soils and geologic hazards and conditions. See **Appendix K**. The preliminary geotechnical review has been conducted to investigate geologic and seismic hazards, and with compliance with building codes and recommendations of site-specific geotechnical reports, the Proposed Project (Salinas Pump Station Diversion) exposure to seismic hazards would be minimized.
City of Salinas	City of Salinas General Plan	Safety Element	Salinas Pump Station Diversion	**S-4.1:** During the review of development proposals, investigate and mitigate geologic and seismic hazards, or require that development be located away from such hazards, in order to preserve life and protect property.	**Consistent:** The preliminary geotechnical review has been conducted to investigate geologic and seismic hazards, and with compliance with building codes and recommendations of site-specific geotechnical reports, the Proposed Project (Salinas Pump Station Diversion) exposure to seismic hazards would be minimized.
City of Marina	City of Marina General Plan		RUWAP Alignment Option RUWAP Booster Pump Station Option Coastal Alignment Option	**4.99 (MarGP):** New development shall be permitted in areas of high seismic risk only when adequate engineering and design measures can be implemented in accordance with a geotechnical investigation and report.	**Consistent**: The preliminary geotechnical review has been conducted to investigate geologic and seismic hazards, and with compliance with building codes and recommendations of site-specific geotechnical reports, the Proposed Project's exposure to seismic hazards would be minimized.
City of Marina	City of Marina General Plan	Public Health and Safety	RUWAP Alignment Option RUWAP Booster Pump Station Option Coastal Alignment Option	**Policy 4.102.2:** Require that new development be sited and designed to conform to site topography and to minimize grading wherever possible. Recommendations to developers as to how to mitigate geologic or seismic hazards should include mention of the need to avoid massive grading or excavation or structures that might require substantial alteration of natural landforms.	**Consistent:** The Proposed Project design would not require massive grading. The Product Water Conveyance Pipelines and Pump Station would be constructed to conform to site topography and would only require grading to create a level work area. Pipeline installation would generally occur within existing road rights-of-way, not requiring extensive grading.
City of Marina	Marina General Plan	Public Health and Safety	Coastal Alignment Option	**Policy 4.102.4:** Where new development is proposed within 300 feet of active dune fields, require that the geotechnical report include an assessment of dune migration rates and recommend appropriate setbacks.	**Consistent:** The Coastal alignment of the Product Water Conveyance would be constructed within the vicinity of an active dune area. Most facilities would be constructed below ground, and these locations would not be exposed in the future due to coastal retreat caused by sea level rise, thus affecting dune migration rates. This issue is addressed further Impact GS-5.
City of Marina	Marina General Plan	Soils and Mineral Resources	RUWAP Alignment Option RUWAP Booster Pump Station Option Coastal Alignment Option	**4.124 (MarGP):** To conserve soil and mineral resources within the Marina Planning Area, the following policies and conditions shall be established: 1. The City shall continue to require erosion-control and landscape plans for all new subdivisions or major projects on sites with potentially high erosion potential. Such plans should be prepared by a licensed civil engineer or other appropriately certified professional and approved by the City Public Works Director prior to issuance of a grading permit. All erosion control plans shall incorporate Best Management Practices to protect water quality and minimize water quality impacts and shall include a schedule for the completion of erosion and sediment-control structures, which ensures that all such erosion-control structures are in place by mid-October of the year that construction begins. Site monitoring by the applicant's erosion-control specialist should be undertaken, and a follow-up report should be prepared that documents the progress and/or completion of required erosion-control measures both during and after construction is completed. *[Note: This policy is truncated due to portions being not applicable to Geology, Soils, and Seismicity, and included in this EIR in analysis of agricultural resources and mineral resources issues.]*	**Consistent:** The Proposed Project would be subject to the state Construction General Permit and would comply with the Marina Excavations and Encroachment Ordinance, which require the implementation of specific construction-related BMPs to prevent concentrated storm water run-on/runoff, soil erosion, and release of construction site contaminants.
City of Seaside	Seaside General Plan	Conservation / Open Space	RUWAP Alignment Option Coastal Alignment Option Coastal Booster Pump Station Option	**COS-4.2.2 Local Coastal Program**: Require public and private development projects to comply with Seaside's certified Local Coastal Program, which protects natural features within the beachfront areas in the City, including the Laguna Grand/Roberts Lake Areas Assess development proposals for potential seismic and	**Consistent**: The preliminary geotechnical review has been conducted to investigate geologic and seismic hazards, and with compliance with building codes and recommendations of site-specific geotechnical reports, the Proposed Project's

Table 4.8-2
Applicable State, Regional, and Local Land Use Plans and Policies Relevant to Geology, Soils, and Seismicity

Project Planning Region	Applicable Plan	Resource Topic	Project Component(s)	Specific Policy or Program	Project Consistency with Policies and Programs
		Element	Injection Well Facilities Transfer Pipeline Monterey Pipeline	geologic hazards pursuant to the California Environmental Quality Act (CEQA). Require studies of soil and geologic conditions by state licensed Engineering Geologists and Civil Engineers where appropriate. When potential geologic impacts are identified, require project applicants to mitigate the impacts per the recommendations contained within the soil and geologic studies. If substantial geologic/ seismic hazards cannot be mitigated, require the development to be relocated or redesigned to avoid the significant hazards.	exposure to seismic hazards would be minimized.
City of Seaside	Seaside General Plan	Safety Element	RUWAP Alignment Option Coastal Alignment Option Coastal Booster Pump Station Option Injection Well Facilities Transfer Pipeline Monterey Pipeline	**S-1.1:** Reduce the risk of impacts from and seismic and geologic hazards.	**Consistent:** The Proposed Project would be constructed in compliance with the California Building Code (CCR Title 24), which requires projects to adhere to specific structural and seismic design criteria, as deemed necessary by the project registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. Preliminary and final geotechnical assessments would be completed prior to final pipeline design. In addition, the proposed pipelines would be constructed in accordance with the industry-accepted AWWA Standards for Proposed Pipelines. Compliance with California regulations and application of the AWWA pipeline construction standards would ensure the Proposed Project is consistent with this policy.
City of Monterey (coastal zone)	Monterey Harbor Land Use Plan	Natural Hazards	Monterey Pipeline	***Policy 3.a:*** Site-specific geotechnical studies shall be required prior to project filing to determine the extent and nature of geologic hazards at the site. These studies shall specifically include an analysis of seismic hazards, such as ground shaking, liquefaction, ground rupture, and lateral spreading. Site specific geotechnical studies shall comply with the report guidelines of the State Board of Geologists and geophysicists. Such reports shall be signed by a licensed Certified Engineering geologist (CEG) or Geotechnical Engineer (GE), working within areas of his/her professional responsibilities, and should contain recommendations for mitigation measures for any hazards that are identified. Said reports are subject to review and approval by the city engineer.	**Consistent:** The Monterey Pipeline would be constructed in compliance with the California Building Code (CCR Title 24), which requires projects to adhere to specific structural and seismic design criteria, as deemed necessary by the project registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. Preliminary and final geotechnical investigations would be completed prior to final pipeline design. In addition, the Monterey Pipeline would be constructed in accordance with the industry-accepted AWWA Standards for Proposed Pipelines. Compliance with California regulations and application of the AWWA pipeline construction standards would ensure the Proposed Project is consistent with this policy.
City of Monterey (coastal zone)	Monterey Harbor Land Use Plan	Natural Hazards	Monterey Pipeline	***Policy 3.b:*** New residential, commercial, and industrial structures and facilities shall be constructed in a manner that will minimize risks to life and property from geologic, flood, and fire hazard; such development shall be sited and designed to not require a shoreline protection structure during the life of the development. Applicants for development are required to accept a deed restriction to waive all rights to protective devices associated with development on coastal dunes.	**Consistent, with Mitigation:** The Monterey Pipeline would be buried below the ground surface along Del Monte Avenue. In one area of the pipeline route identified within a coastal erosion hazard zone, the pipeline could become exposed in the future due to coastal retreat caused by sea level rise and subject to wave and erosion damage. This is addressed in Impact GS-5, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
City of Monterey (coastal zone)	Monterey Harbor Land Use Plan	Natural Hazards	Monterey Pipeline	***Policy 3.c:*** For bayfront properties, site specific geotechnical studies submitted as part of the application shall be conducted to determine storm wave reach and tsunami runup, based on an engineering analysis for each project. Wave runup shall be analyzed for an eroded shoreline, combined with a 100-year storm event. Tsunami runup may be analyzed on an average beach profile, with consideration for, at a minimum, the 100-year event.	**Consistent, with Mitigation:** The Monterey Pipeline would be buried below the ground surface along Del Monte Avenue. In one area of the pipeline route identified within a coastal erosion hazard zone, the pipeline could become exposed in the future due to coastal retreat caused by sea level rise and subject to wave and erosion damage. This is addressed in Impact GS-5, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
City of Monterey (coastal zone)	Monterey Harbor Land Use Plan	Natural Hazards	Monterey Pipeline	***Policy 3.d:*** New residential, commercial, and industrial development shall not be allowed in tsunami (seismic sea wave) runup or storm wave inundation areas. Exceptions would include … public utilities that cannot be feasibly located elsewhere.	**Consistent, with Mitigation:** The Monterey Pipeline would be buried below the ground surface along Del Monte Avenue. In one area of the pipeline route identified within a coastal erosion hazard zone, the pipeline could become exposed in the future due to coastal retreat caused by sea level rise and subject to wave and erosion damage. This is addressed in Impact GS-5, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Section B. Natural Hazards	Monterey Pipeline	***Policy 3.1*****:** New development shall be constructed in a manner that will reduce risks to life and property from geologic, flood, and fire hazards; such development shall be sited and designed to not require a shoreline protection structure during the life of the development. Applicants for new development are required to accept a deed restriction to waive all rights to protective devices associated with development on coastal dunes.	**Consistent, with Mitigation:** The Monterey Pipeline would be buried below the ground surface along Del Monte Avenue. In one area of the pipeline route identified within a coastal erosion hazard zone, the pipeline could become exposed in the future due to coastal retreat caused by sea level rise and subject to wave and erosion damage. This is addressed in Impact GS-5, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Section B. Natural Hazards	Monterey Pipeline	***Policy 3.2*****:**Site-specific geotechnical studies shall be required prior to project filing to determine the extent and nature of geologic hazards at the site. These studies shall specifically include an analysis of seismic hazards, such as ground shaking, liquefaction, ground rupture, and lateral spreading. Site specific geotechnical studies shall comply with the report guidelines of the State Board for Geologists and Geophysicists. Such reports shall be signed by a licensed Certified Engineering Geologist (CEG) or Geotechnical Engineer (GE), working within areas of his/her professional responsibilities, and should contain recommendations for mitigation measures for any hazards that are identified. Said reports are subject to review and approval by the City engineer. To assist in the preparation of these studies by qualified professionals, the City shall maintain a database of information derived from previous studies.	**Consistent:** The Monterey Pipeline would be constructed in compliance with the California Building Code (CCR Title 24), which requires projects to adhere to specific structural and seismic design criteria, as deemed necessary by the project registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. Preliminary and final geotechnical investigations would be completed prior to final pipeline design. In addition, the Monterey Pipeline would be constructed in accordance with the industry-accepted AWWA Standards for Proposed Pipelines. Compliance with California regulations and application of the AWWA pipeline construction standards would ensure the Proposed Project is consistent with this policy.
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Section B. Natural Hazards	Monterey Pipeline	***Policy 3.3*****:** New development and utilities shall be set back from the eroding coastal dunes at a sufficient distance to assure safety to life and property during the expected 100-year economic life of the property. New development shall not be allowed in tsunami (seismic sea wave) runup or storm wave inundation areas. An exception would include coastal dependent marine installations requiring locations near the water, which are constructed to withstand tsunami and/or wave runup inundations, and public access improvements. No	**Consistent with Mitigation:** The Monterey Pipeline would be buried below the ground surface along Del Monte Avenue. In one area of the pipeline route identified within a coastal erosion hazard zone, the pipeline could become exposed in the future due to coastal retreat caused by sea level rise and subject to wave and erosion damage. This is addressed in Impact GS-5, which identifies mitigation measures

Table 4.8-2
Applicable State, Regional, and Local Land Use Plans and Policies Relevant to Geology, Soils, and Seismicity

Project Planning Region	Applicable Plan	Resource Topic	Project Component(s)	Specific Policy or Program	Project Consistency with Policies and Programs
				additions or demolitions/rebuilds are allowed for existing structures within tsunami run-up or storm wave inundation areas, with the exception of those additions or demolitions/rebuilds allowable consistent with takings law, and public utilities that cannot be feasibly located elsewhere.	whose implementation would minimize or avoid this potential inconsistency.
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Section B. Natural Hazards	Monterey Pipeline	***Policy 3.4***: For bayfront properties, site specific geotechnical studies submitted as part of the application, shall be conducted to determine storm wave reach and tsunami runup and to ensure accurate determination of coastal erosion rates. Such studies shall reflect current known factors attributable to erosion, the recent cessation of sand mining in upcoast Sand City, and other current known technical factors used in the science of coastal erosion. Wave runup shall be analyzed for an eroded shoreline, combined with a 100-year storm event. Tsunami runup may be analyzed on an average beach profile, with consideration for, at a minimum, the 100-year event.	**Consistent, with Mitigation:** The Monterey Pipeline would be buried below the ground surface along Del Monte Avenue. In one area of the pipeline route identified within a coastal erosion hazard zone, the pipeline could become exposed in the future due to coastal retreat caused by sea level rise and subject to wave and erosion damage. This is addressed in Impact GS-5, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Section B. Natural Hazards	Monterey Pipeline	***Policy 3.5***: No development shall be allowed which would increase the rate at which erosion is occurring. Development located in or adjacent to coastal dunes shall be sited and constructed in a manner that minimizes disturbance to the foredunes and to dune vegetation, and shall include an analysis of wind direction and orientation of proposed development to avoid adverse wind impacts to the dune system.	**Consistent:** All structures in dune areas would be located below the ground surface and would not increase erosion or affect wind impacts.
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Section B. Natural Hazards	Monterey Pipeline	***Policy 3.7***: Siting and design of new shoreline development and shoreline protective devices shall take into account anticipated future changes in sea level. In particular, an acceleration of the historic rate of sea level rise shall be considered. Development shall be set back a sufficient distance landward and elevated to a sufficient foundation height to eliminate or minimize to the maximum extent feasible hazards associated with anticipated sea level rise over the expected 100-year economic life of the structure. No new lots shall be created within areas of high water hazard.	**Consistent, with Mitigation:** The Monterey Pipeline would be buried below the ground surface along Del Monte Avenue. In one area of the pipeline route identified within a coastal erosion hazard zone, the pipeline could become exposed in the future due to coastal retreat caused by sea level rise and subject to wave and erosion damage. This is addressed in Impact GS-5, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Section B. Natural Hazards	Monterey Pipeline	***Policy 3.11***: Siting and design of new development in dunes shall take into account the extent of landward migration of the foredunes that can be anticipated over the life of the development. This landward migration shall be determined based upon historic dune erosion, storm damage, anticipated sea level rise, and foreseeable changes in sand supply. Development shall be set back a sufficient distance from the frontal dunes and shall be elevated to a sufficient foundation height to eliminate, or minimize to the maximum extent feasible, hazards from waves and inundation, combined with anticipated sea level rise over the expected 100-year economic life of the structure.	**Consistent, with Mitigation:** The Monterey Pipeline would be buried below the ground surface along Del Monte Avenue. In one area of the pipeline route identified within a coastal erosion hazard zone, the pipeline could become exposed in the future due to coastal retreat caused by sea level rise and subject to wave and erosion damage. This is addressed in Impact GS-5, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
City of Pacific Grove (inland area)	Pacific Grove Municipal Code	Title 18 - Buildings and Construction	Monterey Pipeline	***Section 18.040.050: Engineering reports.*** a. ***Preparation of Reports.*** Building owners shall employ a civil or structural engineer to prepare the investigation and engineering report outlined below. b. ***Purpose.*** To investigate, in a thorough and unambiguous fashion, a building's structural systems that resist the forces imposed by earthquakes and to determine if any individual portion or combination of these systems is inadequate to prevent a structural failure (collapse or partial collapse). c. ***General.*** Each building shall be treated as an individual case without prejudice or comparison to similar type or age buildings which may have greater or lesser earthquake resistance. Generalities or stereotypes are to be avoided in the evaluation process by focusing on the specifics of the structural system of the building in question and the local geology of the land on which the building is constructed. d. ***Level of Investigation.*** Some buildings will require extensive testing and field investigation to uncover potential structural deficiencies, while others will allow the same level of overall evaluation by a less complicated process due to simplicity of design or the availability of original or subsequent alteration design and construction documents. It is the responsibility of the engineer performing the evaluation to choose the appropriate level of investigation which will produce a report that is complete and can serve as a sound basis for a conclusion on the collapse hazard the building may present.	**Consistent:** The Monterey Pipeline would be constructed in compliance with applicable requirements of the California Building Code (CCR Title 24), which requires projects to adhere to specific structural and seismic design criteria, as deemed necessary by the project registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. Preliminary and final geotechnical assessments would be completed prior to final pipeline design. In addition, the Monterey Pipeline would be constructed in accordance with the industry-accepted AWWA Standards for Proposed Pipelines. Compliance with California regulations and application of the AWWA pipeline construction standards would ensure the Proposed Project is consistent with this section.
City of Sand City (coastal zone & inland area)	Sand City Local Coastal Program Land Use Plan	Building Code	Transfer Pipeline, and Monterey Pipeline	***Section 15.09.010:*** For the purposes of prescribing regulations governing conditions to the development of better building construction and greater safety to the public by uniformity in building laws, that certain code known as the 2007 California Building Code and Appendix Chapter J promulgated by the State of California, being particular of the 2007 Edition thereof and the whole thereof, save and except such portions as they are deleted, modified, or amended in the Ordinance codified in this Chapter, a copy of which is now on file in the office of the City Clerk, and the same are adopted and incorporated as fully as if set out at length in this chapter, and from the date on which the Ordinance codified in this chapter shall take effect, the provisions thereof shall be controlling within the limits of the City.	**Consistent:** The Transfer Pipeline and Monterey Pipeline would be constructed in compliance with the California Building Code (CCR Title 24), which requires projects to adhere to specific structural and seismic design criteria, as deemed necessary by the project registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. Preliminary and final geotechnical assessments would be completed prior to final pipeline design. In addition, the proposed pipelines would be constructed in accordance with the industry-accepted AWWA Standards for Proposed Pipelines. Compliance with California regulations and application of the AWWA pipeline construction standards would ensure the Proposed Project is consistent with this section.
City of Sand City (coastal zone)	Sand City Local Coastal Program Land Use Plan	Natural Hazards	Transfer Pipeline, and Monterey Pipeline	***Section 4.3.9: Require preparation of geologic and soils reports for all new developments located in the coastal zone.*** The report should address existing and potential impacts, including ground shaking from earthquakes, direct fault offset, liquefaction, landslides, slope stability, coastal bluff and beach erosion, and storm wave and tsunami inundation. The report shall identify appropriate hazard setbacks or identify the need for shoreline protective devices to secure long-term protection of Sand City's shoreline, and shall recommend mitigation measures to minimize identified impacts. The reports shall be prepared by qualified individuals in accordance with guidelines of the California Division of Mines and Geology, the California Coastal Commission, and the City of Sand City.	**Consistent:** The Transfer Pipeline and Monterey Pipeline would be constructed in compliance with the California Building Code (CCR Title 24), which requires projects to adhere to specific structural and seismic design criteria, as deemed necessary by the project registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. Preliminary and final geotechnical assessments would be completed prior to final pipeline design. In addition, the proposed pipelines would be constructed in accordance with the industry-accepted AWWA Standards for Proposed Pipelines. Compliance with California regulations and application of the AWWA pipeline construction standards would ensure the Proposed

Table 4.8-2
Applicable State, Regional, and Local Land Use Plans and Policies Relevant to Geology, Soils, and Seismicity

Project Planning Region	Applicable Plan	Resource Topic	Project Component(s)	Specific Policy or Program	Project Consistency with Policies and Programs
					Project is consistent with this section.
City of Sand City (coastal zone)	Sand City Local Coastal Program Land Use Plan	Natural Hazards	Transfer Pipeline, and Monterey Pipeline	***Section 4.3.14:*** Require all new developments to be designed to withstand expected ground shaking during a major earthquake.	**Consistent:** The Transfer Pipeline and Monterey Pipeline would be constructed in compliance with the California Building Code (CCR Title 24), which requires projects to adhere to specific structural and seismic design criteria, as deemed necessary by the project registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. Preliminary and final geotechnical assessments would be completed prior to final pipeline design. In addition, the proposed pipelines would be constructed in accordance with the industry-accepted AWWA Standards for Proposed Pipelines. Compliance with California regulations and application of the AWWA pipeline construction standards would ensure the Proposed Project is consistent with this section.
City of Seaside (coastal zone)	City of Seaside Local Coastal Program Land Use Plan	Natural Hazards	Transfer Pipeline, and Monterey Pipeline	***Policy NCR-CZ 5.2:*** **Protection from Natural Hazards:** All new development in areas of high geotechnical, flood, and fire hazard shall be sited, designed, and sized to minimize risk to life, property, and the environment from natural disaster.	**Consistent:** The Transfer Pipeline and Monterey Pipeline would be constructed in compliance with the California Building Code (CCR Title 24), which requires projects to adhere to specific structural and seismic design criteria, as deemed necessary by the project registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. Preliminary and final geotechnical assessments would be completed prior to final pipeline design. In addition, the proposed pipelines would be constructed in accordance with the industry-accepted AWWA Standards for Proposed Pipelines. Compliance with California regulations and application of the AWWA pipeline construction standards would ensure the Proposed Project is consistent with this policy.

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4.8.4 Impacts and Mitigation Measures

4.8.4.1 Significance Criteria

Based on Appendix G of the CEQA Guidelines, the project would result in significant impacts related to geology, soils, and seismicity if it would:

a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    - 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.
    - Strong seismic ground shaking.
    - Seismic-related ground failure, including liquefaction.
    - Landslides
b. Result in substantial soil erosion or the loss of topsoil.
c. Be located on a geologic unit or soils 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 creating substantial risks to life or property.
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property.
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available of the disposal of wastewater.

No additional significance criteria are needed to comply with the CEQA-Plus[2] considerations required by the State Revolving Fund Loan Program administered by the State Water Resources Control Board.

[2] To comply with applicable federal statutes and authorities, EPA established specific "CEQA-Plus" requirements in the Operating Agreement with SWRCB for administering the State Revolving Fund (SRF) Loan Program.

4.8.4.2 Impact Analysis Overview

Approach to Analysis

The potential for impacts related to geology, soils, and seismicity are evaluated according to the significance criteria listed above. Each Proposed Project component site has been evaluated with respect to existing published data, mapping and research and the analysis of project effects is based upon the preliminary geotechnical evaluation by Ninyo & Moore provided in **Appendix K**, the Coastal Erosion Analysis report by ESA-PWA, and a preliminary geotechnical review of the CalAm Distribution System Monterey Pipeline for the CalAm Monterey Peninsula Water Supply Project EIR (URS Corporation, 2014).

The preliminary geotechnical evaluations identify seismic, geologic and geotechnical hazards and constraints at the project sites and identify the types of measures and engineering criteria that can be incorporated into project designs to prevent damages to facilities or properties or injury to people. The preliminary geotechnical investigations both concluded that construction of the project is feasible from a geotechnical perspective, provided appropriate design, engineering and construction considerations are incorporated into the project once detailed design information is developed. The following details the rationale for the geotechnical feasibility determination.

The proponent of the Proposed Project would have site-specific geotechnical investigations completed for all facilities requiring foundations and specialized soils engineering work. Geotechnical studies are essential for facility and pipeline design because it is the information that informs the structural design of foundations and determines whether the geologic materials underlying the proposed facilities are capable of supporting the proposed uses without risk of detrimental effects from potential hazards associated with problematic soils, liquefaction, or excessive seismic shaking. Geotechnical investigations are required under the California Building Code for most structures intended for human occupancy and by the Monterey County and most municipal grading ordinances. Based on field observation and laboratory testing, the geotechnical engineer can assess whether the soils are adequate to support the structure under static (non-earthquake) or seismic conditions. If corrective work is necessary to remedy the problem soils or otherwise unstable ground condition, the geotechnical engineer would recommend approaches to correct the condition. Geotechnical engineering recommendations are typically standard engineering practices that have been proven elsewhere to increase the geotechnical performance of an underlying soil or bedrock material. This impact analysis assumes that the applicant would incorporate all geotechnical recommendations set forth by the project geotechnical engineer.

Pipelines are constructed to various industry standards. The American Water Works Association (AWWA) is a worldwide nonprofit scientific and educational association that, among its many activities, establishes recommended standards for the construction and operation of public water supply systems, including standards for pipe and water treatment facility materials and sizing, installation, and facility operations. While the AWWA's recommended standards are not enforceable code requirements, they nevertheless can dictate how pipelines for water conveyance are designed and constructed. CalAm would require its contractors to incorporate AWWA Standards into the design and construction of the proposed CalAm Distribution System pipelines. Other components of the Proposed Project would also apply AWWA Standards, as applicable.

Pipeline Geotechnical Considerations

The engineering consultants for the proposed pipelines, have indicated that they would apply a two-fold geotechnical design approach for the proposed pipelines that includes a preliminary geotechnical investigation followed by a site-specific geotechnical design investigation. The analysis in this section incorporates the preliminary findings and takes into consideration that the finalized engineering design criteria for the pipeline would be developed during the final stage of geotechnical evaluation.

The previously completed preliminary geotechnical assessment relied on published data available through federal and state agencies and previous local geotechnical investigations. The purpose of the preliminary investigation was to provide a characterization of the geologic, seismic, and subsurface conditions along the pipeline alignments and at locations where above-ground facilities are planned. The preliminary investigation evaluated the potential geologic and seismic hazards as well as geotechnical engineering considerations. The information gathered through the preliminary investigation included geologic setting, subsurface soil and geologic conditions, general groundwater conditions, potential geologic hazards (i.e. ground motion, corrosive soils, and liquefaction), and pipeline construction considerations. The findings of the preliminary geotechnical investigation did not indicate site conditions that would preclude the planned improvements (URS Corporation, 2014).

Final geotechnical evaluations of all Proposed Project components would be completed following project approval and prior to obtaining final County and/or applicable city building permits. The final geotechnical study builds off of the previously completed preliminary assessment and focuses on the specific geologic conditions for each pipeline segment. The final study would involve additional soil sampling and soil laboratory analysis, field reconnaissance, and geotechnical engineering analysis to develop the final design criteria for the project. The recommendations developed under the final level of geotechnical study provides designers and construction contractors with necessary engineering details needed for all aspects of the final design such as seismic criteria considerations, maximum allowable displacements for settlement, excavation characteristics, trench stability, temporary shoring, dewatering, backfill requirement, traffic surcharge loading, and pipe bedding. The project proponents would incorporate the recommendations developed by the final geotechnical study into the pipeline design. The recommendations can include soil conditioning, compaction, removal of problematic soils, installation of foundation piers, and special trench backfilling. These standard engineering practices are applied at construction sites throughout California.

Seismic Considerations

In California, an earthquake can cause injury or property damage by: (1) rupturing the ground surface, (2) violently shaking the ground, (3) causing the underlying ground to fail due to liquefaction, or (4) causing enough ground motion to initiate slope failures or landslides, any of which could damage or destroy structures. The checklist items in Appendix G of the CEQA Guidelines, which provide the basis for most of the significance criteria in Section 4.8.4.1, above, reflect the potential for large earthquakes to occur in California and recommend analysis of the susceptibility of the project sites to seismic hazards and the potential for the Proposed Project to exacerbate the effects of earthquake-induced ground motion at the project sites and surrounding areas. Impacts associated with seismic hazards would be considered significant if the potential effects of an earthquake on a particular site could not be mitigated by an engineered solution. The significance criteria do not require elimination of the potential for structural damage from seismic hazards. Rather, the criteria require an evaluation of whether significant seismic hazards could be minimized through engineering design solutions that would reduce the associated risk of loss, injury, or death.

State and local code requirements ensure buildings and other structures are designed and constructed to withstand major earthquakes, thereby reducing the risk of collapse and the associated risks to human health and safety and private property. The code requirements have been developed through years of study of earthquake response and the observed performance of structures during significant local earthquakes (e.g. the 1989 Loma Prieta Earthquake) and others around the world. As discussed in **Section 4.2.2, Regulatory Framework**, the Proposed Project would comply with federal, state, and local laws regulating construction. The laws ensure that proposed development sites are adequately investigated and that seismic hazards are evaluated and addressed in the project design and construction. These laws include the Seismic Hazards Mapping Act, the California Building Code, and Monterey County and City ordinances/codes pertaining to excavation, grading, and site development in geologic hazard zones (described in **Section 4.8.3.3**, above). The California Geological Survey Guidelines for Evaluating and Mitigating Seismic Hazards (Special Publication 117A) (California Geologic Survey, 2008) provides guidance for evaluating and mitigating seismic hazards as required by Public Resources Code Section 2695(a).

Site-specific geotechnical investigations are conducted to determine the presence of problematic soils and identify seismic hazards on a subject site. These investigations identify the geologic and seismic setting of a subject site and provide feasible engineering recommendations to remedy potentially adverse soil and seismic conditions.

Site-specific geotechnical investigations also provide the necessary soil information required by structural engineers to ensure structures and buildings are designed appropriately to withstand earthquake ground motion. Grading plans, foundation designs, and structural designs are prepared based on the geotechnical recommendations presented in the site-specific geotechnical investigation and other pertinent requirements of the CBC.

Coastal Retreat Study

The Proposed Project would place infrastructure along the Monterey Bay coastline. Sea level is predicted to rise over the next century and, in response, coastal erosion is expected to accelerate. The rise in sea level and increased coastal erosion rate could result in impacts to certain project components. To evaluate coastal erosion impacts associated with project components proposed in the coastal zone, a project-specific coastal retreat study — Analysis of Historic and Future Coastal Erosion with Sea Level Rise — was conducted by a team of licensed coastal engineers and coastal geomorphologists (ESA-PWA, 2014). The findings and recommendations of the study inform the analysis of Impact GS-5, below.

The coastal retreat study focused on six locations within the project area and examined the coastal processes at these locations to determine the likelihood for project components to become exposed before the end of their usable lifespan. The study estimates coastal retreat both laterally and vertically. The lateral extent of erosion was evaluated using coastal erosion hazard zones; the vertical extent was evaluated using coastal profiles. Both of these methods are described in more detail below.

Coastal Erosion Hazard Zones (Lateral Erosion Estimates)

A coastal erosion hazard zone represents an area where erosion (caused by coastal processes) has the potential to occur over a certain time period. Within any area of such a zone, there is a risk of damage due to erosion during a major storm event. Actual location of erosion during a particular storm depends on the unique characteristics of that storm (e.g. wave direction, surge, rainfall, and coincident tide). The coastal hazard zones are developed from three components: historic erosion, additional erosion due to sea level rise, and the potential erosion impact caused by a large storm wave event (e.g. 100-year). As sea level rises, higher mean sea level will

increase the frequency of wave run-up, thereby undercutting the dune toe and increasing erosion.

The most important variables in the coastal erosion model are: the historic erosion trend, backshore toe elevation, and the total water level. The historic erosion rate was applied to the planning horizon (2010 through 2060 at 10 year increments) to determine the erosion rates that would occur without the project. The erosion model does not account for shore management actions, such as sand placement, that could potentially mitigate future shore recession. In this region, where beaches are controlled in part by sand mining, the study assumed there would be no changes to existing sand mining practices.

The potential for shoreline retreat caused by sea level rise and the impact from a large storm event was estimated using a geometric model of dune erosion and applied with different slopes to make the model more applicable to sea level rise. This method is consistent with the Federal Emergency Management Agency (FEMA) Pacific Coast Flood Guidelines. The potential shoreline retreat estimates account for uncertainty in the duration of future storm events. Instead of predicting storm-specific characteristics and response, the method assumes that the coast would erode or retreat to a maximum storm wave event with unlimited duration. This is a conservative approach to estimating the impact of a 100-year storm event.

Coastal Profile (Vertical Erosion Estimates)

The coastal profile analysis developed a set of representative profiles that show how the shoreline is likely to evolve from the present to 2040 and 2060, and shows the locations of selected project components relative to those profiles. As previously discussed, the Monterey Bay shoreline is affected by seasonal changes, localized erosion (rip currents), long-term erosion, and sea level rise. Each of these factors is important in defining the profile shape and location at a given time. For this reason, the analysis identified a projected future profile and an extremely eroded profile (lower envelope) for each future time horizon. The future profile is the current profile eroded at the historic rate, with added erosion caused by sea level rise. The lower profile envelope represents a highly eroded condition, which could occur from a combination of localized erosion (rip currents), a large winter storm, and seasonal changes. The upper envelope (a highly accreted profile) was not analyzed because the key concern for the project is that buried project components would become exposed over time. There are two profile/envelope combinations for each time step: one to represent long term profile evolution (historic erosion and accelerated erosion from sea level rise) and another that adds potential erosion from a 100-year storm event, which could be as high as much as 100 feet.

The high and low rates of sea level rise were estimated for each year from 2012 to 2073, the time period for which input data was needed by the groundwater modeling efforts discussed in **Section 4.10, Groundwater Resources**. The coastal erosion hazard zones maps delineate the estimated areas along the coast expected to be at or below sea level by the years 2030, 2040, 2050, 2060, and 2100, and thus subject to erosive wave action. Coastal profiles were then prepared at six locations to show the current (2010) profile and estimate the coastal profiles in 2040 and 2060, where project components would be close to the coastline and potentially subject to the damage that would be the result of coastal retreat.

Areas of No Project Impact

Some of the significance criteria outlined above are not applicable to the Proposed Project or the Proposed Project would not result in impacts related to these criteria, as explained below. Construction of the Proposed Project components would be temporary and, as such, would not expose people or structures to a substantial risk due to fault rupture, seismic shaking or seismically-induced ground failure, liquefaction, or landslides (criterion a), although effects of

seismic hazards on people and structures after construction is evaluated below under Impact GS-2.

- *Septic System Soil Suitability.* The Proposed Project consists of wastewater collection, treatment, and water supply facilities improvements and does not propose use of septic tanks. Thus, criterion e is not applicable to the Proposed Project during construction or operation.

Summary of Impacts

Table 4.8-3, Summary of Impacts – Geology, Soils, and Seismicity provides a summary of potential impacts related to geology, soils, and seismicity and significance determinations for each Proposed Project component.

Table 4.8-3
Summary of Impacts – Geology, Soils, and Seismicity

	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance		Injection Well Facilities	CalAm Distribution System		Project Overall
Impact Title	**Salinas Pump Station**	**Salinas Treatment Facility Storage and Recovery**	**Reclamation Ditch**	**Tembladero Slough**	**Blanco Drain (Pump Station and Pipeline)**	**Lake El Estero**		**RUWAP Alignment Option**	**Coastal Alignment Option**		**Transfer Pipeline**	**Monterey Pipeline**	
GS-1: Construction-Related Erosion or Loss of Topsoil	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
GS-2: Construction-Related Soils Collapse and Soil Constraints during Pipeline Trenching	LS	LS	NI	NI	LS	LS	NI	LS	LS	LS	LS	LS	LS
GS-3: Operation - Exposure to Fault Rupture	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	LS	LS
GS-4: Operation - Exposure to Seismic Ground Shaking and Liquefaction	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
GS-5: Operation - Exposure to Coastal Erosion and Sea Level Rise	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	LSM	LSM
GS-6: Operation - Hydro-Collapse of Soils from Well Injection	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	NI	LS
GS-7: Operation - Exposure to Expansive and Corrosive Soils	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Cumulative Geology, Soils, and Seismicity Impact	LS: There would be no significant construction or operational cumulative geology, seismicity or soils impacts.												

NI – No Impact
LS – Less than Significant
LSM – Less than Significant with Mitigation
SU – Significant Unavoidable
BI – Beneficial Impact

4.8.4.3 Construction Impacts and Mitigation Measures

Impact GS-1: Construction-Related Erosion or Loss of Topsoil. Construction of the Proposed Project would not result in substantial soil erosion or the loss of topsoil. (Criterion b) (Less than Significant)

Construction at all Proposed Project sites would involve ground disturbance including site preparation, grading, and/or trenching for installation of utilities, although ground disturbance at some sites would be minimal. Most of the Proposed Project area is identified as being within areas of moderate erosion hazard, except for northern areas that are identified as having a low erosion hazard. Some areas along the coast are identified as having a high erosion hazard. The potential for erosion or loss of topsoil impacts at each of the Proposed Project sites is discussed below.

Potential erosion that may result from grading, pipeline trenching, and other soil disturbance during construction would generally be controlled during construction with implementation of erosion control plans as required by local jurisdictions prior to issuance of easements, grading, and building permits. Additionally, standard construction practices to prevent and minimize construction-related erosion would be included in contract documents and Storm Water Pollution Prevention Plans (SWPPP) that are required pursuant to federal and state National Pollutant Discharge Elimination System regulations and permits for construction on one acre or more. (See **Section 4.11, Hydrology/Water Quality-Surface Water**, for further explanation of SWPPP requirements). The SWPPP would include Best Management Practices (BMPs) to prevent erosion, such as: use of silt fences or other physical barriers to prevent erosion and sedimentation into water bodies, use of desilting basins, limitations on work during storm events and control of runoff; and post-construction revegetation and drainage requirements, including low impact development standards.

Source Water Diversion and Storage Sites

Salinas Pump Station Diversion

Construction at the Salinas Pump Station Diversion site consists of four new underground diversion structures, modifications to one existing structure, and installation of short pipeline segments (four measuring no more than approximately 150 feet long). As shown on **Tables 2-19, Proposed Project AWT Facility Process Design Flow Assumptions** and **2-20, Construction Areas of Disturbance and Permanent Footprint** in **Chapter 2, Project Description**, the construction area would be less than 0.25 acres (less than 10,000 square feet) with an estimated 100 cubic yards in excess graded material. The site is located within an area of low erosion hazard (see **Figure 4.8-5, Soil Erosion Hazard Areas**). Given the limited area of disturbance and the identified low potential for erosion, ground disturbance and construction at this site would not result in significant erosion or loss of topsoil impacts.

Salinas Treatment Facility Storage and Recovery

Development at the Salinas Treatment Facility site consists of construction of two new pump stations and pipelines. In addition, an existing 6,000-foot long, 33-inch diameter pipeline between the Salinas Pump Station and the Salinas Treatment Facility would be slip-lined for recovery of stored pond water back to the Salinas Pump Station. As shown on **Tables 2-19** and **2-20** in **Chapter 2, Project Description**, the construction area would encompass approximately 3.0 acres with an estimated 1,200 cubic yards in excess graded material. The site is located within an area of low erosion hazard (see **Figure 4.8-5**). However, given the amount of potential disturbance, and the site's proximity to the Salinas River, grading, pipeline installation and

ground disturbance could result in potentially significant erosion impacts. The site is located within the unincorporated area of Monterey County, and may be subject to approval of a grading permit as construction involves more than 100 cubic yards of excavated soil. Since the construction site would be greater than one acre in size, implementation of a SWPPP also would be required at this site that would insure erosion and loss of topsoil impacts would be less than significant.

Reclamation Ditch Diversion

Construction at the Reclamation Ditch Diversion site consists of installation of an intake structure, lift station (manhole) and a short pipeline segment (approximately 60 feet long) that would involve minor grading. As shown on **Tables 2-19** and **2-20** and described in **Chapter 2-Project Description**, the construction area would be approximately 0.15 acres (approximately 6,000 square feet) with an estimated 20 cubic yards in excess graded material. The site is located within an area of low erosion hazard (see **Figure 4.8-5**). Given the limited area of disturbance and the identified low potential for erosion during ground disturbance, the limited construction at this site would not result in significant erosion or loss of topsoil impacts.

Tembladero Slough Diversion

Construction at the Tembladero Diversion site consists of installation of an intake structure, lift station (manhole) and a short pipeline segment (approximately 100 feet long). As shown on **Tables 2-19** and **2-20** in **Chapter 2-Project Description**, the construction area would be less than 0.25 acres (approximately 10,000 square feet) with an estimated 20 cubic yards in excess graded material. The site is located within an area of low erosion hazard (see **Figure 4.8-5**). Given the limited area of disturbance and the identified low potential for erosion and ground disturbance, the construction at this site would not result in significant erosion or loss of topsoil impacts.

Blanco Drain Diversion (Pump Station and Pipeline)

Construction at the Blanco Drain Diversion site consists of construction of a new pump station that would involve minor grading and installation of approximately 8,500 linear feet of new pipeline using trenching and directional drilling to cross the Salinas River. As shown on **Tables 2-19** and **2-20** and described in **Chapter 2, Project Description**, the construction area for the pump station would be under 0.15 acres (approximately 2,500 square feet) and approximately 5.0 acres would be disturbed for pipeline installation with an estimated 1,500 cubic yards in excess graded material. The site is located within an area of low erosion hazard (see **Figure 4.8-5**). Given the site's proximity to the Salinas River, proposed pipeline installation beneath the Salinas River, and the amount of grading, trenching, and other ground disturbance, construction of this component could result in potentially significant erosion or loss of topsoil impacts without regulatory controls. The site is located within the unincorporated area of Monterey County, and may be subject to approval of a grading permit as construction involves more than 100 cubic yards of excavation. Since the construction site would be greater than one acre in size, implementation of a SWPPP would also be required for construction at this project component site. Implementation of the SWPPP would ensure that potential erosion and loss of topsoil impacts would be less than significant.

Lake El Estero Diversion

Improvements at the Lake El Estero Diversion site would result in minor land disturbance within an existing paved area. As shown on **Tables 2-19** and **2-20** in **Chapter 2, Project Description**, the construction area would be less than 1,000 square feet with an estimated 10 cubic yards in excess graded material. The site is located within an area of moderate erosion hazard (see

Figure 4.8-5). However, the construction would be within an existing flat, paved area that would require only 10 cubic yards of excavation. Construction at this site would not result in substantial erosion or loss of topsoil, therefore, the impact would be less than significant.

Treatment Facilities at Regional Treatment Plant

Development at the Regional Treatment Plant site would consist of construction of a new advanced water treatment facility that would be constructed on approximately 3.5 acres of land within the existing MRWPCA Regional Treatment Plant site and modifications to the existing Salinas Valley Reclamation Plant at the same plant site. As shown on **Table 2-20** in **Chapter 2, Project Description**, construction is estimated to result in approximately 700 cubic yards in excess graded material. The site is located within an area of moderate erosion hazard (see **Figure 4.8-5**), and grading and site disturbance could result in erosion and topsoil loss. This erosion and loss of topsoil would be reduced because the site is located within the unincorporated area of Monterey County, and may be subject to approval of a grading permit as construction involves more than 100 cubic yards of excavation. In addition, the construction site would be greater than one acre in size, and implementation of a SWPPP would be required at this site. Implementation of the SWPPP would ensure potential erosion and loss of topsoil impacts would be less than significant.

Product Water Conveyance

Development the Product Water Conveyance component of the Proposed Project consists of construction of a new pipeline and booster pump station along one of two alternate alignments. The estimated area of disturbance is 15-16 acres. As shown on **Table 2-20** in **Chapter 2-Project Description**, construction is estimated to result in approximately 8,300 to 8,600 cubic yards in excess graded material. Most of the alignment segments are located within an area of moderate erosion hazard, except for the southern portion of the Coastal Alignment that is within an area of high erosion hazard (see **Figure 4.8-5**), Some segments of the Product Conveyance Pipeline alignment (both options) are sited on gently sloping terrain, and some of the soils are classified as having moderate to high erosion hazards. Grading and site disturbance could in potentially result in significant erosion impacts. The sites are located within the unincorporated area of Monterey County, and within incorporated city limits of Marina and Seaside, and may be subject to approval of a grading permit from each applicable jurisdiction. Since the construction site would be greater than one acre in size, implementation of a SWPPP would be required at this site. Implementation of the SWPPP would ensure potential erosion and loss of topsoil impacts would be less than significant.

Injection Well Facilities

Construction of the Injection Well Facilities would consist of installation of new wells, appurtenant facilities, and an access road. As shown on **Tables 2-19** and **2-20** in **Chapter 2-Project Description**, the total construction area would involve approximately 7.5 acres with nearly 9,750 cubic yards in excess graded material. The site is located within an area of moderate erosion hazard (see **Figure 4.8-5**), and grading and site disturbance could result in potentially significant erosion impacts. The site is located within the City of Seaside, and may be subject to city requirements and standards to control excavation, grading, clearing and erosion (pursuant to Chapter 15.32 of the Seaside Municipal Code). Since the construction site would be greater than one acre in size, implementation of a SWPPP would be required at this site. Implementation of the SWPPP would ensure potential erosion and loss of topsoil impacts would be less than significant.

CalAm Distribution System Pipelines

The CalAm Distribution System components include construction of a new 3-mile long Transfer Pipeline from the Injection Well Facilities site located primarily within the City of Seaside and a new 5.4-mile long Monterey pipeline, which together comprise the CalAm Distribution System Pipelines. As described **Chapter 2, Project Description**, the area of disturbance for these facilities would total up to approximately 30 acres. The pipeline alignments are located within an area of moderate erosion hazard (see **Figure 4.8-5**), and grading and site disturbance could result in potentially significant erosion impacts. Since the construction site would be greater than one acre in size, implementation of a SWPPP would be required at this site. Implementation of the SWPPP would ensure potential erosion and loss of topsoil impacts would be less than significant.

Impact Conclusion

The Proposed Project construction could result in soil erosion or loss of topsoil due to ground disturbance and construction at all Proposed Project sites. However, state requirements for implementation of a SWPPP would ensure this impact would be less than significant. No mitigation measures are required.

Impact GS-2: <u>Construction-Related Soil Collapse and Soil Constraints during Pipeline Trenching</u>. Construction of some Proposed Project pipeline components would be located on geologic units or soils that are unstable, or that may become unstable during project construction, and potentially result in soil instability or collapse; however, this exposure would not result in a substantial risk to people or structures. (Criterion c) (Less than Significant)

Impact GS-2 applies to Proposed Project components that include installation of underground pipelines located in areas with soil stability concerns. Construction of short segments of pipelines at the following project sites would not result in construction-related impacts associated with soil collapse because the sites are not located on areas with unstable geologic units or soils: the Tembladero Slough and Reclamation Ditch Source Water Diversion sites, and the Treatment Facilities at the Regional Treatment Plant. No geotechnical issues have been identified for these locations that could result in soil collapse during pipeline trenching activities, and exposure to or creation of soil stability hazards is not expected to be significant at these locations. Potential for soil instability or collapse during pipeline trenching at other project sites are discussed below.

Project facilities would be designed in accordance with recommendations of site-specific geotechnical investigations prepared by a California-licensed geotechnical engineer, or engineers. Design-level geotechnical investigation would be prepared for all project components to inform final design and construction that address seismic hazards and expansive soils, and the best means for complying with all applicable state and local code requirements and other protective standards. The investigations would include soil sampling and laboratory testing of materials in order to provide design criteria and recommendations applicable to foundation design, earthwork, backfill, site preparation, trenching, tunneling, materials, and other factors related to all project components. All recommendations of the preliminary geotechnical investigations would be incorporated into the final design and construction specifications for each project component, and would be implemented as specified by the construction contractors. Project construction would comply with applicable codes and requirements of the California Building Code with California additions (CCR Title 24), and applicable City and

County construction and grading ordinances. Temporary construction slopes may range up to 1.5:1 or 3:1 (horizontal:vertical) inclinations.

In accordance with requirements of state and local agencies and professional engineering standards, the contractor would use continuous shoring as necessary to protect existing improvements, where temporary slopes are not feasible. Where flowing sand conditions warrant special excavation and shoring procedures, trench shields and limited open trench conditions would be used to protect adjacent improvements and existing utilities. Given these considerations, the Proposed Project components described in more detail below would result in a less-than-significant impact due to soil instability or collapse during pipeline trenching.

Source Water Diversion and Storage Sites

Salinas Pump Station Diversion and Salinas Treatment Facility

Construction activities within the northeastern low-lying areas of the Salinas Valley (in the vicinity of the proposed Salinas Pump Station and Salinas Treatment Facility Source Water Diversion sites) are anticipated to encounter areas of shallow groundwater and soft soil conditions. Drainage conditions are relatively poor and the subsurface is anticipated to consist of moist to saturated soils. Trench excavations may encounter groundwater, moist to wet soils, and soft ground conditions, and trench dewatering may be required. Soft ground may require overexcavation and stabilization with crushed rock/filter fabric to provide suitable pipe bedding support. However, no geotechnical issues have been identified for these locations that could result in soil collapse during construction, and exposure to, or creation of, soil stability hazards would not result in a significant impact at these construction sites.

Blanco Drain Diversion

The central areas of the Proposed Project area are anticipated to encounter friable dune sands that may cave continuously in some areas. Pipeline trenching in the central area would generally encounter eolian deposits and fill materials. The eolian deposits are anticipated to consist of weakly to moderately consolidated, moderately to well-sorted silt and fine- to medium-grained sand. Excavation in eolian deposits may encounter flowing sands and caving. This is a potential hazard for the installation of the Blanco Drain component of the Proposed Project. Although there is the potential for soil collapse during pipeline trenching in this location, compliance with the requirements of state and local agencies and professional engineering standards, would ensure that this impact would be less than significant.

Lake El Estero Diversion

The southwestern edge of Lake El Estero is mapped as being underlain by the Monterey Formation. Excavation may be difficult in areas where strongly cemented layers of the Monterey Formation are encountered and where granodiorite is present. Proposed improvements at the Lake El Estero Source Water Diversion site would consist of a pumping system, consisting of a new column pump installed in the wet well of the existing lake management pump station or a gravity system, consisting of a new headwall and screened intake pipe, both of which would be entirely underground or within existing pump dry and wet well structures. Depending on the extent of excavation, specialized excavation equipment, such as ripper teeth or chipper attachments may be appropriate for trenching in these deposits. However, no geotechnical issues have been identified for these locations that could result in soil collapse during construction, and exposure to, or creation of, soil stability hazards would not be a significant impact at this location.

Product Water Conveyance

As indicated above, construction activities in the central areas of the Proposed Project area are anticipated to encounter friable dune sands that may cave continuously in some areas. Pipeline trenching in the central area would generally encounter eolian deposits and fill materials. The eolian deposits are anticipated to consist of weakly to moderately consolidated, moderately to well-sorted silt and fine- to medium-grained sand. Fill materials are generally anticipated to consist of compacted silts and sands generated locally from the natural eolian deposits. Fill materials may also include imported soils and miscellaneous debris (particularly in older developed areas and along the former Fort Ord military base). The preliminary geotechnical investigation anticipates well-drained conditions and relatively deep groundwater, although shallow groundwater may be present along low-lying coastal areas.

The preliminary geotechnical investigation indicates that trenching conditions can vary depending on presence/absence of cementation and/or groundwater. Excavation in eolian deposits may encounter flowing sands and caving. This is a potential hazard for the installation of the Product Water Conveyance Pipeline component of the Proposed Project. Temporary construction slopes may range from up to 1.5:1 to 3:1 (horizontal:vertical) inclinations. Continuous shoring may be appropriate to protect existing improvements, where temporary slopes are not feasible. Flowing sand conditions may warrant special excavation and shoring procedures to protect adjacent improvements and existing utilities, such as trench shields placed during excavation and limited open trench conditions. Thus, there is a potential for soil instability or collapse during construction of the Product Water Conveyance pipeline; however, compliance with the requirements of state and local agencies and professional engineering standards, would ensure that this impact would be less than significant.

CalAm Distribution Pipelines

The soil conditions in the southwestern areas of the project area (including the CalAm Distribution Pipelines) will vary and may include soft wet soil conditions in canyon areas to difficult excavation in granodiorite and potentially strongly cemented zones of the Monterey Formation. Variable geologic conditions are present within the area where the western segment of the CalAm Distribution System is proposed. Alluvium along canyon bottoms and drainages is anticipated to include moist to wet, loose/soft clays, silts, and sands. Shallow groundwater may be encountered along lower canyon and drainage areas. Flat and sloped areas throughout the southwestern portion of the study area contain coastal terrace deposits anticipated to be comprised of semi-consolidated, moderately well-sorted marine sand containing thin, discontinuous gravel-rich layers. Construction activities in the western portion of the proposed CalAm Monterey Pipeline would be anticipated to encounter granodiorite in several locations.

Trench excavations in the low-lying alluvial areas may encounter some soft, wet, alluvium with a potential for caving and unstable trench bottoms. Dewatering may be required. Moist to wet soil conditions along lower elevations may require drying/mixing prior to trench backfill compaction. Soft ground may require overexcavation and stabilization with crushed rock/filter fabric to provide suitable pipe bedding support. Trenches excavated in coastal terrace deposits may experience variable stability due to potential zones where debris flow deposits locally overlie the terrace deposits. Monterey Formation and granodiorite materials are anticipated to be relatively stable in trench excavations. Difficulties in excavating may be encountered in granodiorite and strongly cemented layers of the Monterey Formation. Specialized excavation equipment, such as ripper teeth or chipper attachments may be appropriate for trenching in these deposits. Although there is a potential for soil instability or collapse during construction of the segments of the CalAm Distribution pipelines located in sandy soils, compliance with the requirements of

state and local agencies and professional engineering standards, would ensure that this impact would be less than significant.

Impact Conclusion

Construction of the Proposed Project pipeline segments at the Blanco Drain Diversion and Product Water Conveyance sites could result in exposure to unstable soils due to presence of friable dune sands that may cave continuously in some areas. Construction at these sites may require temporary shoring to protect construction workers from injury due to potential soil collapse. There also is a potential for soil instability or collapse during construction of the segments of the CalAm Distribution pipelines located in sandy soils. Although there is the potential for soil collapse during pipeline trenching, compliance with the requirements of state and local agencies and professional engineering standards would ensure that this impact would be less than significant. No mitigation measures are required.

4.8.4.4 Operation Impacts and Mitigation Measures

Impact GS-3: Exposure to Fault Rupture. The Proposed Project would be located in a seismically active area, and portions of the Proposed Project may be affected by fault rupture from an earthquake on local faults; however, this exposure would not result in a substantial risk to people or structures. (Criterion a) (Less than Significant)

The project would be located in an area of relatively high seismicity. Some active and potentially active faults cross the project area; although no faults in the project area are mapped on the Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist. Specifically, segments of the proposed CalAm Distribution System Pipelines cross potentially active fault traces. No other Proposed Project components are located in the vicinity of known, active or potentially active fault traces or zones.

The proposed CalAm Distribution Pipeline-Monterey Pipeline would cross the Chupines Fault Zone in the City of Seaside and the trace of the Navy Fault in the City of Monterey. These faults are not mapped as active by the State of California because they do not display evidence of recent displacement. However, past studies have indicated that certain segments of certain faults do exhibit Holocene-age displacement leading to the conclusion that certain segments could be considered active. The Chupines and Navy Faults are concealed along Del Monte Avenue, and there is no reported evidence of recent fault displacement in this area (URS, 2014). In the event of an earthquake along the Navy or Chupines Faults, ground shaking could occur, but because there has not been historic (less than 200 years) or Holocene (less than 11,000 years) activity on these faults, the active traces would be buried beneath sand and marine terrace deposits. In addition, because the faults segments are comparatively short (in comparison to an active fault such as the San Andreas Fault), any surface expression of fault movement would be minor if it would occur at all (URS Corporation, 2014).

In the unlikely event that the Navy or Chupines Faults generated earthquake activity or surface fault displacement along the Monterey Pipeline, the pipeline would likely accommodate the lateral movement and not be damaged (URS Corporation, 2014). Potential damage could include a break to a pipe segment and possibly leakage that would be readily repaired. Documented municipal water system pipe breaks due to fault rupture during large-magnitude earthquakes are not typically the cause of substantial risks of loss of life or property. While it is

possible that these local faults could generate an earthquake and rupture at the surface, the potential for such an occurrence to expose people or structures to substantial adverse effects related to fault rupture is low because the faults are either concealed beneath sediments or at a sufficient distance from the project components. In the unlikely event that one of the faults crossing the project components did generate an earthquake and cause surface rupture, the rupture area would be localized, resulting in a minor offset associated with low level groundshaking. Damage could include localized pipeline leaks that would be immediately repaired. Considering the low potential for fault rupture on the project area faults, this impact is considered less than significant (URS Corporation, 2014).

Potential design features proposed to minimize effects to off-site properties due to pipeline breakage include: 1) installation of isolation valves on either side of a pipeline fault crossing to reduce water loss in case of rupture, 2) oversize trench excavation and backfill with select compressible materials, and 3) open channel construction and/or flexible couplings.

Impact Conclusion

The Proposed Project operation would not expose people or structures to substantial risk of adverse effects due to fault rupture. The risk of fault rupture along the CalAm Distribution Pipeline would result in a less-than-significant impact. No impacts would result from fault rupture at any other Proposed Project components. No mitigation measures are required.

Impact GS-4: Exposure to Seismic Ground Shaking and Liquefaction. The Proposed Project would be located in a seismically active area; however, Proposed Project operations would not expose people or structures to a substantial risk of loss, injury, or death involving exposure to seismic groundshaking and liquefaction. (Criteria a and c) (Less than Significant)

All of the Proposed Project components would be located within a seismically active region. An earthquake on local or regional faults could result in damage to structures and pipelines due to seismic shaking and/or liquefaction. The intensity would be dependent on the magnitude of the earthquake and distance of facilities from the earthquake epicenter. The primary effects of groundshaking would be potential damage to project buildings, including foundations, and/or breaks in water pipelines. Structures would be designed in accordance with requirements of the California Building Code regarding seismic design criteria, which would help minimize damages and would not result in substantial adverse risks to people or structures.

Broken pipelines could result in localized soil washout that could damage nearby non-project facilities; repairs to broken lines could result in a temporary cessation of operation of the project facilities until repairs are complete. However, any such breaks would be localized and would be repaired, thus avoiding substantial adverse effects. Design features proposed to minimize pipeline breakage include: 1) installation of isolation valves on either side of a pipeline fault crossing to reduce water loss in case of rupture, 2) oversize trench excavation and backfill with select compressible materials, and 3) open channel construction and/or flexible couplings.

There is a strong potential for seismically induced soil liquefaction and dynamic settlement at some locations within the project area, which may damage some Proposed Project facilities (including wells, structures and pipelines). The alluvial materials in the northeastern floodplain area of the Proposed Project area are mapped as having moderate to high liquefaction susceptibility. The eolian deposits in the central portion of the Proposed Project area are generally mapped as having low liquefaction susceptibility, except where shallow groundwater

may be present in localized low-lying areas, including in the floodplain of the Salinas River (near the Salinas Pump Station Diversion site and the Blanco Drain Diversion Pump Station and Pipeline), low-lying coastal areas (i.e., near Lake El Estero), and alluvial river-bottom areas such as Canyon del Rey (Highway 68) and other drainages within the southwestern portion of the project area (see **Figure 4.8-4, Liquefaction Hazards**). Low-lying alluvial areas along segments of the CalAm Distribution Pipeline may be considered to have a relatively high susceptibility to liquefaction and dynamic settlement. There may be a moderate potential for dynamic settlement of dry, loose sands within the elevated dune sand deposits; dynamic settlement of loose dry sands may be a potential hazard to pipelines.

Project locations within areas of high liquefaction susceptibility include:

- All source water diversion and storage areas except for Lake El Estero diversion, and
- Some segments of the CalAm Distribution Pipelines.

Prior to design of facilities, detailed geotechnical evaluations would be performed for Proposed Project sites, including pipeline alignments, with geology and soils hazards in order to develop and incorporate appropriate seismic design parameters into new structural development. Geotechnical evaluation of liquefaction potential and dynamic settlement, including subsurface exploration, would be performed during the design phase for project sites with planned new structural development constructed in accordance with local requirements and the California Building Code. Appropriate measures to protect structures and other improvements would be developed based on the site specific geotechnical conditions. Adherence to existing regulations and standards, including the California Building Code, would minimize harm to people and structures from adverse geologic events and conditions. Buildings would be designed in accordance with the latest edition of the California Building Code, which sets forth structural design parameters for buildings to withstand seismic shaking without substantial structural damage.

In comparison to above-ground structures, underground pipelines, and buried structures are generally less susceptible to liquefaction damage because they are imbedded in compacted backfill that can tolerate more seismic wave motion. While this practice would not completely eliminate the potential for damage to the facilities, it would ensure that the resultant improvements would have the structural fortitude to withstand anticipated groundshaking and seismically induced ground failures without significant damage (URS Corporation, 2014).

Impact Conclusion

Upon completion of construction, all of the Proposed Project facilities would be subject to seismic shaking during an earthquake, and all the source water diversion sites, except for Lake El Estero Diversion, and some segments of the CalAm Distribution Pipeline could be subject to liquefaction. Generally, damages to facilities would be localized and minimized with adherence to local regulations, building codes, and recommendations of site-specific geotechnical reports. The application of proven seismic design criteria as standard engineering practices that are recommended in geotechnical reports would ensure that the facilities would be designed and built to minimize risk of damage. Damage from an earthquake could result in temporary cessation of project operations until repairs are completed, but the effects of seismic groundshaking and liquefaction would not result in a substantial risk of loss, injury, or death resulting in a significant impact. No mitigation measures are required.

Impact GS-5: Exposure to Coastal Erosion and Sea Level Rise. The Proposed CalAm Distribution System Monterey Pipeline would be exposed to substantial soil erosion as a result of sea level rise. (Criterion b) (Less than Significant with Mitigation)

Coastal areas are subject to coastal erosion, which may be exacerbated by sea level rise which is predicted to occur throughout the century. It is possible that coastal erosion exacerbated by sea level rise may affect segments of the proposed CalAm Distribution Pipeline. The sea level in Monterey Bay is projected to continue to rise over the next several decades, and the Monterey Bay coastline is expected to retreat inland due to the rising sea level and the resulting erosion (ESA-PWA, 2014).

A technical memorandum prepared by ESA-PWA shows selected coastal zones at risk of damage during a major storm event, considering sea level rise scenarios through 2060 (ESA-PWA, 2014). The memorandum includes a longitudinal profile spanning between Lake El Estero and Monterey Bay, with the approximate location of the proposed CalAm Monterey Pipeline plotted within the envelope of erosion for a 100-year storm at the estimated predicted sea levels in the years 2040 and 2060. The Lake El Estero Source Water Diversion site is located outside the identified coastal erosion hazard area, specifically outside the year 2100 envelope for coastal erosion as shown on **Figure 4.8-6, Coastal Erosion Hazard Zones**; therefore it would not be subject to coastal erosion or retreat impacts during its lifetime representing no impact. All other areas of the Proposed Project are located farther inland and/or are behind large dunes that would not be expected to erode as a result sea level rise within the lifetime of the project (beyond the year 2100).

CalAm Distribution Pipelines

The coastal erosion hazard zone assessment completed as part of coastal retreat study found that the portion of the Monterey Pipeline along Del Monte Avenue, adjacent to Lake El Estero, could be close enough to the ocean to succumb to coastal erosion during the operational life of the project (ESA-PWA, 2014). The study concluded that a portion of the Monterey Pipeline was within the 2030 to 2050 coastal erosion hazard zone. The coastal profile on **Figure 4.8-6** shows that the Monterey Pipeline would be within the 2060 100-year lower profile envelope meaning that there would be a potential for this pipeline section to become undermined and exposed after a significant coastal storm event sometime around 2060. This possible future condition represents a significant impact of the project because in accordance with the significance criteria, the exposure of the Monterey Pipeline along Del Monte Avenue could accelerate and/or exacerbate natural rates of coastal erosion and scour resulting in damage to adjoining properties or a substantial change in the natural coastal environment.

Impact Conclusion

Upon completion of construction, a segment of the CalAm Distribution Pipeline (Monterey Pipeline) along Del Monte Boulevard could become exposed due to projected sea level rise and associated coastal erosion. This could occur during the operational life of the project. The exposure of the Monterey Pipeline in this area could result in damage to adjoining properties from excessive bayshore erosion and scour, which is considered a significant impact. Implementation of Mitigation Measure GS-5 (Monterey Pipeline Deepening) would reduce the impact to less than significant because the pipeline in this area would be buried at the time of initial construction below the level of the 2060, 100-year lower profile envelope.

Mitigation Measure

Mitigation Measure GS-5: Monterey Pipeline Deepening. (Applies to CalAm Distribution System: Monterey Pipeline only)

CalAm shall bury the Monterey Pipeline segment that is within the pre-determined coastal erosion hazard zone to a depth of five feet below the depth of the 2060, 100-year lower profile envelope. The extent of the coastal erosion hazard zone, length of affected pipeline section, and lower profile envelope for this pipeline segment shall be determined as per the Analysis of Historic and Future Coastal Erosion with Sea Level Rise (ESA-PWA, 2014).

Impact GS-6: Hydro-Collapse of Soils from Well Injection. Proposed Project operation would not create a substantial risk to life or property due to its facilities being located on a geologic unit or soils that are unstable, or that would become unstable as a result of hydro-collapse. (Criterion c) (Less that Significant)

Injection Well Facilities

The Proposed Project includes the construction of Injection Well Facilities, which would include both deep injection wells and vadose zone (shallow) wells. The vadose zone wells would inject water into the unsaturated soils overlying the uppermost aquifer (the unconfined Paso Robles Aquifer), and the deeper wells would directly replenish the confined Santa Margarita Aquifer. The eolian deposits that underlie the proposed location for the Injection Well Facilities could be susceptible to hydro-collapse if large quantities of water are injected into the ground in the surficial soils at the site. The vadose zone wells would be screened below 100 feet, so the upper 100 feet of surficial sediment would not be wetted by the Proposed Project's vadose zone wells. Wetting of the eolian deposits at 100 feet or deeper, and mounding beneath the vadose zone wells is not expected to create a substantial risk to life or property due to the size and storativity of the unsaturated zone. Based on the depth to groundwater and minor groundwater mounding that is expected with the Proposed Project, the preliminary geotechnical report in **Appendix K** indicates that the risk of hydro-collapse due to the injection of water into the Seaside Groundwater Basin would be less than significant.

The only project component that would wet the upper sediments is the back-flush basin, a 5-foot deep shallow dug-out basin (three feet water depth plus two feet free board) where water would be discharged for several hours four times per week for injection well maintenance. Water percolated through the basin would recharge the Paso Robles aquifer. The overall basin depth would be five feet. The embankment of the basin would have 3:1 side slopes and 12-foot wide perimeter access road, and it would not contain structures (except a discharge pipe) or other features that would be negatively impacted from settlement or hydro-collapse. The basin would not be located adjacent to the wells. The proposed back-flush basin may cause wetting of the shallow eolian deposits. However, the back-flush basin is only expected to receive pumped water for a few hours per week so settlement due to hydro-collapse is anticipated to be relatively minor and limited to the footprint of the back-flush basin which can accommodate minor settlement. As such, the impact of hydro-collapse resulting from use of the back-flush basins would be less than significant.

Impact Conclusion

The risk of hydro-collapse resulting from injection of water into the Seaside Groundwater Basin and from use of the back-flush basin for well maintenance during Proposed

Project operations would constitute a less-than-significant impact. No mitigation measures are required.

Impact GS-7: Exposure to Expansive and Corrosive Soils. The Proposed Project would not result in substantial risks to the public or other facilities due to location on expansive or corrosive soil types. (Criterion d) (Less than Significant)

The Proposed Project facilities may be impacted by expansive soils in locations containing clays including the Salinas River Valley, southwestern alluvial areas, and potential locations containing clayey fills. Proposed Project elements could be damaged due to settlement of weak or saturated subsurface soils. The expansion characteristics of clayey soils may vary locally, and thus, should be considered during detailed project design on a site-specific basis. Clayey soils are potentially corrosive and/or expansive.

The Proposed Project facilities may also be impacted by corrosion of ferrous metals or sulfate attack on concrete due to corrosive/deleterious soils. The potential for corrosivity depends on the material type and the proximity to saltwater. In general, clay deposits in the alluvium of the Salinas River Valley, southwestern alluvial areas, or coastal marine areas may constitute a corrosive or deleterious environment. Over time, pipe corrosion could lead to pipeline failure, resulting in localized surface flooding and/or soil settlement, although no substantial adverse risks to life or property at offsite properties would result from this potential occurrence during Proposed Project operations.

The conductivity of soils may be high enough in the project study area to corrode underground metal pipes and electrical conduits. Over time, pipe corrosion could lead to pipeline failure, resulting in localized surface flooding of water or localized settlement of surface soils in the location of the failure. Failed subsurface electrical conduits could result in electrical short-circuiting. This would reduce power temporarily to the facility and possibly result in temporary shutdown of operations.

Many of the project sites have been previously studied and developed and the underlying soils replaced with engineered fill; in addition, previous geotechnical evaluations have been prepared for some sites. Detailed site-specific geotechnical engineering studies, including subsurface exploration and laboratory testing, should be performed during project design to further assess site soils. These engineering studies will determine whether site soils will be expansive and corrosive, and to analyze other geotechnical constraints at the Proposed Project so that appropriate geotechnical design and construction recommendations can be prepared.

Impact Conclusion

Although there is the potential for soil types at the project sites to exhibit expansive and corrosive properties, detailed site-specific geotechnical engineering studies, including subsurface exploration and laboratory testing, would be performed during project design to further assess site soils. As indicated in **Section 4.8.4.2** above, these studies would provide design details for facility plans in response to soils conditions present. Implementation of recommendations in the geotechnical studies, which is applicable to all Proposed Project components, would ensure this impact is less than significant. No mitigation measures are required.

4.8.4.5 Cumulative Impacts and Mitigation Measures

The geographic scope for cumulative impact analysis on geology, soils, and seismicity consists of each Proposed Project component site and the immediate vicinity around each of these sites.

Geologic and seismic impacts are generally site-specific, because they result from the local geology and soil conditions at a given site and do not have additive effects with activities/projects beyond the immediate vicinity. Based on the list of cumulative projects provided on **Table 4.1-2, Project Considered for Cumulative Analysis** (see **Section 4.1, Introduction**), there are no other proposed or planned developments within the immediate vicinity of the Proposed Project facilities, except for the proposed CalAm Transmission Main that is adjacent to the Product Water Conveyance: Coastal alignment. The Transmission Main is a component of the Monterey Peninsula Water Supply Project (MPWSP) with the smaller, 6.4 mgd desalination plant.

The discussion of cumulative impacts is organized to address the combined impacts of the Proposed Project plus the MPWSP (with the 6.4 mgd desalination plant) and then to address the overall combined impacts of the Proposed Project and all relevant past, present and probable future projects identified on **Table 4.1-2**:

- *Combined Impacts of Proposed Project Plus MPWSP (with 6.4 mgd Desalination Plant) (referred to as the MPWSP Variant):*[3] The CalAm MPWSP includes: a seawater intake system; a source water pipeline; a desalination plant and appurtenant facilities; desalinated water conveyance facilities, including pipelines, pump stations, a terminal reservoir; and an expanded ASR system, including two additional injection/extraction wells (ASR-5 and ASR-6 Wells), a new ASR Pump Station, and conveyance pipelines between the wells. The CalAm Distribution Pipelines (Transfer and Monterey) would be constructed for either the MPWSP or GWR project. The overall estimated construction schedule would be from June 2016 through March 2019 for the combined projects and construction could overlap for approximately 18 months (mid-summer 2016 through December 2017). The cumulative impact analysis in this EIR anticipates that the Proposed Project could be combined with a version of the MPSWP that includes a 6.4 mgd desalination plant. Similarly, the MPSWP EIR is evaluating a "Variant" project that includes the proposed CalAm Facilities (with the 6.4 mgd desalination plant) and the Proposed Project. The impacts of the Variant are considered to be cumulative impacts in this EIR. The CalAm and GWR Facilities that comprise the MPSWP Variant are shown in **Appendix Y**.
- *Overall Cumulative Projects:* This impact analysis is based on the list of cumulative projects provided on **Table 4.1-2** (see **Section 4.1**). The overall cumulative impacts analysis considers the degree to which all relevant past, present and probable future projects (including the MPWSP (with the 6.4 mgd desalination plant)) could result in impacts that combine with the impacts of the Proposed Project.

Combined Impacts of Proposed Project Plus MPWSP (with the 6.4 mgd Desalination Plant). **Table 4.6-6, Summary of Impacts – Cultural Resources**, above provides a summary of impacts of the Proposed Project for construction-related impacts of erosion, soils collapse during trenching. These impacts were found to be less-than-significant with compliance with the requirements of state and local agencies and professional engineering standards during construction. GWR operational impacts from exposure to fault rupture, ground shaking, liquefaction, expansive soils and hydro-collapse of soils from well injection were also found to

[3] The October 2012 Notice of Preparation of an EIR for the MPWSP describes an alternative to the MPWSP that would include a smaller desalination plant combined with the Proposed GWR Project (CPUC 2012). Based on ongoing coordination with the CPUC's EIR consultants, this alternative is referenced as the "Variant" and includes a 6.4 mgd desalination plant that was proposed by CalAm in amended application materials, submitted in 2013 to the CPUC (CPUC, 2013).

be less than significant. The MPSWP would have similar impacts from erosion and corrosive soils and potential to expose people or structures to substantial adverse effects related to fault rupture, ground shaking, liquefaction, expansive soils and hydro-collapse of soils as the Proposed Project.

Segments of the MPWSP Transmission Main would be in a similar location as segments of the Proposed Project's Product Water Conveyance Coastal Alignment Pipeline. The construction of the two pipelines would be in proximity to each other, but would not be located within the same alignment trenches, and would not exacerbate soil instability issues related to the projects' individual impacts. Therefore, construction and operation of the combined facilities would not result in a significant cumulative impact.

Overall Cumulative Impacts. This impact analysis is based on the list of cumulative projects provided on **Table 4.1-2** (Also see **Figure 4.1-2** in **Section 4.1**). The overall cumulative impacts analysis considers the degree to which all relevant past, present and probable future projects could result in impacts that combine with the impacts of the Proposed Project. The Proposed Project would not be within the same location as any other known projects, with the exception of the MPWSP as discussed above and the City of Salinas Solar Project. The City of Salinas Solar Project would be constructed starting in 2015 and ending in 2016, which would not completely coincide with construction of the Proposed Project at the Salinas Pump Station Diversion site. Should an overlap of construction schedules occur, it is likely that the installation of the solar panels would be nearing completion, and construction of the two projects would not create a combined geologic, soil or seismicity impacts.

Because of the localized nature of the anticipated individual project impacts, the projects listed in **Table 4.1-2** would not combine with those of the Proposed Project to cause or contribute to potential cumulative geologic, soil, or seismic impacts. Construction of all projects would be subject to applicable codes and requirements of the California Building Code with California additions (CCR Title 24), and applicable City and County construction and grading ordinances.

Cumulative Impact Conclusion

With compliance with applicable regulations overseeing construction of both MPWSP and GWR facilities and implementation of mitigation measures for each project, the exposure to seismic or soils hazards would not result in a significant cumulative impact. Because of the localized nature of the anticipated impacts or other cumulative projects listed in **Table 4.1-2**, the cumulative projects, including the Proposed Project, would not result in cumulative geologic, soil, or seismicity impacts.

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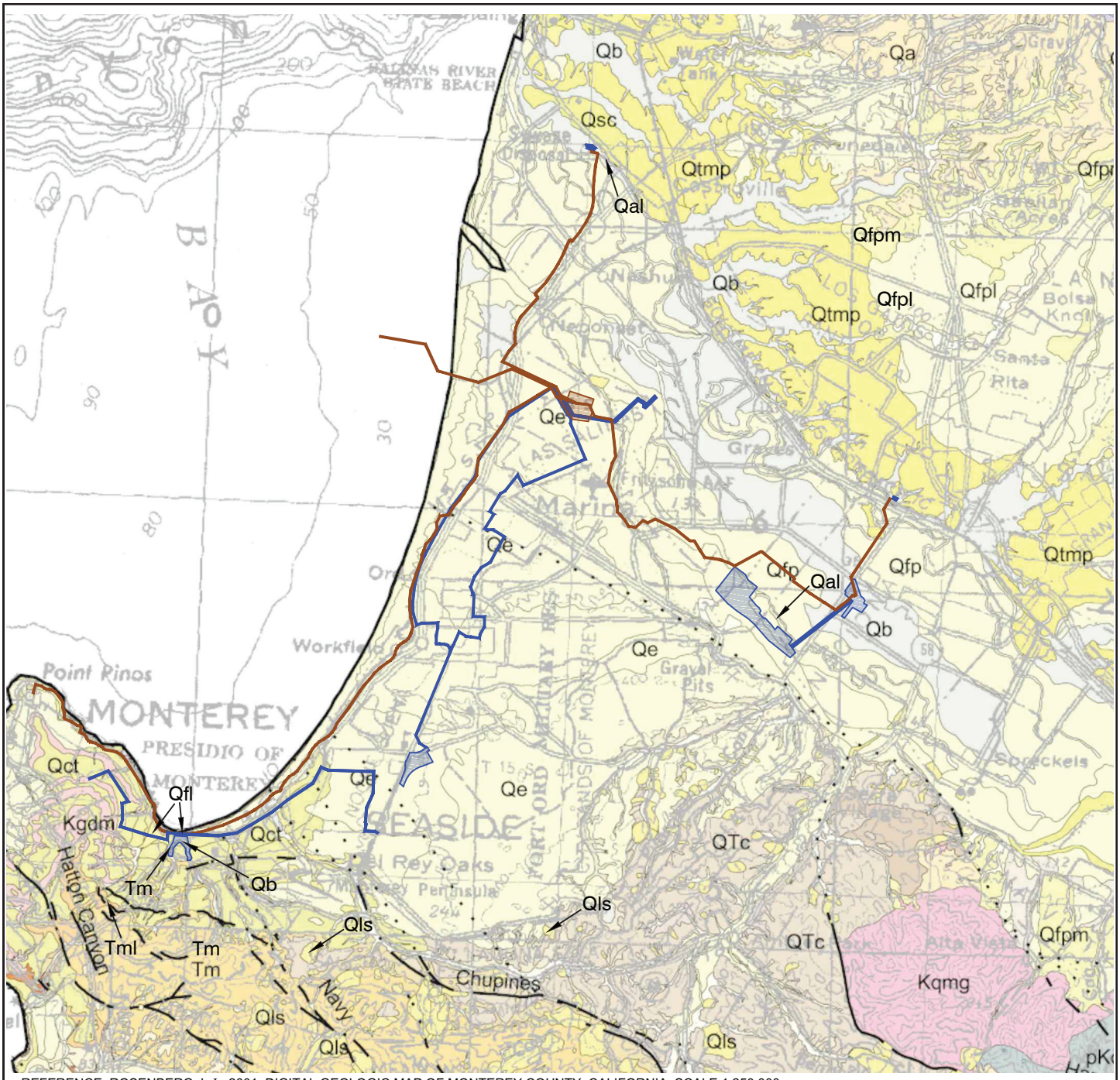


REFERENCE: ROSENBERG, L.I., 2001, DIGITAL GEOLOGIC MAP OF MONTEREY COUNTY, CALIFORNIA, SCALE 1:250,000.

N

SCALE IN MILES

0 2.5 5

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

LEGEND

- EXISTING WASTEWATER FACILITIES
- PROJECT COMPONENT

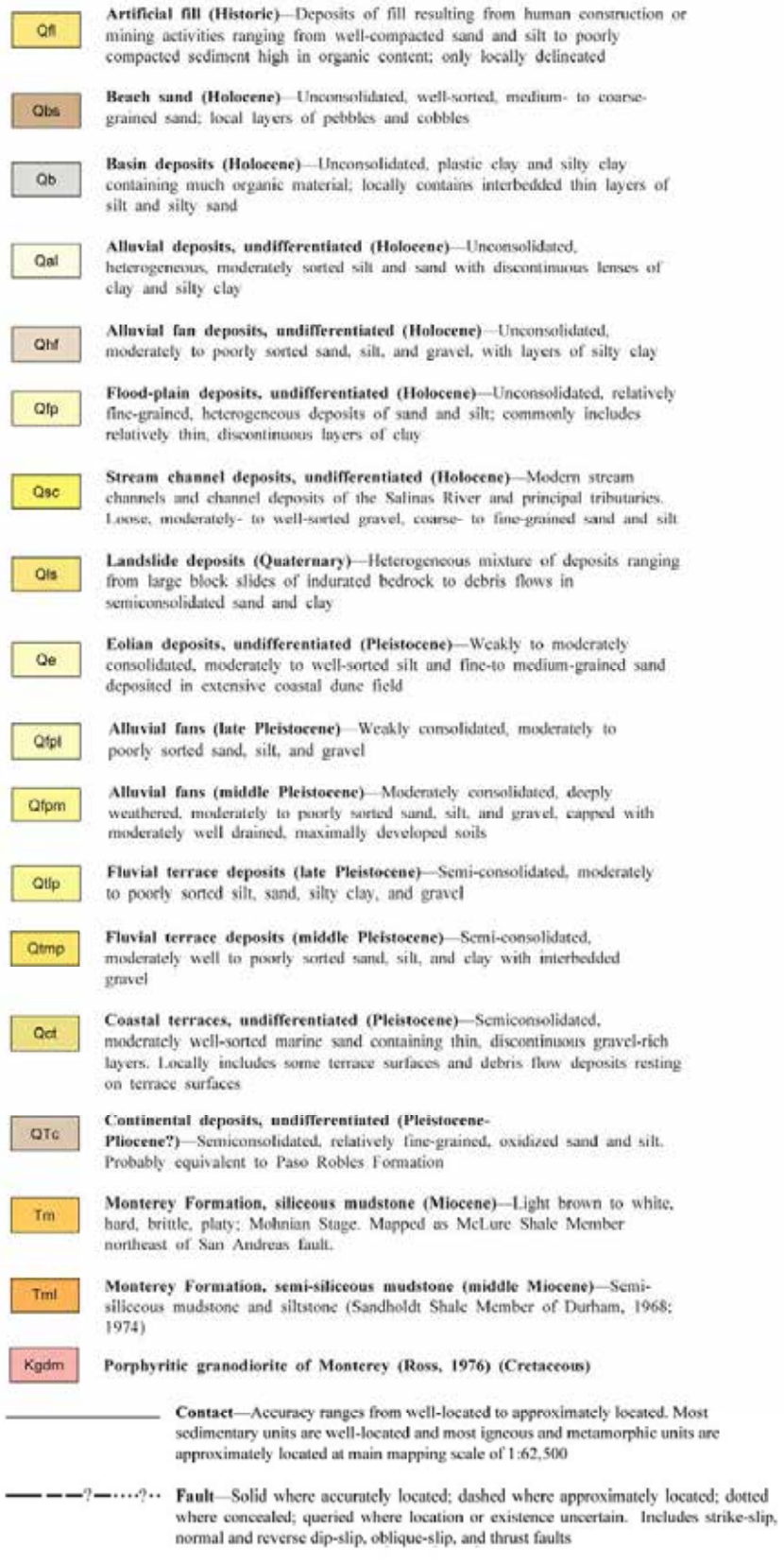
Regional Geology Map

April 2015

Source: Ninyo and Moore, 2014

Pure Water Monterey GWR Project
Draft EIR

Figure
4.8-1A



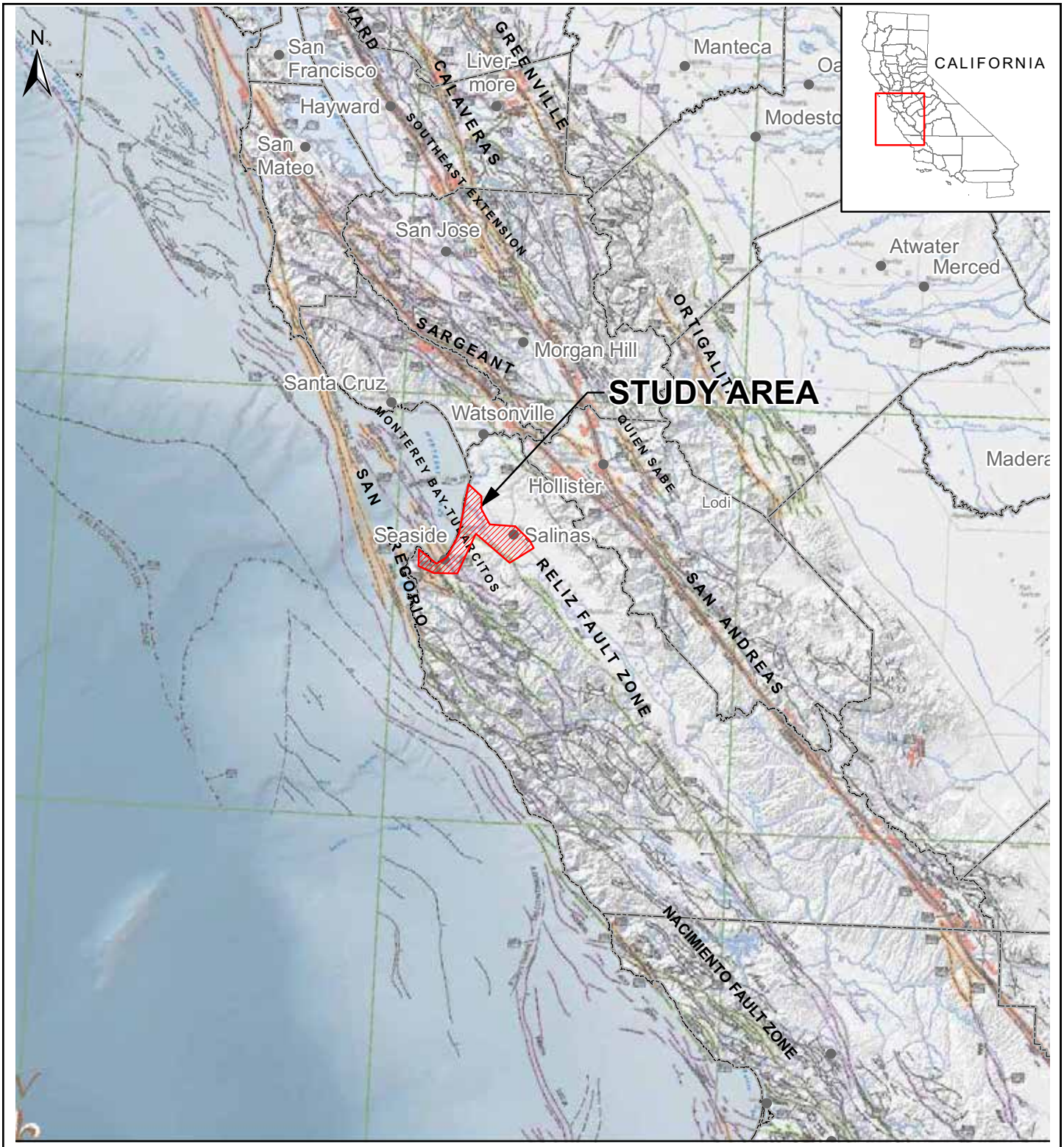
Source: Ninyo and Moore, 2014

Explanation of Regional Geology

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.8-1B



SOURCE: Fault Activity Map of California, 2010, Jennings, C.W., and Bryant, W.A., California Geological Survey.

APPROXIMATE SCALE

0 20 40 MILES

LEGEND

CALIFORNIA FAULT ACTIVITY

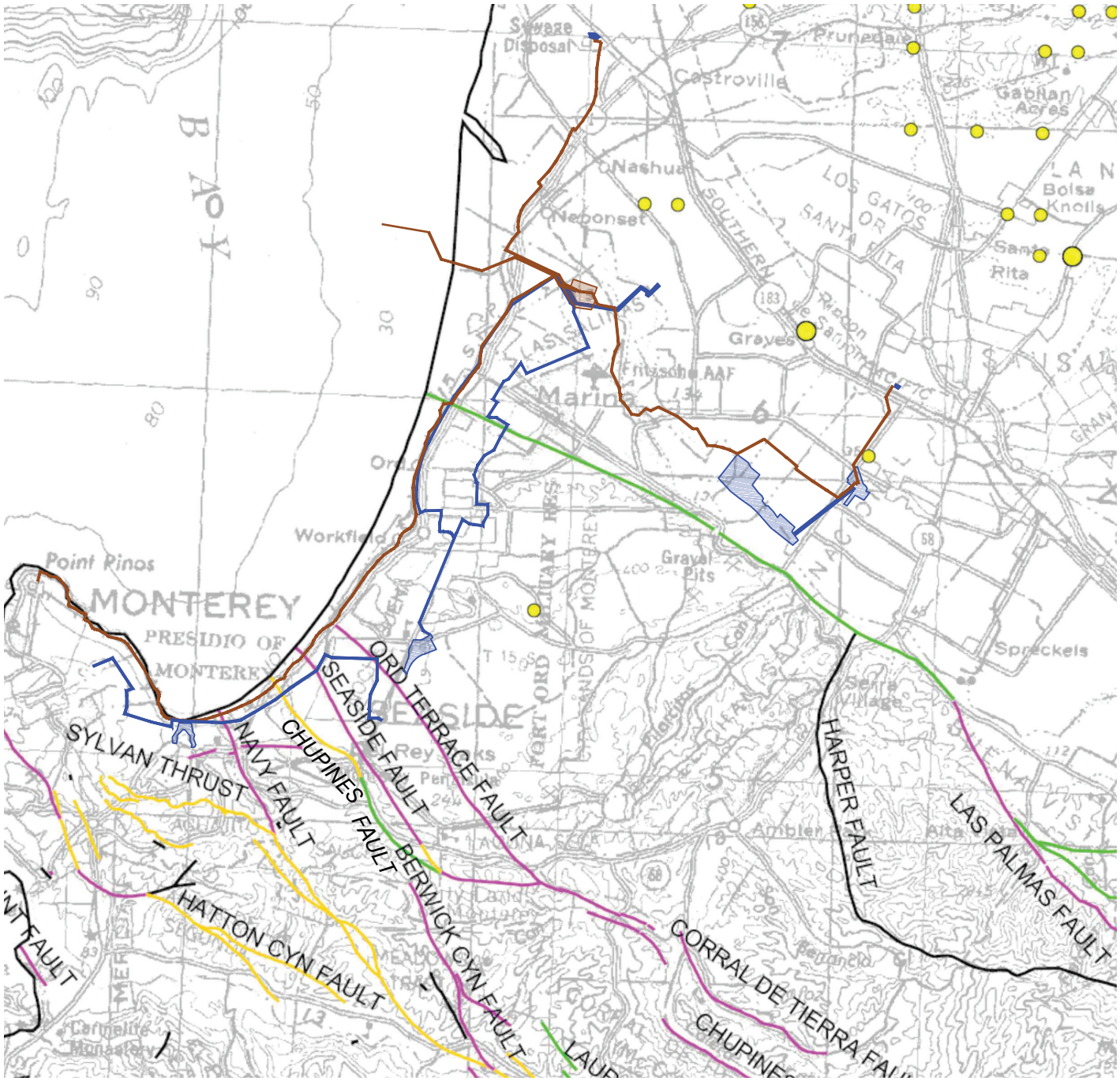
- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- STATE/COUNTY BOUNDARY
- QUATERNARY (POTENTIALLY ACTIVE)
- LATE QUATERNARY (POTENTIALLY ACTIVE)

Regional Fault Map

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.8-2



REFERENCE: ROSENBERG, L.I., 2001, DIGITAL MAP SHOWING RELATIVE FAULT HAZARDS OF MONTEREY COUNTY, CALIFORNIA, SCALE 1:250,000.

LEGEND

EXISTING WASTEWATER FACILITIES — PROJECT COMPONENT

Historic (younger than 200 years before present)—Displacement during historic time (1906 San Andreas fault earthquake)

Holocene (younger than 11,000 years before present)—Fault offsets Holocene deposits as dated by radiocarbon methods; delineated by well-developed geomorphic features such as deflected stream channels, linear drainages, saddles, notches, and troughs; aligned with historic seismicity recorded by the UCB/USGS Northern California Earthquake Data Center

Late Quaternary (750,000 to 11,000 years before present)—Fault cuts middle Pleistocene or younger deposits. Marine terrace age estimates based on correlations by McKittrick (1988) and Dupré (1990). Alluvial fan age estimates based on correlations by Tinsley (1975), Dupré and Tinsley (1980), and Klaus (1999)

Undivided Quaternary (younger than 1,600,000 years before present)—Offset of Quaternary deposits not otherwise determined to be younger than middle Pleistocene

Pre-Quaternary (older than 1,600,000 years before present)—Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.

Earthquake epicenter (magnitude 3.0-3.9) — **Earthquake epicenter (magnitude 5.0-5.9)**

Earthquake epicenter (magnitude 4.0-4.9) — **Earthquake epicenter (magnitude 6.0-6.9)**

N

SCALE IN MILES

0 2.5 5

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

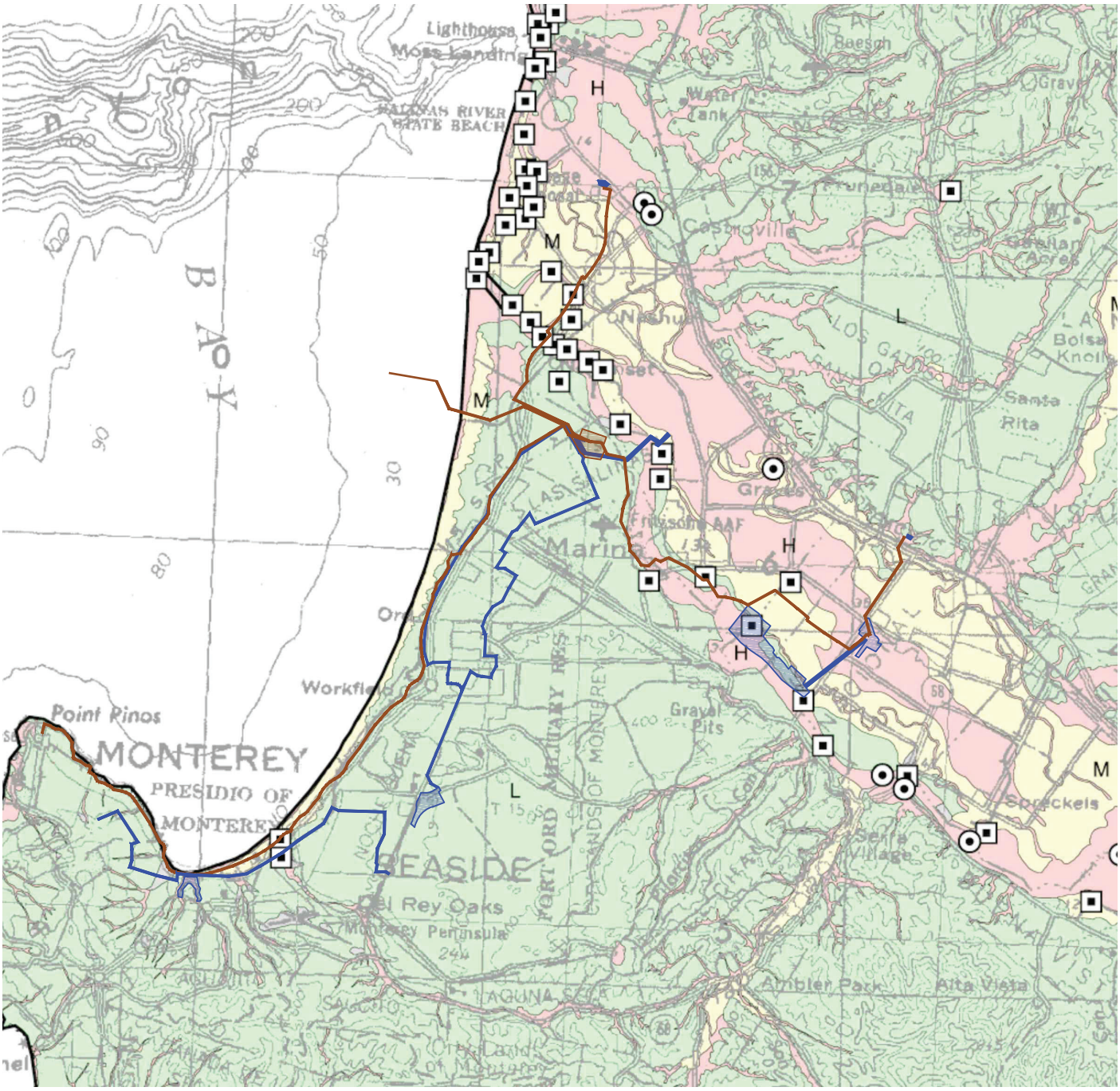
Detailed Fault Map

April 2015

Source: Ninyo and Moore, 2014

Pure Water Monterey GWR Project
Draft EIR

Figure
4.8-3



REFERENCE: ROSENBERG, L.I., 2001, DIGITAL MAP SHOWING RELATIVE LIQUEFACTION SUSCEPTIBILITY OF MONTEREY COUNTY, CALIFORNIA, SCALE 1:250,000.

LEGEND

EXISTING WASTEWATER FACILITIES — PROJECT COMPONENT

H — **High liquefaction susceptibility**— Engineering tests and shallow ground water, the local presence of free faces, or historical evidence of liquefaction-induced ground failure in the 1906 San Francisco or 1989 Loma Prieta earthquakes. Mainly latest Holocene (0-500 years before present) younger flood-plain deposits and most Holocene basin deposits, undivided alluvial deposits, and abandoned channel-fill deposits. Sediments are likely to liquefy in a nearby major earthquake

M — **Moderate liquefaction susceptibility**—Historical evidence of liquefaction-induced ground failure absent, although high susceptibilities calculated in engineering tests. Includes late Holocene (500-5,000 years before present) older flood-plain deposits, colluvium, and some late Pleistocene-Holocene eolian deposits. May liquefy in a nearby major earthquake

L — **Low liquefaction susceptibility**—Includes almost all Pleistocene deposits and pre-Quaternary deposits, and Holocene deposits where the historical high ground water table is at least 30 feet below the ground surface (e.g., most alluvial fan deposits). Unlike to liquefy, even in a nearby major earthquake

V — **Variable liquefaction susceptibility**—Areas of mapped artificial fill. Depending on the type of material and method of placement, the suceptibility may range from high to low

Historical liquefaction present in 1906 San Francisco or 1989 Loma Prieta earthquakes

Historical liquefaction absent in 1906 San Francisco or 1989 Loma Prieta earthquakes

N

SCALE IN MILES

0 2.5 5

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

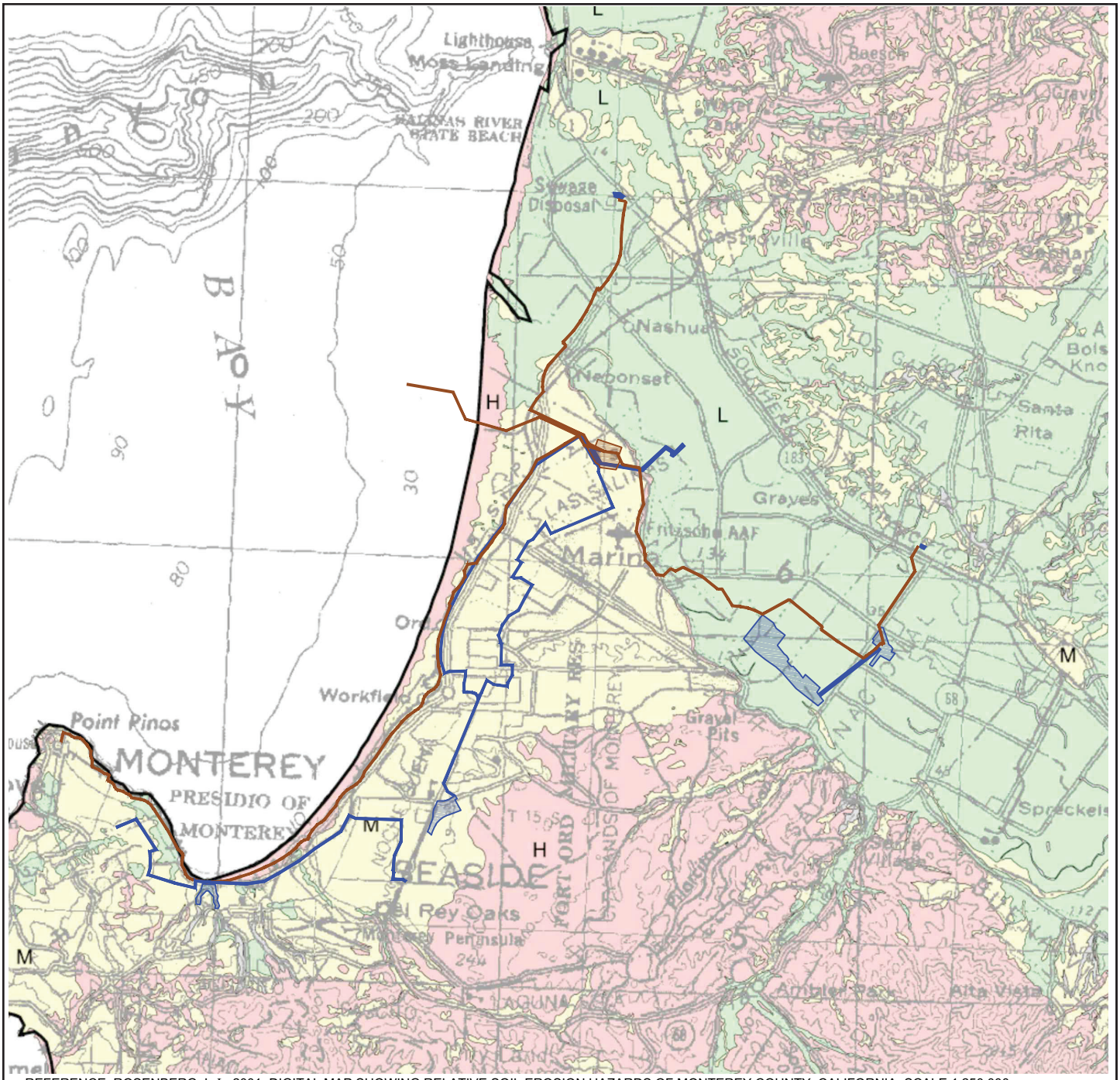
Liquefaction Hazards

April 2015

Source: Ninyo and Moore, 2014

Pure Water Monterey GWR Project
Draft EIR

Figure
4.8-4



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N

SCALE IN MILES

0 2.5 5

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

LEGEND

- EXISTING WASTEWATER FACILITIES
- PROJECT COMPONENT
- H — **Area of high erosion hazard**—Includes areas classified by Cook (1978) as high and very high, high or very high, high to very high, moderate to high, slight to high, very high, and high
- M — **Area of moderate erosion hazard—**Includes areas classified by Cook (1978) as moderate, and slight to moderate
- L — **Area of low erosion hazard**—Includes areas classified by Cook (1978) as minimal, minimal to slight, none, and slight
- V — **Area of variable erosion hazard**—Includes areas classified by Cook (1978) as variable

Source: Ninyo and Moore, 2014

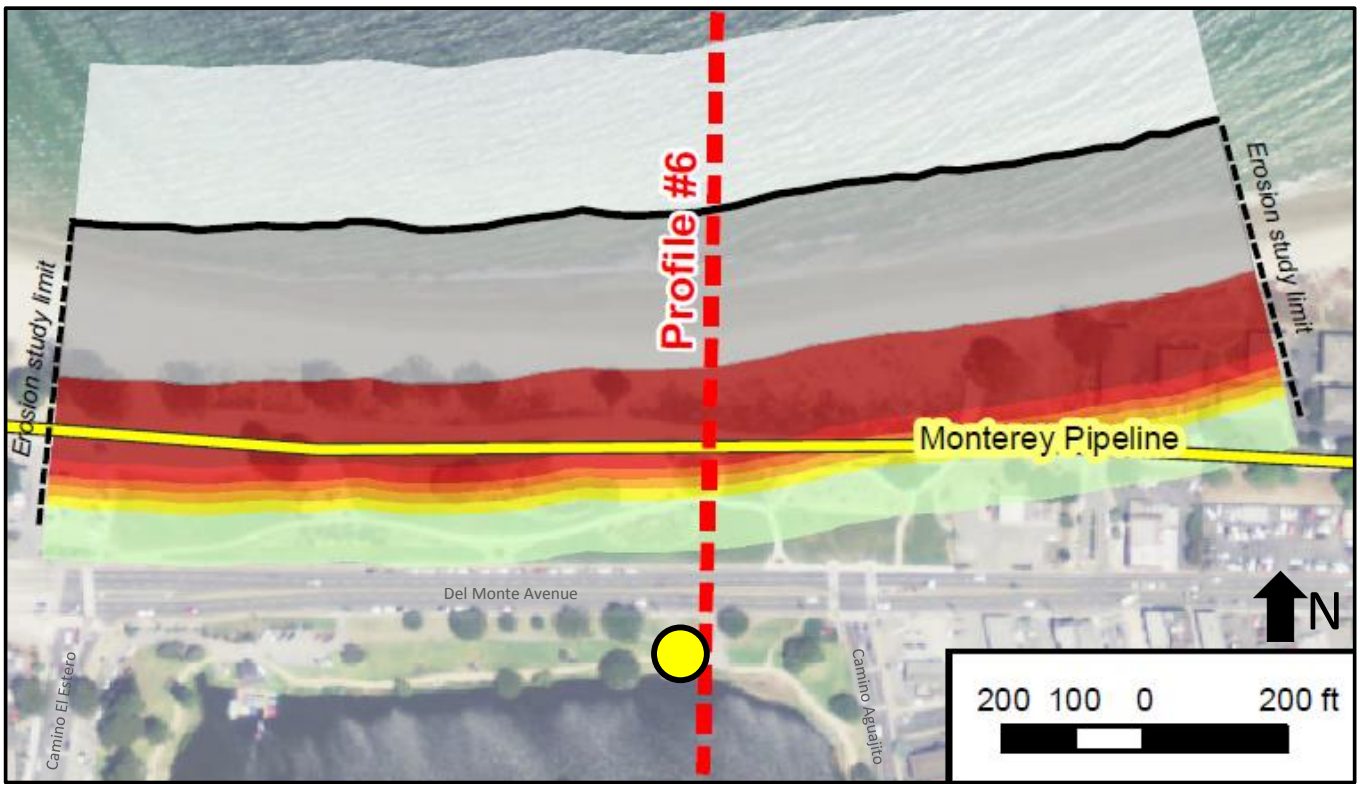
DD&A

Soil Erosion Hazard Areas

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.8-5



Lake El Estero Diversion Site

Monterey Pipeline

Erosion Reference Line

Offset to backshore toe

Coastal Erosion Hazard Zones

2010

2030

2040

2050

2060

2100

Note: Existing infrastructure locations are approximate. Proposed infrastructure Locations are shown for reference and were developed prior to this study. Proposed infrastructure locations were provided by the California American Water Company/MRWPCA and are included her for reference.

Source: ESA/PWA, 2014. Modified by DDA to add Lake El Estero site.

Source: ESA / PWA, 2014

Coastal Erosion Hazard Zones

April 2015

Pure Water Monterey GWR Project
Draft EIR

Figure
4.8-6

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